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Correspondence and Communications

A new modification in the design of inferior pedicle breast reduction: Pedicle advancement

Dear Sir,

Macromastia is a condition that may cause back and neck pain, peripheral neuralgia, shoulder pain, postural problems, physical and psychologic stresses[1-3]. To date, although many methods for reduction mammaplasty have been described, the wise pattern inferior pedicle method has been considered as the most commonly used technique, since it was described by Ribeiro in 1975[4].

Common criticisms of inferior pedicle approach are the development of pseudoptosis or bottoming out due to pedicle's tendency to inferior descent[5].

In this study, inferior pyramidal pedicle was entirely advanced to the direction of the upper pole of the breast for filling the upper pole, avoiding the descent of the breast and decreasing the tension on the T junction.

A total of 18 consecutive patients who underwent bilateral breast reduction with inferior pedicle advancement technique was included in the study.

Patients'ages ranged from 23 to 59 years with a mean of 34,4 years. They had mild to moderate breast hypertrophy for which no more than 1050 g tissue per breast was excised. In all patients, both the distance between the nipple and the sternal notch and the distance between the nipple and the inframammary fold were measured preoperatively, then one week and 12 months after surgery. Outcomes were compared statistically using $\chi 2$ tests.

New nipple site was located at the inframamarian fold level, which was approximately 21–22 cm from the sternal notch (SN). Then, skin markings were proceeded with the standard inverted T scar pattern. Inferior pyramidal pedicle was designed in 8–10 cm width with leaving 1 cm tissue around the areola (Figure 1A).

In the operation, pedicle was entirely de-epithelized, preserving the underlying dermis. It was shaped by means of cutting the dermis and breast tissue straight down to the prepectoral fascia without opening or detaching it to preserve vascular and neural supports of both the areola and pedicle. Deep connections of the pedicle with Würinger's horizontal septum were also protected. A subglandular pocket at the upper pole of the breast was created. Afterwards, the pyramidal pedicle was incised straight down to the level of the pectoralis fascia at the base area without leaving any dermal or glandular attachment to the inframammary fold (Figure 1B). After the advancement of the flap under upper breast flap, three stitches were placed at the level of 2 nd intercostal space between the flap bottom under the areola and pectoralis muscle to fix the flap position. Another two symmetrical sutures were also secured the flap to the pectoral muscle (Figure 2A, B). Skin flaps were redraped over the pedicle and sutured in the usual manner. The mean preoperative sternal notch to nipple distance, indicating the severity of ptosis, was 33 cm and the mean distance between nipple and submammary fold was 15,7 cm. The average weight of excised breast tissue per breast was 755 g. Amount of the advancement of the flap varied 3 to 6 cm during the operation. One patient developed partial suture dehiscence at the vertical suture line which was treated conservatively. This modification added an additional operation time of 10 to 15 min to the duration of well-known inferior pedicle technique. There was no sensation loss or changes on nipple areola complexes of patients. Clinically, maintenance of breast shape, without pseudoptosis or nipple rotation was significant in the follow up period. Degree of glandular descent and pseudoptosis was evaluated by comparing the values of the sternal notch to nipple and the nipple to submammary fold distances between the postoperative first week and the first year. Values of sternal notch to nipple distance showed an insignificant difference between the measurements, indicating the protection of upper pole fullness and breast projection one year later ($p > 0.05$). Mean values of nipple to submammary fold distance showed a statistically significant difference ($p < 0.05$). However, there wasn't any patient having elongation in nipple to submammary distance more than 2 cm, excluding the development of bottoming-out deformity. As observational datas were not much in this study, this communication presented a way how this modification was done and the personal experiences with this technique. This modification turns the inferiorly based pedicle to a chest wall-based flap, by means of cutting the flap base down to the pectoral facia. As a result of it, inferior pyramidal pedicle gains a significant mobility, by freeing from the pedicle base at the submammary fold; that's why, this modification may be considered as a new modification in the inferiorly based pedicle technique.

With this modification, the septum-enhanced mammaplasty technique was combined with the chest wall-based inferior pedicle procedure to carry both the inferior pyramidal pedicle and NAC safely up to the upper pole. It provides the ability for upper movement of the pedicle, preservation of lactation potential and nipple sen-

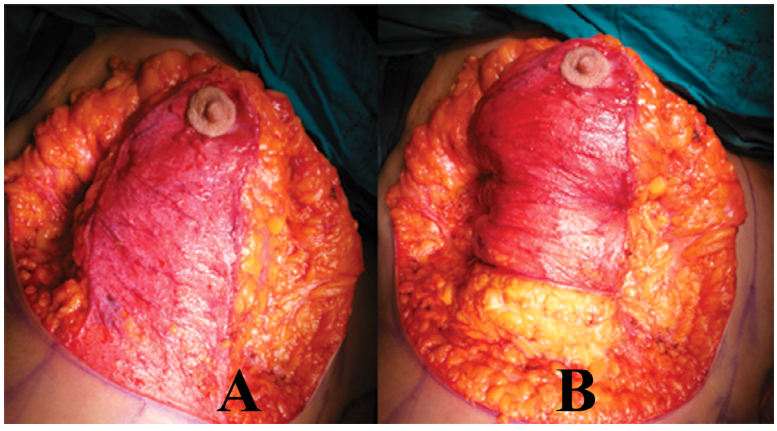

Figure 1 (A) Appearance after dissection of the pedicle that was incised straight down to the pectoralis fascia at the base area. Note that there wasn't any dermal or glandular attachment to the inframammary fold. (B) Dermal stitches that were placed between dermis and pectoral muscle after the advancement of the pedicle.

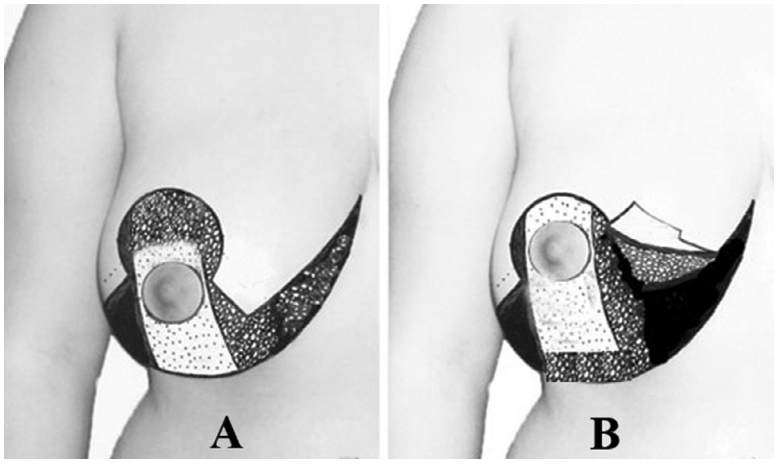

Figure 2 Illustration of the technique. (A) Intraoperative drawing shows inferior pedicle design before the pedicle cut. Please note the dotted area represents the inferior pedicle. (B) The pedicle is cut, and moved to the upper pole of the breast and then fixed with sutures to the pectoral fascia.

sation, safe blood supply, lesser skin tension at T junction, a long lasting breast shape without sagging.

Declaration of Competing Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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Ethical approval

Research protocol was approved by the local Ethical Committee (2019/433).

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Nazım Gümüş
Plastic, Reconstructive and Aesthetic Surgery, Department of Mersin University, Medical Faculty, Mersin, Turkey
E-mail address: gumus1970@mersin.edu.tr (N. Gümüş)

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CAD-CAM planned double free flap reconstruction of the paediatric mandible after Ewing sarcoma resection

Dear Sir,

Ewing sarcoma is a rare tumour, with an incidence of approximately 3/1.000.000.[1] Standard therapy consists of neoadjuvant chemotherapy, followed by local therapy (surgery and/or radiotherapy).

We present a six-year-old girl who consulted with intermittent pain to the right submandibular region and excessive nightly sweating. She endured a rapidly progressive submandibular swelling without functional impact (Figure 1). The tumour had a hard consistency, without fluctuation or pain during palpation. Imaging showed a homogenous tumour mass (71 × 50 × 63 mm) in the right masticator space, from right beneath the temporomandibular joint to the submandibular salivary gland, which had been moved anteriorly. The mass infiltrated in the ramus and corpus mandibulae, up to tooth 23, with periosteal reaction. There were no enlarged lymph nodes. Cytology showed evidence of a small blue round cell tumour (DD Ewing sarcoma, neuroblastoma, osteosarcoma, acute leukaemia). A mandibular bone biopsy confirmed the diagnosis of Ewing sarcoma, with MIC-2 positivity (CD99). Staging with imaging, fine needle aspiration cytology (FNAC) of a neck lymph node and bone marrow aspiration showed local disease activity, without lymph node, bone marrow or distant tissue invasion. Neoadjuvant chemotherapy was started according to the Euro-Ewing 2012 protocol (VIDE arm).

Four months after diagnosis, she underwent multidisciplinary surgery. The maxillofacial surgeons performed a total parotidectomy, and right hemimandibulectomy with sparing of the rami temporales, zygomatici and buccales of the facial nerve.

The plastic surgery team (JJV) reconstructed the bony and cheek volume defect using a free osteocutaneous fibula flap (FOFF) and anterolateral thigh (ALT) flap respectively, both coming from the right leg. The fibula flap was harvested according to the preoperative CAD-CAM 3D planning (Computer Aided Design and Manufacturing). Surgical cutting guides and models, for both the recipient as donor sites, were printed in-house overnight (Leuven University Hospital 3D Core Facility) using Materialise ProPlan software (Materialise, Leuven, Belgium) and a Connex 350 3D Printer (Stratasys, MN, USA). A neomandible was constructed in accordance with the 3D cutting guides.

The ipsilateral fibula was used resulting in a vascular pedicle coming in from an anterior neck position. After the neomandible was fit into the defect, the fibular pedicle remained short as expected. A length deficit of one of the two flap vascular pedicles was anticipated. Therefore a second connection site was provided for an anteriorly located microvascular anastomosis, dissecting the transverse circumflex vascular pedicle along with the descending branches for the ALT flap. The peroneal vein was anastomosed to the transverse branch of the transverse circumflex femoral vein. The descending branch was connected end-to-end with the facial vein. The peroneal and lateral circumflex femoral artery were anastomosed with the lingual and facial artery, respectively, which were dissected to their maximal lengths. The ALT flap was deepithelialised to provide soft tissue volume and recreate the facial contour in the buccozygomatic area. Due to excessive traction, both donor sites were closed using a split thickness skin graft, which can be removed in a later stage for aesthetic reasons when elasticity allows excision.

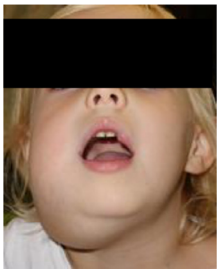

Figure 1 Preoperatively: Ewing sarcoma of the ramus and corpus mandibulae (71 × 50 × 63 mm).

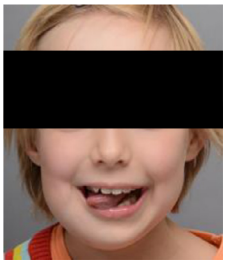

Figure 2 Two years postoperatively: complete remission and fully functional.

Anatomopathological investigation of the resection specimen showed a complete therapy response, without lymph node invasion. Two months after surgery, adjuvant chemotherapy was started according to the Euro-Ewing 2012 protocol. At request of the parents, adjuvant radiotherapy was not administered.

Almost two years after therapy completion, the patient remains in remission and is fully functional (Figure 2).

Extensive aggressive oromandibular resection and subsequent reconstruction have a central role in the treatment of primary non-metastatic, resectable Ewing sarcoma. It reduces the risk of local relapse, offers the opportunity for assessing the histological response to chemotherapy and restores both function and aesthetic integrity of both the bony contour as the volume deficit in the cheek.[2] Yet, the use of double microsurgical free flaps in the paediatric population carries additional challenges e.g. smaller vessels, donor site morbidity, and continued craniofacial growth.

Institution: KU Leuven University Hospitals, Herestraat 49, 3000 Leuven, Belgium

The FFOF and ALT flap is the most prevalent combination of simultaneous free flap transposition for complex head and neck defects.[3] Revision rate, flap failure rate, and recipient and donor site complications are not significantly different between double and single free flaps.[3-4] Using in-house CAD-CAM technology, we were able to optimise the restoration of the facial contour and function, simultaneously reducing the handling trauma of donor tissues, ischaemia and operative time.[5]

In conclusion, double free flap reconstruction of the paediatric mandible after extensive Ewing sarcoma resection is safe and offers excellent facial aesthetic and functional results. In-house virtual planning and 3D printing of guides and scaffolds allow for optimal reconstruction of bony contour and anticipate on future dental rehabilitation. Future research and experience will determine quality of life, long term impact and added value of augmented reality technology.

Declaration of Competing Interest

No conflict of interest.

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Ethics

N/A.

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Renee De Busser
KU Leuven University, Faculty of Medicine, Leuven, Belgium

Liza Van Kerckhoven, Jan Jeroen Vranckx
KU Leuven University, Faculty of Medicine, Leuven, Belgium
KU Leuven University Hospitals, Department of Plastic & Reconstructive Surgery, Leuven, Belgium
E-mail addresses: renee.de.busser@hotmail.com (R. De Busser), jan.vranckx@uzleuven.be (J.J. Vranckx)

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Head, neck and chest reconstruction using cervical vessel as a vein graft

Dear Sir,

Vein grafts are sometimes required for head, neck and chest reconstruction and are generally harvested from the thigh, lower leg, or arm. However, during neck dissections (or similar procedures) where cervical vessels are already exposed, they present a convenient, less invasive option for harvesting as vein grafts. In this report, we will use selected cases to detail the successful and efficacious usage of these cervical vessels as vein grafts during free flap transfers in head, neck and chest reconstruction.

Microvascular anastomoses using vein grafts harvested from the dissected neck area were performed at the Department of Plastic and Reconstructive Surgery, University of Tsukuba Affiliated Hospital from 2007 to 2019. Multiple criteria were retrospectively investigated, including: diagnoses, transferred tissue, donor vessels used for grafting, vessel length of vein grafts, and records of surgical complications.

Characteristics of the three male and one female patients are in Table 1. Two patients had tongue cancer, one patient had buccal mucosa cancer, and one patient had sternum osteomyelitis after radiation. The skin flaps used were a free tensor fascia lata muscle perforator flap (TFL), a free anterolateral thigh flap (ALT), a free rectus abdominis mus-

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Table 1 Patient data: using cervical vessel as a vein graft.

Patient	Age, y/sex	Diagnosis (preoperative radiation therapy)	Free flap[a]	Vein graft[b]	Length of graft, (cm)	Recipient vessel
1	60/M	Tongue cancer (40 Gy)	TFL	AJV	5	Internal Jugular V (ipsilateral)
2	82/M	Buccal mucosa cancer (−)	RAMC	EJV	3	Superior Thyroid V (contralateral)
3	68/F	Sternum osteomyelitis (+)	RAMC[c]	AJV	4	Superior Thyroid A (ipsilateral)
4	43/M	Tongue cancer (−)	ALT	EJV	2	Internal Jugular V (ipsilateral)

[a] TFL, tensor fascia lata musculocutaneous; RAMC, rectus abdominis musculocutaneous; ALT, anterolateral thigh.
[b] AJV, anterior jugular vein; EJV, external jugular vein.
[c] Pedicled rectus abdominis muscle flap with microvascular anastomosis.

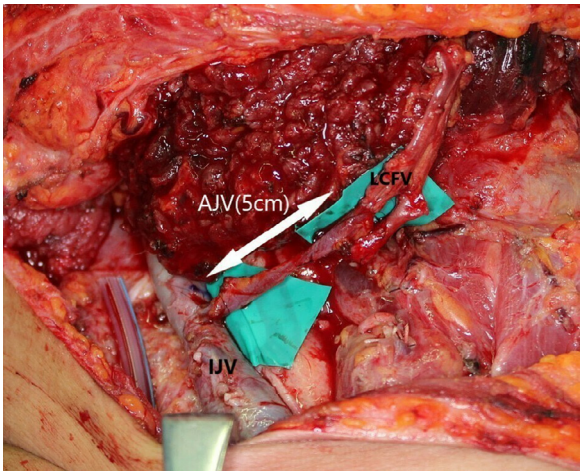

Figure 1 A 60-year-old man with tongue cancer. Reconstruction using a free tensor fascia lata muscle perforator flap was performed. The lateral circumflex femoral vein (LCFV) was too short to reach to the internal jugular vein (IJV). An anterior jugular vein (5.0 cm length) was harvested from the operative field as a vein graft and anastomosed in an end-to-side fashion with the IJV *(double arrow)*.

culocutaneous flap (RAMC), and a pedicled rectus abdominis muscle flap with additional microvascular anastomosis. Three patients required vein grafting for venous anastomosis and one patient for arterial anastomosis due to contralateral vascular anastomosis or short pedicle. The cervical donor vessels were two anterior jugular veins (AJV) and two external jugular veins (EJV) of a vascular length from 2 to 5 cm. The AJV used as vein grafts were 4–5 cm length (4 mm diameter) and the EJV used as vein grafts were 2–3 cm length (5–6 mm diameter). All donor vessels were harvested from the cervical operative field without extending the incision and these flaps all survived without postoperative venous thrombosis or partial flap necrosis.

Figure 1 indicate case 1. A 60-year-old male had right tongue cancer (T3N2bM0) and had received preoperative radiation therapy with 40 Gy. Subtotal glossectomy, radical neck dissection and reconstruction using a free tensor fascia lata muscle perforator flap were performed. The flap artery was anastomosed to the superior thyroid artery in an end-to-end fashion. The flap vein was too short to reach the internal jugular vein (IJV) so we used an AJV(5.0 cm length) harvested from the operative field as a vein graft and anastomosed in an end-to-side fashion with the IJV (Figure 1). This flap survived completely without any necrosis.

In head, neck and chest reconstruction, vein grafts are required when the pedicle of the flap is insufficient to reach the recipient vessel; if highly variable differences in diameter exist between the flap pedicle and the recipient vessel; a prior flap fails; upon exposure to prior radiotherapy; if tumors recur; and in trauma.[1,2] Vein grafts are generally harvested from thighs, lower legs, or arms, meaning that the great saphenous vein, the cephalic vein and the basilic vein are frequently used.[1] However, cervical vessels harvested from the operative field as vein grafts are rarely reported.

In this study, the AJV and the EJV were used after neck dissection and vessel exposure and carried the advantage of convenient harvesting from the same operative field. Our cases indicate that the operation time when using these donor veins for grafting is extended by a mere 30 min because there is no need to make new additional incision and harvest a graft. Moreover, there is no trouble to harvesting them since these vessels may have already been ligated during the course of the operation. Furthermore, as the AJV lacks valves, directional concerns are eliminated with respect to microvascular anastomosis.[3]

Increased flap failure rates are the result of the underlying factors that necessitated the use of interposition grafts in the first place, such as absence of recipient vessels, prior irradiation, infection, and/or flap failure, among others.[4] Insufficient flap pedicle length, prior irradiation and tumor recurrence are the factors in our four cases that apply to situations in which vein grafts are generally used. In such conditions, intraoperative flap ischemia times are usually greatly extended,[5] but our cases saw much shorter times by using cervical vessels as vein grafts. Importantly, all flaps survived completely without postoperative venous thrombosis or partial flap necrosis.

No problems were observed in our four patients regarding diameter differences, ease of anastomosis and safety. In head, neck and chest reconstruction, using cervical vessels (AJV /EJV) harvested from the operative field as a donor veins for grafting is simple and very useful when the pedicle of the free flap is short.

Our results suggest that the use of cervical vessels as donors for vein grafting in head, neck and chest reconstruction is simpler and less invasive than harvesting grafts from other sites. Both surgical and flap ischemia times are shortened in this convenient and alternative method for vein grafting.

Declaration of Competing Interest

None declared.

Funding

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Ethical approval

Not required.

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Toshifumi Akazawa, Mitsuru Sekido, Kaoru Sasaki, Yukiko Aihara
Department of Plastic and Reconstructive Surgery, Faculty of Medicine, University of Tsukuba, 1-1-1, Tennodai, Tsukuba, Ibaraki 305-8575, Japan

E-mail address: toshitsuku8msf@hotmail.co.jp (T. Akazawa)

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Microvascular anastomosis in atherosclerotic vessels: Technical challenges and recommendations

Dear Sir,

Atherosclerosis is a widespread disease which can influence the outcomes in reconstructive surgery, making microsurgery in atherosclerotic vessels fundamentally different.[1] Patients with atherosclerosis often have multiple comorbidities such as diabetes, hypertension and peripheral vascular disease.[1,2] Additionally, arteries lose their elasticity and become more prone to endothelial injuries, which can lead to thrombosis and occlusion. A meticulous microsurgical technique is required, to minimize complications and increase the success rates.[1] Indeed, it has been shown that despite patients' comorbidities, free tissue transfer can be equally effective in patients >80 years old, with an acceptable complication risk.[2]

The inherent characteristics of atherosclerotic arteries may require adjustments to the steps that microvascular surgeons commonly perform, even when pre-operative imaging is deployed to allow further insights, in order to improve the success rate of this high-risk microsurgical task.[1,2,5] The frequent presence of intra-operative challenges, such as being aware of plaques close to the anastomosis, means that an alternative plan should exist in case that it needs to be altered intra-operatively. Awareness of these technical considerations could enhance ones' microsurgical technique in all stages of microvascular anastomoses. (Table 1). This article discusses the caveats in performing a microvascular anastomosis in atherosclerotic vessels, summarises the pre-, intra- and post-anastomotic considerations and provides recommendations which may contribute to reducing complication risk. (Figure 1)

It is appropriate to consider the use of free tissue transfer in patients with atherosclerosis, especially where limb salvage is attempted through the use of a free flap and in lower extremity traumatic injuries where soft tissue coverage may enhance functional outcomes. Furthermore, patients and surgeons should collaboratively consider the risks and benefits of free tissue transfer in the presence of atherosclerosis, which in experienced hands *and high-volume units can prove to be rewarding.*

Pre-operative imaging, often in the form of CT angiography or duplex-doppler ultrasound, enables the creation of a plan for reconstruction as well as an alternative plan regarding the choice of donor or recipient vessel. In the event that the original recipient/donor vessel is deemed unsuitable on pre-operative imaging, an alternative vessel must be selected. For example, if the donor vessel of choice contained a large segment of atherosclerosis or if recipient vessel contained an atherosclerotic-free segment far from the planned zone of anastomosis, both situations might necessitate the choice of an alternative flap.

Starting with recipient vessel selection, important influencing factors are the site of injury, the vascular status of the lower extremity and site of microvascular anastomosis. Risk factors associated with increased flap failure include diabetes mellitus and peripheral vascular disease, with arteriosclerosis potentially affecting both donor and recipient vessels.[1] In the lower extremity, recipient vessel options can be limited and in the acute trauma setting, choosing a good recipient vessel can be particularly challenging. The presence of radiologically evident atherosclerosis and long-standing diabetes, as well as diabetic patients being more likely to have sub-popliteal atherosclerotic disease, complicates matters.[3] Despite recent advances in perforator to perforator anastomosis, the traditional recipients are still

Table 1 Intra-operative challenges and technical recommendations for arterial microvascular anastomosis in atherosclerotic vessels.

	Challenges	Technical Recommendations
Pre-anastomotic		
I	**Choice of Vessels -** *Recipient vessel or donor site selection* (presence of atheroma plaques and loss of vessel pulsatility)	Aim for a plaque-free pulsatile vessel as the recipient and flap vessel of choice, if unable to perform the anastomosis in a plaque-free zone.
II	**Anastomotic Technique -** *Coupler* versus *Hand-sewn*	Hand-sewn is the recommended method – given there is no atheroma present, there are no reported differences between end-to-end versus end-to-side, consider using the coupler only in high-flow, pliable and elastic thn walled arteries of larger calibers than 2.5 mm)
III	**Vessels Handling & Dissection -** *Atheroma "fracture"* - Dislodged emboli may cause distal necrosis or *Delamination* - Vessel wall layers separation during cutting manipulation or even - *branch injury* can occur during dissection and ligation.	Vessel transection or trimming should be performed using micro-scissors, slowly and in a circumferential manner, including all layers of the vessel wall [1]. Excessive vessel manipulation, dilation, dissection and use of microvascular clamps should be avoided. Careful retraction using a gentle push technique, microvascular Spear or Q-tip to manipulate vessel, rather than "grasping". Ligating branches a millimeter away from junction helps minimize the risk of micro-injuries.
IV	**Hyper coagulation -** Systematic use of heparin	Low molecular weight heparin and/or Heparinized Saline can be used for hydro-dissection and hydro-expansion techniques, to prevent hypercoagulation in the anastomotic surgical site.
During anastomosis		
V	**Microvascular Suturing -** *Delamination* could be caused by needle insertion, creating a 'false lumen' or 'double' lumen phenomena.	Suture bites should be taken from inside out, alternatively Miyamoto two-needle suture technique can be used. The smallest size micro-suture with a round-tip needle or a J-needle should be used, as it enables a full thickness bite and reduces the likelihood of intimal injuries.[1] Simple interrupted sutures or parachuted continuous-interrupted should be used to secure all vessel wall layers, when moving along the vessel wall circumference.[1]
VI	**Microvascular Suturing -** *Endothelial or Intimal injury* during needle driven through vessel wall.	Multiple needle insertions and excessive intimal manipulation during suturing should be avoided, ideally aiming for a "no touch technique". Cannulation of the vessel lumen should be avoided, but if performed, minimal tension should be applied to achieve vessel caliber extension.
VII	**Vessels calibers discrepancy**	Matching the vessels caliber should be selected during flap or pedicle dissection, as atherosclerotic vessels rarely stretch via mechanical dilation. End-to-side anastomosis is the preferred technique as it maintains distal perfusion and enables size adjustments.
VIII	**Inadequate - No inflow phenomena**	Miyamoto arterial trimming technique can be used, to assess whether anastomosis is out of zone of trauma and whether inflow is adequate.
IX	**"False lumen" phenomenon**	The vessel should be carefully examined under the microscope with higher magnification (x15) and the edge trimmed to the point free from atheroma or delamination of intima.
Post-anastomotic		
X	**Patency Testing**	When dealing with minor immediate anastomotic bleeding, a haemostat should be used to wrap arterial anastomosis in a single layer, reducing the risk of a blind suture through the delaminated opposite vessel wall.

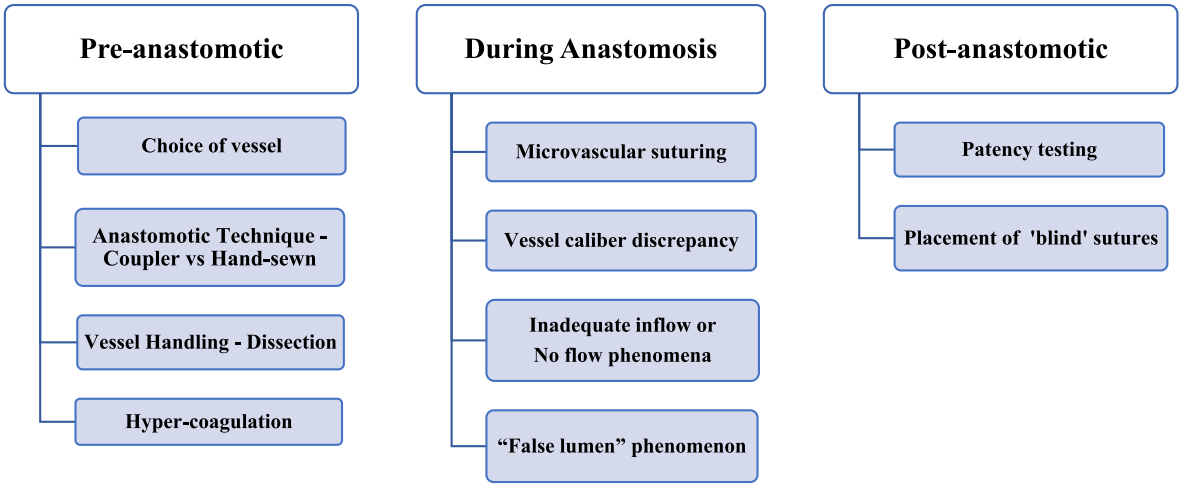

Figure 1 Key considerations in performing microvascular anastomosis in atherosclerotic vessels.

the gold standard, especially in traumatic lower extremity reconstructive microsurgery. It is therefore important to bear the above in mind and aim for a plaque-free pulsatile vessel as the recipient or donor vessel of choice and allow further safety, while reducing the hyper-coagulation status of these patients, by early systematic administration of low molecular weight heparin and heparinised saline infusion at the anastomotic site.

During the vessel handling and dissection, atheroma "fracture" and dislodging of emboli can cause distal necrosis phenomena. Therefore, excessive vessel manipulation, mechanical dilation, dissection and use of microvascular clamps should all be avoided. Delamination is the separation of layers occurring due to shearing forces. Occasionally, despite apparently normal macroscopic appearance of the chosen vessel, a "patchy" intra-luminal appearance can occur due to the invasion of cholesterol plaques between vessel wall layers, which could cause delamination affecting the microanastomosis.[5] Vessel trimming should therefore be done with precision using micro-scissors and ligation of branches in close proximity to an atherosclerotic plaque, should be a millimeter away from the branching junction to minimize the risk of micro-injuries.

During microvascular suturing, delamination can be caused when the needle is driven through the vessel wall, which can be avoided by inserting it in an inside-to-outside manner, or alternatively using a two-needle suture technique, as described by Miyamoto et al.[5] Using the smallest suitable size of microsuture with a round-tip needle, or using a J-shaped needle, enables a 90° full thickness suture bite and reduces the likelihood of intimal injuries. It is imperative to inspect the vessel lumen under high magnification (x15) prior to tying it, to prevent and/or address the "false lumen" phenomenon. Tying each individual simple interrupted suture sequentially, passed independently or in continuous- interrupted fashion either in loops or parachuted, secures the vessel wall layers in each segment, prior to moving the next suture bite along the vessel wall circumference.[1] Current literature keeps with no difference in clinical outcomes between end-to-end or end-to-side configuration in arterial anastomosis in patients with peripheral arterial disease. Endothelial and intimal layer in atherosclerotic vessels are fragile, and injuries or tears can be more common during suturing. This could increase the intraluminal platelet aggregation and primary thrombus formation, which could immediately decrease the intraluminal caliber of the newly formed anastomosis. Hence, multiple unnecessary bites, cannulation of the vessel lumen, use of micro clamps or mechanical dilatation with the forceps, should be limited. Additionally, we recommend minimal intimal handling or if possible, a "no touch" technique.[1]

During immediate patency testing, minor technical errors in suture placement may lead to anastomotic bleeding, which would occasionally require the placement of additional sutures, however, in an atherosclerotic vessel, this could be avoided with the use a single layer of wrapped haemostat, to reduce the risk of inserting a blind, partial thickness suture or a suture through the delaminated opposite vessel wall.[4]

There are several technical considerations and practice recommendations that experts find advantageous, in reducing the risks during microvascular anastomosis, in atherosclerotic vessels. Most are usually based on experience and the seniority of the operator, due to the difficulty in establishing high level evidence. Nevertheless, we believe this summative technical report can add value and constructively refine the procedures used in microvascular anastomosis especially in lower extremity reconstruction.

Ethical approval

Not required.

Conflicts of interest

None declared.

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Georgios Pafitanis
Department of Plastic Surgery, Emergency Care and Trauma Division, The Royal London Hospital, Barts Health NHS Trust, London, United Kingdom
Department of Plastic and Reconstructive Surgery, China Medical University Hospital, Taichung, Taiwan
Department of Plastic Surgery, St Thomas Hospital, Guy's and St. Thomas' NHS Trust, London, United Kingdom

Katerina Kyprianou
Department of Plastic Surgery, St Thomas Hospital, Guy's and St. Thomas' NHS Trust, London, United Kingdom

Hung-Chi Chen
Department of Plastic and Reconstructive Surgery, China Medical University Hospital, Taichung, Taiwan
E-mail address: g.pafitanis@qmul.ac.uk (G. Pafitanis)

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Free tissue transfer after unsatisfactorily implant-based breast reconstruction, a cohort study

Dear Sir,

Breast reconstruction is known to improve quality of life after mastectomy and can involve implants and/or autologous tissue. Implant-based breast reconstruction is generally considered less technically demanding than free flap reconstruction, has less downtime and no donor site morbidity. The major long-term disadvantage of implant-based reconstruction is the need for subsequent procedures. The recent immediate implant-based breast reconstruction with and without mesh (iBRA) study demonstrated an 18% reoperation rate within three months.[1] At three, six and ten years following initial implantation for primary reconstruction, manufacturers report rates of reoperation to be 34%, 42% and 53%.[2] The majority of these procedures are for adverse capsular contracture. *Re*-operation may also be indicated for rippling, infection, malposition, exposure or implant rupture.

Autologous reconstruction, particularly from the abdomen, is associated with improved general- and aesthetic patient satisfaction.[3] The deep inferior epigastric perforator (DIEP) flap is the widely accepted, gold standard for breast reconstruction.

Autologous reconstruction is a definitive form of reconstruction with minimal surgical maintenance over the patients' lifespan. This can be seen as attractive for patients whom have had previous implant-based reconstruction and have reached the time for implant exchange. Thus, there is demand for explantation of implant and exchange for autologous tissue.

We hypothesise that a free flap offers a satisfactory method of salvage breast reconstruction, resulting in a good aesthetic outcome with an acceptable risk profile. The aims of this study were to (1) assess the outcomes and complications of salvage breast reconstruction with free flaps in our unit and (2) to consider the cost implications of the service.

We included all patients with failed implant-based reconstructions from January 2018 to January 2020. Patients were retrospectively identified using clinical coding and their case notes interrogated. All recipient and donor site complications were recorded.

Nineteen consecutive patients were identified of which ten patients underwent expander-to-implant procedures and nine patients had definitive implant insertion. There was a median of nine years between implant placement and time to salvage reconstruction. During that time, two patients underwent exchange of implants, four patients underwent one or more lipofilling sessions and one patient underwent both implant exchange and lipofilling. The median number of implant-related procedures was two per patient. Median age was 52 years (31- 61 years).

The 19 salvage reconstruction patients underwent a total of 32 free flaps; 29 DIEPs, two profunda artery perforator and one lateral thoracic artery perforator flap. Median follow up was 11 months (range 4–30). All patients were satisfied with the end aesthetic result, and found improvement in their symptoms.

Median length of stay was five days (range 2–11). One patient returned to theatre for evacuation of a haematoma. There were no total- but one partial flap loss. There were five wound breakdowns, all managed conservatively. One donor site seroma required aspiration.

Three patients required revisions to improve the aesthetic outcome of the breast flap; symmetrising lipofilling in two cases and one excision of a small stitch sinus at the flap inset. There were no donor site corrective procedures.

This paper has not previously been presented.

Table 1 The cost of salvage breast reconstruction.

Item	Cost (£)
Initial plastic surgery outpatient clinic	139
Follow up plastic surgery outpatient clinic	86
Implant exchange (not including physical implant)	3345
Lipofilling of breast	2584
Procurement of implants	791.78 (based on 2x MENTOR® CPG™ Gel Breast Implants cost of £395.89 each)
Bilateral delayed DIEP	9004
Unilateral delayed DIEP	7181
Pre-operative CT angiogram	112
Totals*	
1 Implant exchange	**4447.78**
2 Implant exchanges	**8895.56**
Implant exchange and lipofilling	**7375.78**
Lipofilling	**2, 895**
2 Lipofilling sessions	**5, 651**
Bilateral DIEP	**9427**
Unilateral DIEP	**7, 604**
Unilateral DIEP and lipofilling	**10, 360**

DIEP, Deep inferior epigastric perforator.
* Totals assume one pre-operative and two subsequent plastic surgery outpatient appointments after each procedure. All DIEP costs includes a pre-operative CT angiogram £112.

Table 1 shows the cost of salvage breast reconstruction, using the 2019/20 National Tariff Payment System for reference. It can be seen that if implant intolerant patients have two procedures (e.g. implant exchange and lipofilling) costs become comparable to unilateral free tissue transfer, at £7375.78 and £7604, respectively. If an additional product such as an acellular dermal matrix is utilised alongside an exchange of implant, or if an additional investigation is required such as an MRI the costs converge further. As the median patient age is 52, it would be reasonable to infer that a third procedure would likely be required in the womans lifetime. Furthermore, a woman undergoing multiple implant related procedures for capsular contracture also has a personal cost of reduced quality of life and loss of productivity. Salvage reconstruction aims to break this cycle, by delivering a lasting reconstruction without ongoing maintenance procedures.

Salvage breast reconstruction with free tissue transfer has been reported since the mid 1990s.[4,5] These have shown high post-operative patient satisfaction and a significant improvement in the aesthetic result.[4]

Salvage breast reconstruction with a free flap is a major surgical undertaking, and is not suitable for all patients with capsular contracture or unsatisfactory cosmesis following implant reconstruction. However, in symptomatic patients adequately counselled and accepting of the post-operative downtime, salvage breast reconstruction with autogenous tissue offers a lasting result that ages naturally. The upfront healthcare costs are higher with a free tissue transfer, but may become comparable longer term given the multiple exchange of implant procedures required over a patient's lifetime.

We believe conversion to definitive autologous reconstruction to be a worthwhile endeavour based on patient improvement in symptoms, and the diminishing return of multiple implant related revisions.

Ethical approval

Not required.

Declaration of Competing Interest

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Olivia L. Sharp, Shikha Gupta, Guido Köhler
Department of Plastic Surgery, Norfolk and Norwich University Hospital, Norwich, UK

Richard M. Haywood
Department of Plastic Surgery, Norfolk and Norwich University Hospital, Norwich, UK
Department of Anatomy, University of East Anglia, Norwich, UK

Dhalia Masud
Department of Plastic Surgery, Norfolk and Norwich University Hospital, Norwich, UK
E-mail address: o.sharp@nhs.net (O.L. Sharp)

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Bilayer wound matrix dermal substitute allows survival of split-thickness skin graft in necrotizing fasciitis defects: A retrospective, uncontrolled case study

Dear Sir,

Introduction

Necrotizing fasciitis (NF) is an acute, rapidly spreading polymicrobial infection involving the skin and underlying soft tissues.[1] NF invades the superficial fascia, causing damage to surrounding connective tissue, muscle, and nerves. Traditional treatment strategies consist of broad-spectrum intravenous antibiotics and diligent surgical debridement. Secondary to necrotizing soft tissue infections is the development of large defects as a result of numerous debridement procedures.

Due to the complexity of NF defects, achieving successful reconstruction is challenging. Integra™ Bilayer Wound Matrix (Integra LifeSciences, Plainsboro, New Jersey) is a bioengineered porous matrix composed of collagen and glycosaminoglycan (GAG) with a semi-permeable polysiloxane membrane.[4] While select case reports support the use of wound matrices for NF defects in providing immediate coverage and serving as a vascularized scaffold for wound epithelization, there is a paucity of evidence describing its application in a sizeable population.[2] The authors seek to identify bilayer matrix healing outcomes in NF wounds and hypothesize that a bilayer dermal matrix (Integra™ Bilayer Wound Matrix) can be used successfully in the reconstruction of NF wounds by receiving a STSG.

Materials and methods

An uncontrolled retrospective case-study was performed to analyze the utility of collagen-glycosaminoglycan (GAG) bilayer wound matrix (Integra LifeSciences Corporation, Plainsboro, N.J.) reconstruction for the management of NF defects. Patients were excluded from the study with no documented pathological diagnosis of NF, or less than 180-days of post-operative follow-up. Demographics and wound characteristics (age, size, location, etiology) were collected. Wound healing outcomes were assessed up to 180-days post-operatively. Primary study outcome was bilayer wound matrix success, where matrix incorporation was determined based on integration of the matrix (surgeon determined through visual observation), defined by generating a wound bed healthy for a split-thickness skin graft (STSG). Partial success was defined as a wound that underwent more than half bilayer matrix healing, according to clinical observation, and was viable to receive definitive reconstruction (STSG). Failure was determined as complete loss of bilayer wound matrix or the inability to optimize the wound bed for STSG. Delayed healing was defined as a non-healing wound that necessitated further interventions for healing. No imaging technology was used to analyze wound healing. Analysis was based on subjective, qualitative clinical evaluation. No statistical analysis was performed.

Results

Ten patients with eleven NF wounds underwent reconstruction with a collagen-GAG bilayer matrix (Appendix 1). Demographic information and detailed wound characteristics are listed in Table 1, identifying a comorbid population, with large, complex wounds. Post-operative clinical outcomes are summarized in Table 2. By 180-days post-bilayer reconstruction, 100% of patients underwent the final stage of reconstruction; STSG placement, with 100% STSG take. One instance of delayed healing of bilayer matrix and one instance of partial wound necrosis following bilayer matrix placement was noted. Both patients underwent a secondary operative debridement, while one also received an additional bilayer wound matrix to the area of partial necrosis. No complications resulting in complete graft loss of either the bilayer wound matrix or the subsequent STSG were reported within the 180-day follow up period. Average time to STSG for our cohort was 44 days (21 days – 108 days), with no instances of STSG graft loss, infection, or amputation.

Discussion

Acute treatment of NF involves intensive antimicrobial regimens, and thorough surgical irrigation with wide debridement of inadequately perfused tissue, resulting in large soft tissue defects. While reconstructive therapies such as negative pressure wound therapy, fasciocutaneous or muscle flaps, STSG-only, and autologous tissue transfer have shown efficacy,[2] patients often need additional interventions due to the limited availability of local options, the risk of infection, and cost implications.[3] These drawbacks are potentially augmented in post-NF wounds which include vital structures, where additional dermal support is necessary. In this study, 100% of patients received a STSG and successfully healed, within the 180-day follow-up period. Our results serve as an accurate representation of reconstruction

Table 1 Demographics and Wound Characteristics, n *(%)*.

Patients	10
Wounds	11
Age (years)	56
BMI (kg/m^2)	32.0
Smoking Status (n,%)	
History of Smoking	3 (30)
No History of Smoking	7 (70)
Diabetes	4 (40)
Hypertension	7 (70)
COPD	2 (20)
PVD	4 (40)
Wound Characteristics	
Wound Size (cm^2)	542 (49 - 1050)
Wound Age (days)	23 (10 - 34)
Wound Location	
Lower Extremity	7 (64)
Upper Extremity	3 (27)
Perineum	1 (9)
Extremity Classification: Lower	
Ankle to Knee	5 (71)
Foot	2 (29)
Extremity Classification: Upper	
Wrist to Upper Arm	3 (100)
Wound Etiology	
Surgical Site Wound	7 (11)
Vascular Wound	2 (18)
Diabetic Ulcer	2 (18)
Bone Exposure	1 (9)
Tendon Exposure	4 (36)
Use of NPWT n (%)	10 (83)
Avg. Time with NPWT (days)	5.6 (4-11)

Table 2 Post-Operative Outcomes, *n* (%).

Length of Procedure (mins)	117 (49-184)
Length of Stay (days)	9.5 (0 - 26)
180-Day Outcomes	
Success	9 (82)
Partial Success	2 (18)
Graft Loss	0 (0)
Split-Thickness Skin Grafts	11 (100)
Time to Split-Thickness Skin Graft	44 days (21 −108)
Delayed Healing n (%)	1 (9)
Partial Necrosis n (%)	1 (9)
Reoperation for Further Debridement	2 (20)

in a complex patient population, across various wound locations with NF. Two patients experienced wound healing complications in the setting of delayed healing, and partial necrosis. However, collagen-matrix effectively served as an adjunct to STSG and played an integral role in wound healing.

This study highlights the utility of collagen-GAG bilayer matrix as an effective adjunctive modality for post-NF wound reconstruction, by bridging the gap to STSG placement and definitive wound healing. Due to a lack of controlled comparative data in this population, precise indications and contraindications cannot be provided at this time. Individual assessment of patient and wound characteristics should be considered. The efficacy of bilayer wound matrices rests in their ability to successfully provide a functional reconstruction, while minimizing donor site morbidity, maximizing cosmesis and providing immediate wound coverage.[4,5] Limitations include the retrospective study design and lack of a comparison group. Future studies are needed to compare outcomes of other reconstructive modalities, such as NPWT-only, direct to STSG, and autologous free-flap reconstruction, as well as cost-effectiveness.

Conclusion

NF often creates challenging defects that require modern techniques to restore function and maintain an acceptable aesthetic outcome. We present the largest series of a collagen-GAG wound matrix for the reconstruction of NF defects and further exemplify its role as a valuable tool in the reconstructive surgeon's armamentarium.

Declaration of Competing Interest

None.

Author contributions

C.A.M.: substantial contributions to conception and design, literature review, data collection, review, analysis, and interpretation of references, drafting the article for critically important intellectual content, and final approval of the version to be published.

C.L.M.: substantial contributions to conception and design, review of data, interpretation of references, drafting the article for critically important content, and final approval of the version to be published.

R.B.B.: substantial contributions to conception and design, review, analysis of data, and drafting the article for critically important intellectual content, final approval of the version to be published.

I.A.R.: substantial contributions to conception and design, review of data, and interpretation of references, drafting the article for critically important intellectual content, and final approval of the version to be published.

J.P.F.: substantial contributions to conception and design, review, and interpretation of references, drafting the article for critically important intellectual content, final approval of the version to be published, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical Approval Statement

This study has been reviewed and approved by the Institutional Review Board at the University of Pennsylvania (Protocol #831280) and an Institutionally based Conflict of Interest committee. Additionally this study is in accordance with the World Medical Association Declaration of Helsinki,

as well as subsequent amendments. All HIPAA (Health Insurance Portability and Accountability Act of 1996) compliant mechanisms were followed to ensure confidentiality.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2020.12.060.

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Charles A. Messa IV[1]
Cody L. Mullens[1]
Robyn B. Broach
Irfan A. Rhemtulla
John P. Fischer
Divison of Plastic and Reconstructive Surgery, Department of Surgery, University of Pennsylvania Health System, Philadelphia, PA, United States

Corresponding author at: Division of Plastic Surgery, University of Pennsylvania, 14th Floor South Pavilion, 3400 Civic Center Blvd, Philadelphia, PA 19104, United States.
[1]The first two authors have made equal contributions to this manuscript.
E-mail addresses: messac04@gmail.com (C.A. Messa IV), John.fischer2@uphs.upenn.edu (J.P. Fischer)

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Complex regional pain syndrome following hand or forearm trauma at a regional plastic surgery service

Dear Sir,

Complex Regional Pain Syndrome (CRPS) is a chronic pain syndrome that typically develops following injury, characterised by symptoms that contrast with the typical course of recovery. Over the years since it was first described, our understanding of CRPS has improved and a number of pathophysiological mechanisms have been proposed, with compelling evidence supporting the role of an aberrant inflammatory response to injury, as well as vasomotor dysfunction and maladaptive neuroplasticity.[1] The current diagnostic criteria, the Budapest Criteria, have been shown to have both exceptional sensitivity, and reasonable specificity for purpose.[2] That said, our knowledge of the epidemiology of CRPS is incomplete. Notably, there has been a relative paucity of literature discussing the incidence of the condition following soft tissue injuries of the hand and forearm. To the best of our knowledge, this communication is the first to look at the incidence of CRPS following these types of injuries.

A retrospective list was generated consisting of 1920 patients with traumatic hand or forearm injuries that underwent some therapeutic surgical intervention at the Addenbrooke's Hospital Plastic Surgery unit between April 2015 and March 2018. Data were collected from thorough examination of patient notes using the EPIC® electronic health record system in place at the hospital, including operation procedure, clinic visits, occupational and physiotherapy appointments, and prescription history.

The procedures that patients underwent were divided into six categories: nailbed repair (NBR; $n = 273$), tendon repair (TR; $n = 376$), nerve repair (NR; $n = 259$), fracture fixation (FF; $n = 26$), wound exploration (WE; $n = 1381$), and other (O; $n = 225$); a category for procedures that were in-

Table 1 Incidence of CRPS by procedure category.

Category	Cases	Rate
Nailbed repair (NBR)	2/273	1%
Tendon repair (TR)	11/376	3%
Nerve repair (NR)	5/259	2%
Fracture fixation (FF)	4/26	15%
Wound exploration (WE)	14/1381	1%
Other (O)	2/225	1%

Table 2 Patients meeting the Budapest Criteria.

#	Age	Sex	Occupation	Mechanism of injury	Structures involved	Time to diagnosis	PT	OT	Medication	Past CRPS
1	26	F	Care assistant	Broken glass	L Wrist: radial artery, FCR, PL, median nerve	40 days	N	Y	Paracetamol, Codeine	N
2	27	M	Office worker	Punched teeth	R Hand: middle finger, extensor zone	42 days	N	Y	Paracetamol, Codeine, Gabapentin	N
3	35	F	Building site manager	Broken glass	R Hand: middle finger, FDP, UDN	14 days	N	Y	Paracetamol, Codeine, Amitriptyline, Gabapentin	N
4	36	F	Chef	Kitchen knife	L Hand: index finger, extensor zone	70 days	N	Y	Paracetamol, Codeine, Gabapentin	N
5	37	F	Unemployed	Kitchen knife	L Hand: little finger, RDN, FDP	13 days	N	Y	Paracetamol, Codeine	N
6	38	F	Unemployed	Self-harm	L Forearm: FDS	56 days	Y	Y	Paracetamol, Codeine, Pregabalin	Y
7	39	M	Vicar	Broken glass	L Hand: thumb, FPL, oblique pulley	84 days	N	Y	Paracetamol, Codeine	N
8	42	F	Solicitor	Road traffic accident	R Hand: 4th/5th metacarpal fracture	213 days	Y	Y	Paracetamol, Amitriptyline, Pregabalin, Gabapentin	N
9	49	M	Electrician	Broken glass	R Hand: FDS, FDP, CDA, CDN	59 days	N	Y	Paracetamol, Codeine, Gabapentin	N
10	53	F	Unemployed	Lawnmower	L Hand: amputated index and middle fingers.	201 days	N	Y	Paracetamol, Gabapentin	N
11	55	F	Housekeeper	Chop saw	R Hand: EI, EDC	39 days	N	Y	Paracetamol, Codeine, Gabapentin	N
12	56	M	Machine operator	Crush injury	R Hand: index finger fracture	40 days	N	Y	Paracetamol, Codeine	N
13	60	F	Housekeeper	Kitchen knife	L Hand: UDN, RDN, FDS, FDP	44 days	N	Y	Paracetamol, Codeine, Gabapentin	N
14	63	F	Office worker	Crush injury	L Hand: little finger, ulnar lateral band	61 days	Y	Y	Paracetamol, Codeine, Gabapentin, Capsaicin	N
15	64	M	Maintenance worker	Crush injury	R Hand: index and middle finger fractures, ring finger nailbed injury	53 days	N	Y	Paracetamol, Codeine	N
16	74	F	Retired	Road traffic accident	R Hand: ring/little finger fractures	13 days	N	Y	Paracetamol, Codeine, Gabapentin	N
17	77	F	Retired	Unknown	R Hand: EDC, EDM	42 days	N	Y	Paracetamol	N

dividually less frequent, such as traumatic amputation. Patients were categorised as either having CRPS symptoms consistent with the Budapest Criteria, a suggested diagnosis of CRPS, or a confirmed and correctly coded diagnosis of CRPS. Also considered was whether each patient had any previous history of CRPS. Where a CRPS diagnosis had been suggested, validity was tested using the Budapest Criteria. Time to diagnosis, and subsequent management of each patient were also considered.

Of the 1920 patients, a total of 17 patients (1%) had a diagnosis of CRPS consistent with the Budapest Criteria, with incidence by procedure category detailed in Table 1. As categories are necessarily not mutually exclusive due to the complex nature of many traumatic injuries, it is difficult to

say for certain whether a specific injury has a higher incidence of CRPS. However, injuries requiring fracture fixation (15%), tendon repair (3%), and nerve repair (2%) all appear to be associated with a relatively higher risk of CRPS. 12 of the 575 female patients (2%), and 5 of the 1345 male patients (< 1%), had a consistent diagnosis of CRPS, with analysis suggesting a significant female dominance in this dataset ($p < 0.005$), consistent with previous studies showing greater incidence amongst female patients.[3] The patients in the dataset ranged in age from 0 to 100 years old; those with a consistent diagnosis of CRPS ranged in age from 26 to 77 years old. There was no significant effect of age on the incidence of CRPS ($R^2 = 0.0002$).

For patients meeting the Budapest Criteria, all patients engaged with post-operative occupational therapy, and 3 patients (18%) received additional physiotherapy. All but two patients were diagnosed within the first 84 days following surgical intervention, with the other two diagnosed at 201- and 213-days post-surgery, respectively. Excluding these two outliers, there was a weakly positive association between time to diagnosis and the number of occupational therapy sessions received ($R^2 = 0.0644$). All patients also received some pharmacological pain management post-operatively. Two patients (12%) attended additional pain clinic sessions. Further details about each patient, including which therapeutic interventions were prescribed, are detailed in Table 2. Most patients presented with a mild form of CRPS and, by the time of writing, all patients have been discharged from the service with their symptoms resolved.

Management of CRPS is a multifaceted process with a focus on reducing the severity of symptoms, however there is no definitive cure. Physical therapy and occupational therapy have been shown to be effective,[3] and may utilise a number of different pharmacological interventions as adjunctive therapy. Treatment is most effective when started early, ideally within three months of the first symptoms, and if delayed the disorder can quickly spread to the entire limb with irreversible change; CRPS that persists beyond one-year rarely resolves.[4] Given that the likelihood of developing CRPS has been shown not to be proportional to the extent of injury or surgery, and can occur even after very minor injuries,[5] it therefore seems salient to consider it when managing all patients following injury. We hope that further research can be carried out in future, in order to elicit a better understanding of this debilitating condition, its incidence, and the most appropriate management.

Ethical approval

Not required.

Declaration of Competing Interest

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Daniel Howard
School of Clinical Medicine, University of Cambridge, United Kingdom

Animesh J K Patel
Consultant, Plastic and Reconstructive Surgery, Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge CB2 0QQ, United Kingdom
E-mail address: howardda@live.com (D. Howard)

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Influential factors when considering reconstruction and post-operative outcomes: A survey of microtia patients and parents

Dear Sir,

Introduction

As microtia children reach school age, social pressure for acceptance is of greater importance. They often suffer from

Disclosures: None of the authors have financial conflict of interests in the products discussed in the manuscript. However, A.L.B. is the co-inventor of the Auryzon™ and DimensioN devices for autologous ear reconstruction. A.L.B. is one of the owners of ReconstratA, LLC, which owns the intellectual property for the devices. A.L.B. is the founder and president of Reconstruct Together, Corp., a non-profit aiming to fund humanitarian reconstructive surgery missions in underserved areas.

Table 1 Response characteristics, type of reconstruction, satisfaction and complications summary. Total responders, $n=98$. Responder demographics: non-reconstructed adults, $n=21$; parents of non-reconstructed children, $n=49$; reconstructed adults, $n=11$; parents of reconstructed children, $n=17$. Abbreviations: A = adult, C = children.

Survey responders ($n=98$)			
Reconstruction Characteristics	Rib Cartilage ($n=17$)	Porous Polyethylene Implant ($n=10$)	P value
Satisfaction			**0.015***
Very satisfied	**2** (11.8%, A; $n=1$, C; $n=1$)	**5** (50.0%, C; $n=5$)	
Satisfied	**6** (35.3%, A; $n=3$, C; $n=3$)	**4** (40.0%, A; $n=3$, C; $n=1$)	
Dissatisfied	**6** (35.3%, A; $n=2$, C; $n=4$)	**1** (10.0%, A; $n=1$)	
Very dissatisfied	**3** (17.6%, C; $n=3$)	**0** (0%)	
Post-operative Complications			0.258
None	**5** (29.4%, A; $n=3$, C; $n=2$)	**6** (60.0%, A; $n=2$, C; $n=4$)	
Ear asymmetry	**7** (41.2%, A; $n=3$, C; $n=4$)	**2** (20.0%, C; $n=2$)	
Contour dissatisfaction	**8** (47.1%, A; $n=1$, C; $n=7$)	**2** (20.0%, A; $n=1$, C; $n=1$)	
Change in ear shape	**2** (11.8%, C; $n=2$)	**2** (20.0%, A; $n=1$, C; $n=1$)	
Delayed wound healing	**3** (17.6%, A; $n=1$, C; $n=2$)	**0** (0%)	
Cartilage or implant exposure	**1** (5.9%, C; $n=1$)	**1** (10.0%, A; $n=1$)	
Infection	**1** (5.9%, C; $n=1$)	**1** (10.0%, A; $n=1$)	
Negative feelings and behaviors			0.139
None	**7** (41.2%, A; $n=3$, C; $n=4$)	**7** (70.0%, A; $n=2$, C; $n=5$)	
Hide affected ear	**5** (29.4%, A; $n=1$, C; $n=4$)	**2** (20.0%, A; $n=1$, C; $n=1$)	
Social situation difficulty	**4** (23.5%, A; $n=1$, C; $n=3$)	**2** (20.0%, A; $n=1$, C; $n=1$)	
Negative Mood	**6** (35.3%, A; $n=2$, C; $n=4$)	**1** (10.0%, A; $n=1$)	
Decreased self-esteem	**4** (23.5%, A; $n=1$, C; $n=3$)	**1** (10.0%, C; $n=1$)	

decreased psychological well-being compared to unaffected children, with improved satisfaction and less psychological distress after reconstruction.[1,2] The aim of this study was to identify resources patients and parents use when considering reconstruction and to report perceived outcomes following autologous reconstruction (AR), porous polyethylene (PPE) implants, and osseointegrated implants (OI).

Methods

Two anonymous, voluntary surveys, approved by our Institutional Review Board (IRB00214434), were uploaded to a microtia and atresia social media support group on Facebook™ using Qualtrics XM Platform™ (Provo, UT, USA). One survey was designed for adult patietns and one for parents of children with microtia.

Responders were asked the extent microtia affected their life, resources used when considering reconstruction, whether they underwent reconstruction and if so the technique utilized and satisfaction with the reconstruction. Non-reconstructed responders were asked how likely they were to elect for reconstruction and which technique they were most strongly considering.

The data were collected and analyzed separately for reconstructed and non-reconstructed patients before subgroup analysis of reconstructed patients. A Mann-Whitney U test was performed to compare groups.

Results

Ninety-eight surveys were completed; 28 by adult patients and 70 by parents of children with microtia (reconstructed $n=28$; non-reconstructed $n=70$). AR was performed in 17, PPE in 10 and OI in 1 (Table 1). *Eighty-three* non-reconstructed and reconstructed patients prior to surgery felt their quality of life had been negatively affected (84.6%).

Complication rates were 70.6% for AR and 40.0% for PPE with satisfaction in 90.0% of PPE cases vs 47.1% of autologous cases ($p=0.015$, Table 1). Contour dissatisfaction was the most frequent adverse outcome following AR, while PPE patients experienced contour dissatisfaction, ear asymmetry, change in ear shape and wound healing issues (Table 1).

Most reconstructed patients consulted a plastic surgeon, with the majority reporting this as the most important resource (Fig. 1). Only 44.3% of non-reconstructed patients had a consultation though a greater proportion who have, are more likely to elect for future reconstruction. A total of 42.9% of reconstructed and 82.9% of non-reconstructed patients/parents used social media with 3.1% and 36.1% reporting this as the most important resource, respectively (Fig. 1).

Non-reconstructed patients who know someone with PPE, 57.1% are more likely to undergo reconstruction while patients who knew someone with AR are 41.7% less likely to. *Forty-one* non-reconstructed patients (68.3%) are considering future reconstruction, with 58.5% inclined to choose PPE compared to a prosthesis (24.4%) or AR (17.1%). The most frequent prospective concern among non-reconstructed patients regarding reconstruction is the need for multiple surgeries while for reconstructed patients was medical cost in addition to the need for multiple surgeries.

Discussion

Patients treated with PPE expressed higher satisfaction with the cosmetic outcome compared to AR, while those

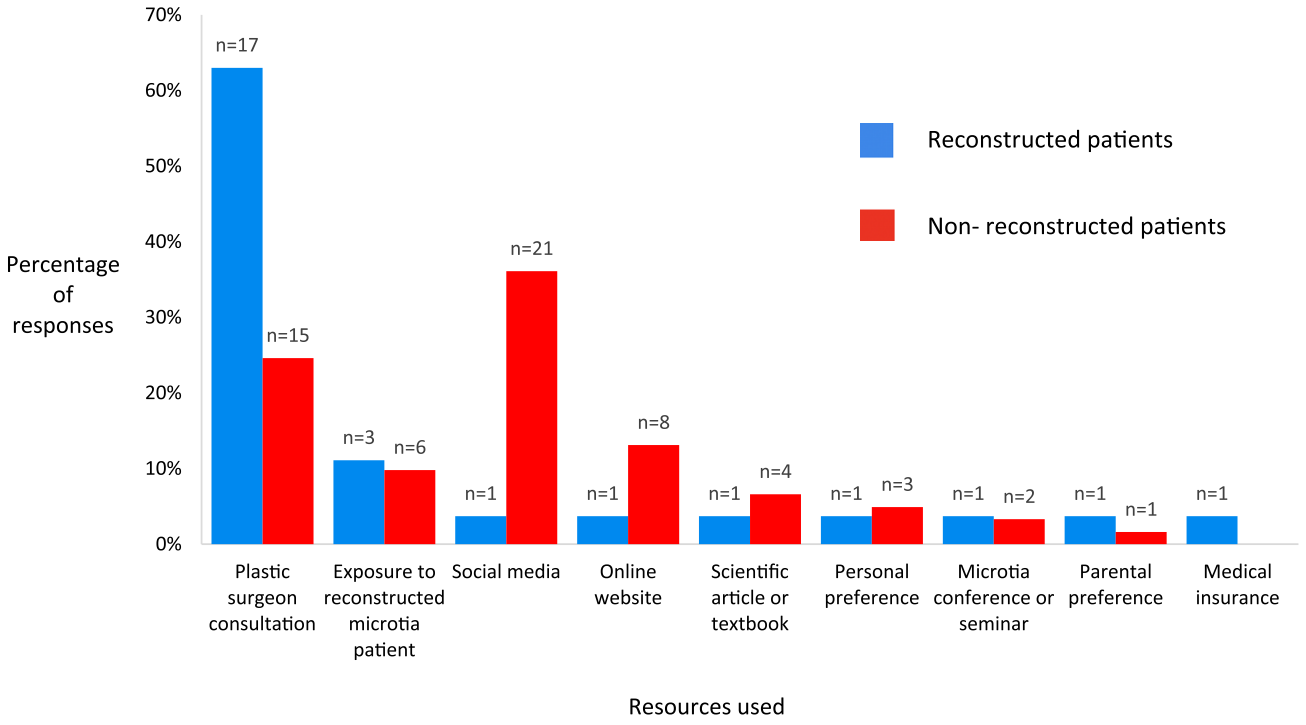

Fig. 1 Most influential resource when considering microtia reconstruction.

considering future reconstruction expressed a preference towards PPE implant reconstruction. This difference may result from the increased complications experienced by autologous patients compared to PPE, since autologous patients were less satisfied with the overall appearance as a greater number continued to hide their reconstructed ear.

Although PPE reconstruction can be burdened with high infection and extrusion rates, surgeons who frequently employ this technique have low complication rates and high satisfaction rates.[3] Many patients elect to have their PPE reconstruction with surgeons who have either had a pioneering role in the field or have high volumes of such reconstructions, possibly explaining these results, in contrast to autologous patients, who selected local, non-high-volume surgeons for this technically challenging reconstruction.

Pre-operative consultation allows the surgeon to provide accurate risk stratification, discuss concerns, and manage expectations, likely making it the most influential resource. Contrastingly, social media was more frequently utilized by non-reconstructed patients. For those considering future reconstruction, social media may allow patients to be more actively involved during the decision-making process, though this may be a negative influence.

The most frequent concern with surgery in all cohorts was the need for multiple procedures. PPE reconstruction has the benefit of a single-stage, outpatient procedure while AR often requires inpatient admission and many surgeons perform a staged reconstruction using the Nagata technique or a modification of the same.[4,5].

This study is limited by its retrospective nature in the reconstructed patient cohort. The majority of responders were parents of non-reconstructed children and only members of one social media group participated, increasing the risk of selection bias. Future studies should distinguish undesirable outcomes including ear asymmetry and contour changes from clinical complications.

Conclusion

PPE patients experienced less undesirable outcomes and were overall more satisfied, while most non-reconstructed patients who desire future reconstruction are more likely to choose PPE. Complication rates, age at which reconstruction can be performed, and the number of anticipated procedures are key points to discuss with patients during surgical planning and technique selection.

Declaration of Competing Interest

None of the authors have financial conflict of interests in the products discussed in the manuscript. However, A.L.B. is the co-inventor of the AuryzoN™ and DimensioN devices for autologous ear reconstruction. A.L.B. is one of the owners of ReconstratA, LLC, which owns the intellectual property for the devices. A.L.B. is the founder and president of Reconstruct Together, Corp., a non-profit aiming to fund humanitarian reconstructive surgery missions in underserved areas.

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Ethical approval

Not required.

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Angelo A. Leto Barone, Thomas G.W. Harris
Department of Plastic and Reconstructive Surgery, Johns Hopkins University School of Medicine, Baltimore, MD, USA

Michael J. Schroeder
University of South Dakota, Sanford School of Medicine, Sioux Falls, SD, USA

Catherine L. Kennedy
Department of Otolaryngology Head and Neck Surgery, University of Maryland Medical Center, Baltimore, MD USA

Carisa M. Cooney, Kavitha L. Ranganathan, Jordan P. Steinberg, Richard J. Redett III
Department of Plastic and Reconstructive Surgery, Johns Hopkins University School of Medicine, Baltimore, MD, USA
E-mail address: aletobarone@jhmi.edu (Angelo A. Leto Barone)

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The Anterior Earlobe Flap

Dear Sir,

The Anterior Earlobe Flap utilises the anterior aspect of the earlobe to reconstruct defects across the lower half of the anterior auricle. This flap can be medially-based or laterally-based. The earlobe is supplied by the vascular arcade vessels, which form a choke region between the inferior branch of the anterior auricular artery medially, and the inferior perforating branch of the posterior auricular artery laterally[1,2] (Figure 1).

The medial anterior earlobe flap (MAEF; Figure 2a and b) and lateral anterior earlobe flap (LAEF; Figure 2c and d) designs are the reverse of each other. The incised cranial margin of both flaps is along the most cranial portion of the lobule where it hangs from the cartilage of the auricle. The caudal edge of the flap can extend down to the inferior free border of the lobule, but the remaining earlobe looks more aesthetically pleasing if at least 5 mm of skin remains. The MAEF is based on the inferior branch of anterior auricular artery (supplementary figure 1). The base width of the flap is from the caudal end of the tragus to the cheek-lobule junction, and the flap length can extend up to the lateral edge of the lobule.

The LAEF utilises the inferior perforating branch of the posterior auricular artery where it enters the lobule beneath the caudal end of the anti-helix (supplementary figure 2). The base of the LAEF is between the caudal end of the anti-tragus and helical rim, where the cartilage ends. The flap can extend up to the cheek-lobule junction.

Raising both flaps involves splitting the lobular tissue in a coronal fashion, with more of the anterior tissue taken with the flap to maintain good flap circulation. The posterior lobular skin is left intact. A 4:1 ratio is possible as the lobular arcade vessels run through the flaps.

The MAEF can cover defects over the tragus and antitragus and can also be passed through the intertragal notch to resurface the cavum concha and medial, inferior and lateral aspects of the external auditory canal. Some patients may require removal of the cartilage of the intertragal notch to increase the stretch of the flap, and facilitate inset. The LAEF can extend into the cymba concha, the lower and middle parts of the anti-helix and the posterior half of the cavum concha, and occasionally up to the external auditory canal, as well as the anti-tragus. Both MAEF and LAEF can be raised with a posterior earlobe skin paddle to allow reconstruction of through-and-through defects of the ear.

There are multiple options available to reconstruct defects of the ear. For example, defects in the concha may be covered by a full-thickness skin graft following cartilage removal. Local flaps, such as “trap door” and “revolving door” post-auricular flaps, can be used to cover small defects. However, a search of the English medical literature revealed only two papers describing local flap techniques raised entirely on the lobule of the ear. In 1997, Marti’nez et al.[3] described completely splitting the earlobe from top to bottom in an antero-posterior direction and rotating the anterior half of the earlobe 180° cranially to reconstruct a tragal defect. This technique is similar to the MAEF in that it is based on circulation from the inferior branch of the anterior auricular artery, but takes both anterior and posterior surfaces of the earlobe together, and is limited to reconstructing defects on the tragus. The other is the “open-book” flap that involves two through-and-through top-to-bottom incisions in the earlobe separating the central third of the earlobe from the medial and lateral thirds.[4] The central third earlobe tissue is then divided in the coronal plane separating anterior from posterior lobular tissue with the spine of the book at the lower edge of the earlobe. This compromises vascularity of the flap, as both the medial and lateral ear-

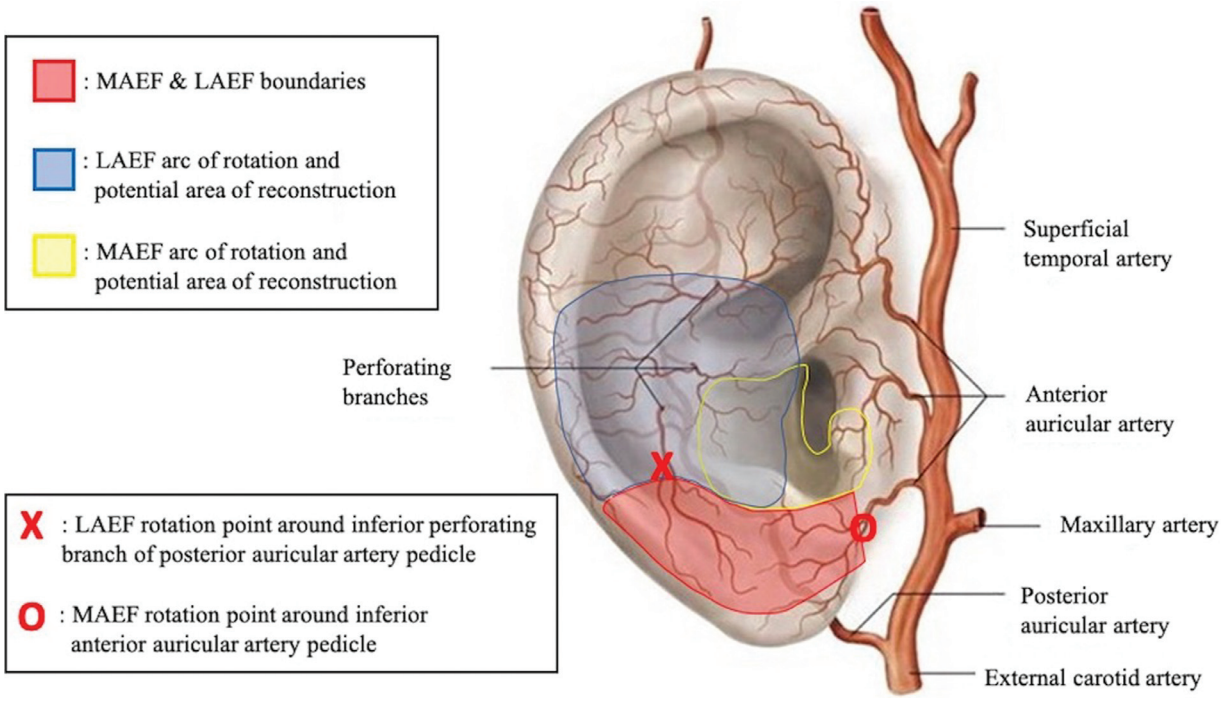

Figure 1 Anatomical boundaries of the anterior earlobe flap and arcs of rotation.

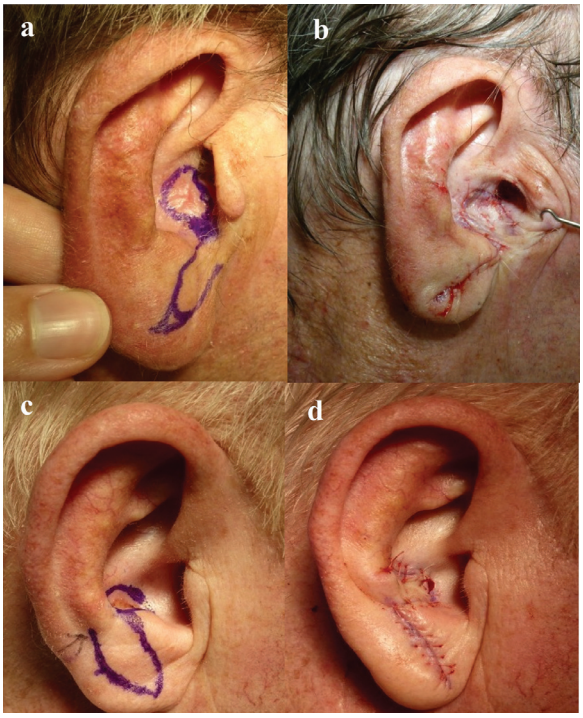

Figure 2 Pre-operative (a) and post-operative (b) appearances of the medially-based anterior earlobe flap (MAEF). Pre-operative (c) and post-operative (d) appearances of the laterally-based anterior earlobe flap (LAEF).

lobe arcade vessels must be transected. The whole central third of the earlobe circulation is now based on the flap's posterior attachment to the ear. This flap has a limited arc of rotation, which restricts its utility to defects in the antitragus and conchal bowl.

In comparison, the anterior earlobe flap offers greater versatility without compromising circulation. It can be based on either the medial or lateral blood supply of the earlobe, which enables the flap to cover a wide range of locations on the lower half of the ear.

The utility and dimension of these flaps are determined by the earlobe characteristics. Some earlobes, such as Type B and C earlobes with no free hanging portion[5] are less amenable to this flap design, or are simply too small for these flaps to be performed. Fortunately, in the elderly population with skin malignancies of the auricle, the lobule is often elongated with age and the resultant earlobe reduction is often aesthetically pleasing.

Ethical approval

Not required

Declaration of Competing Interest

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2020.12.094.

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Anthony Barabas
Shaene Gnanarajah
Jasmine Harnam Bawa
University of Cambridge, Hinchingbrooke Hospital, Plastic Surgery, Parkway Hinchingbrooke, Huntingdon, PE29 6NT, United Kingdom

Correspondence to: School of Clinical Medicine, University of Cambridge, CB2 0SP.
E-mail address: jasmine_bawa@hotmail.com (J.H. Bawa)

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Tackling Jersey finger using extraosseous tunnels: Study of a new technique

Dear Sir,

Flexor digitorum profundus (FDP) avulsion or Jersey finger is a common injury in hand trauma.[1]

Common methods of surgical repair include using a Mitek bone anchor,[2] or drilling two intraosseous tunnels through the distal phalanx to anchor the FDP tendon.[3] However, these carry risk of fracture and can be challenging, particularly if there is an associated fracture of the distal phalanx already. We report a technique which does not require anchoring or drilling into the bone, but rather extraosseus fixation of the FDP tendon.

Once the avulsed FDP tendon is retrieved, a double-Kessler or Krakow repair is performed with a 3-0 prolene suture through the distal FDP tendon. The two free suture ends thus arising from each side of the tendon end are then passed through extraosseous tunnels around the base of the distal phalanx (Figure 1). This is performed by using a large 18 G needle to pass around the side of the distal phalanx and out through the sterile matrix of the nail bed and nail plate, avoiding the germinal matrix. The suture ends are then passed through the needle using Adson forceps. The flared shape of the distal phalanx proximally helps to anchor the sutures to the bone. The prolene suture is then tied (10 knots) over a 1 cm roll of jelonet dressing as a cushion over the nail plate. This avoids any pressure necrosis over the nail complex. The external suture is then removed at 6 weeks post-operatively.

We have used this method in a cohort of 16 patients with Jersey finger injuries of different aetiologies with great success (Table 1). Paediatric and adult patients with Jersey finger injuries or traumatic injuries resulting in avulsion of FDP or division of FDP at the insertion were included in the cohort. Patients with no follow-up data were excluded.

All patients in the cohort were operated on with the above described technique, either by or under the supervision of the senior author. All patients were followed up for at least 6 weeks post-operatively, with the longest follow-up being 6 months in total. All patients underwent the same post-operative rehabilitation by specialist hand therapists, using an early active mobilization protocol.

Fourteen patients (86.7%) regained normal or near-normal function post-operatively (Table 1). The two that did not were a patient with significant polytrauma of the hand and another who developed complex regional pain syndrome post-operatively and were therefore both unable to comply with post-operative hand therapy.

Mean range of flexion at the distal interphalangeal joint (DIPJ) was of 49.6° at a mean of 11 weeks' follow-up. The mean loss of extension in our cohort was 11.6°, comparable to the 10°–15° loss of extension reported by Leddy and Packer in their original cohort.[4] One patient with significantly delayed presentation developed a fixed flexion deformity that did not significantly interfere with function.

These results demonstrate that good patient outcomes are achieved using this technique of extraosseous tunnel repair for FDP tendon avulsion injuries. Outcomes have been comparable or better than those reported in the literature – most patients had negligible loss of extension and had good post-operative flexion of the DIPJ.[5]

We have found this method simple and not requiring any complex instrumentation, as well as providing a reliable method of distal FDP tendon fixation that is unlikely to fail.

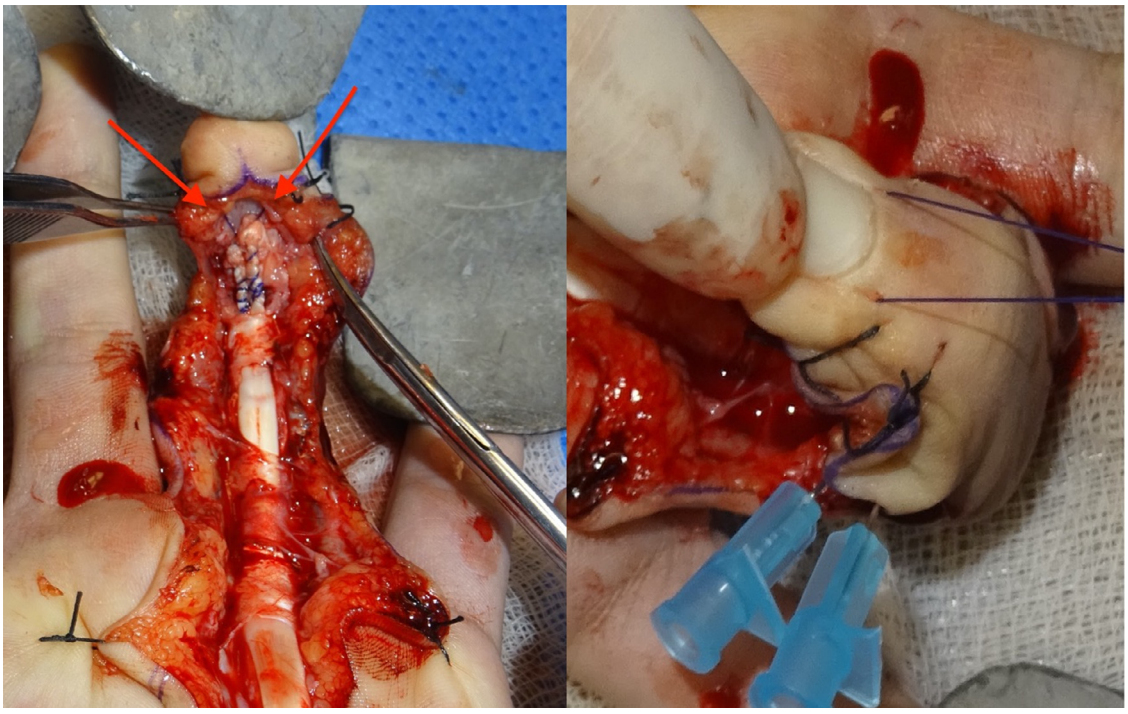

Figure 1 Intraoperative images of technique. Red arrows showing suture threads passed through extraosseous tunnels to anchor FDP to distal phalanx. Suture threads passed over nail complex ready to be tied over a jelonet roll.

Table 1 Summary of patient cohort.

Age of patient at operation	Number of days to repair	Aetiology	Leddy-Packer classification	Post-op range of movement extension/flexion in degrees	Complications
48	12	Fall	3	0/50	
48	9	Sports	2	+10/50	
21	14	Crush	2	+40/70	Fixed flexion deformity
22	9	Sports	2	+10/70	
55	1	Laceration	n/a - laceration	0/55	
13	13	Sports	2	0/55	
39	26	Hyperextension	1/2	0/80	
69	5	Fall	4	+2/53	
15	6	Sports	1	+24/78	
23	4	Sports	4	+15/70	
29	10	Fight	3	0/80	
15	2	Laceration	n/a - laceration	+19/36	Scar contracture, flexion lag
33	4	Laceration	n/a - laceration	+20/56	
50	8	Fight	4	+45/45	CRPS
32	4	Sports	3	0/50	
52	11	Sports	2	0/80	

Ethical approval

N/A - the paper is a description of technique.

Declaration of Competing Interest

None.

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Adam T. Misky
Dimitris Reissis
Dariush Nikkhah
Neil Toft
Department of Plastic Surgery, Royal Free Hospital NHS Foundation Trust, Pond Street, London NW3 2QG, United Kingdom
E-mail address: adam.misky@doctors.org.uk (A.T. Misky)

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RE: Tackling Jersey finger using extraosseous tunnels: Study of a new technique

Dear Sir,

We read with interest the short communication by Misky et al., detailing their experience with the extraosseous fixation of 16 patients with zone 1 flexor digitorum profundus (FDP) injuries.[1] In situations where two Mitek bone anchors cannot be safely used (e.g. associated comminuted basal fractures of the distal phalanx or avulsion of the volar cortex) then we would also advocate an extraosseous approach to zone 1 FDP repairs. However, we would like to raise a number of points in response.

Firstly, extraosseous fixation, in the method described by Misky et al. as 'a new technique', has previously been published, and in our experience is commonly used.[2] In 2006, MacCallister et al. detail an almost identical technique to the authors, except they use Keith needles to create their extraosseous tunnels and combine 2-0 and 3-0 nonabsorbable braided polyester coated sutures for their repair. Indeed, other extraosseous approaches have also been described. Merle and Dautel advocate the use of needles to pass two or three double 4-0 PDS sutures from the FDP tendon end into a fish mouth incision at the junction between the pulp and the nail, before removing the needles and re-inserting them though the nail plate, allowing extraosseous passage of the suture ends, ultimately tying them over a button and silicone washer.[3] Although, this is likely just a simple oversight by the authors, we felt it worthy of clarification.

Secondly, the authors describe the use of an 18-gauge needle passed around the side of the distal phalanx and through the sterile matrix and nail plate, avoiding the germinal matrix. However, Figure 1 (right hand image) appears to directly contradict their own technique, showing two sutures emerging through the germinal matrix, and not clearly through the nail plate at all. Like many, we have always been taught to use a modified button pullout technique, but to angle the needles through the nail plate, distal to the lunula, protecting the germinal matrix. Tying knots directly over the delicate dorsal skin and germinal matrix (even over a jelonet roll) appears counter intuitive and unnecessary, but we would welcome the authors rational and experience with this technical point.

Thirdly, if someone were to simply follow the authors described sequence of extraosseous fixation, they would likely come unstuck after passing sutures through the 18-gauge needle (passing them obliquely from the volar wound through the nail plate dorsally), as the needle would then be trapped in position by its wide plastic base. To avoid this issue, we use a smaller (e.g. 22-gauge) needle as a guide, passing it from the volar wound and through the nail plate, before following it back through the nail plate with a separate 18-gauge needle from the dorsum. This method means the plastic base is now on the outside and can simply be pulled out after the sutures have been retrieved. It is important to thread a rubber bung (we simply detach one from a 5 ml syringe) and jelont onto the 18-gauge needle before following the smaller needle back into the volar wound. With experience, it is often possible to pass the 18-gauge needle directly through the nail plate and round the side of the distal phalanx, without the need for the guiding needle. An alternative approach is to snap off the plastic base of the 18-gauge needle, then use an artery clip to push the metal part of the needle through the nail plate from the volar wound. However, snapping the plastic base can inadvertently narrow the lumen of the needle, preventing passage of the two core sutures. We find the final technique to be slightly clumsy and could risk inadvertent sharps injury. Whatever method is used, it is advisable to pass one needle at a time, simply repeating the process in parallel for the other two core sutures (if a four-strand repair is being performed).

In summary, although we think this is an excellent technique, it is not a new technique, and a number of simple modifications to the authors description will make the process much more straightforward for those looking to employ it.

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Ethical Approval

N/A

Declaration of Competing Interest

None declared

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Calum Honeyman
Department of Plastic and Reconstructive Surgery, Ninewells Hospital, Dundee, Scotland, United Kingdom

Christopher Jones
Department of Plastic and Reconstructive Surgery, Alder Hey Children's Hospital, Liverpool, England, United Kingdom
E-mail address: calum.honeyman@doctors.org.uk (C. Honeyman)

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Response to "RE: Tackling Jersey finger using extraosseous tunnels: Study of a new technique"☆

Dear Sir,

We are grateful for the interest our earlier submission has generated amongst the Journal's readership. In particular, we would like to take the time to respond to some comments made by our esteemed colleagues in the above response to our article.

We appreciate the similarities between our technique and the technique described by MacCallister et al., however there are a number of important differences between the two.[1] Firstly, studies have shown an increased infection rate with braided sutures, due to increased microbial adherence.[2] Indeed, there are reports of this happening spontaneously in tendon repairs in areas other than the hand.[3] Given that in the extraosseous pull-out technique the suture ends are in contact with the outside world for up to 6 weeks, we recommend the use of monofilament sutures such as Prolene to reduce the risk of infection. Secondly, using a suture on a Keith needle for a double-Kessler or Krakow repair is technically very demanding, therefore we continue to advocate the use of a monofilament non-absorbable suture on a conventional curved needle for ease of repair, then passing the cut suture ends through large bore needles extraosseously. Thirdly, we prefer to use a jelonet bolster to cushion the knot over the nailplate as tying it simply over the nailplate may cause pressure necrosis, while the use of a button has multiple difficulties of its own, such as pain and nail deformity.[4]

Similarly, the method described in the textbook by Merle and Dautel has important differences to our technique.[5] Namely the use of an absorbable suture material, with a lower tensile strength than the suture material we advocate, as well as the use of a fish mouth incision at the fingertip, and finally the use of a button tie-over. Again, we believe our method to be simpler and safer than the above method, due to the significant differences mentioned.

To address the second point of criticism, we agree with the authors that unfortunately the images we provided do not completely reflect our advice, as the suture ends emerge proximal to the nailplate. They do, however still bypass the germinal matrix given that they have to pass lateral to the base of the distal phalanx by virtue of their extraosseous passage. This protects the germinal matrix from damage, as intended by the original suture placement described.

Finally, the difficulty the authors describe regarding the 18-gauge needle getting "trapped in position by its wide plastic base" is not something we have encountered. Our centre stocks 40 mm length 18-gauge needles, which allow for good manoeuvrability, given sufficient suture length is left following repair of the FDP end, which can be ensured with adequate planning and good surgical technique. We would not advocate the use of further needles as a guide, as this has the potential to cause additional tissue trauma, as well as increasing the danger of an inadvertent needlestick injury. We do, however encourage the adaptation of our technique for use with whatever appropriate materials the surgeons have available, to ensure optimal outcome for the patient, while prioritising safety for both patient and surgeon.

We thank the authors for their conclusion that our described method is an excellent technique for the repair of distal Zone 1 FDP injuries. While variations on this method do exist in the literature, we believe we have been the first to describe this extraosseous method of Zone 1 FDP repair, particularly using the crucial terminology of extraosseous tunnels – a method avoiding expensive bone anchors and damage to the phalanx. We hope that we may inspire other surgeons to adopt this simple, safe and effective method for the repair of distal Zone 1 FDP injuries.

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Adam T. Misky*
Dimitris Reissis
Dariush Nikkhah
Neil Toft
Department of Plastic Surgery, Royal Free Hospital NHS Foundation Trust, Pond Street, London NW3 2QG, United Kingdom

*Corresponding author.
E-mail address: adam.misky@doctors.org.uk (A.T. Misky)

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Universal ICG lymphography stage for reproducible severity evaluation of extremity lymphedema

Dear Sir,

We read with great interest the article entitled "Correlation of ICG lymphography and lymphoscintigraphy severity stage in secondary upper limb lymphedema" by Yoon, et al. (Yoon, et al. J Plast Reconstr Aesthet Surg. 2020 Nov;73(11):1982–1988).[1] This study suggested that lymphoscintigraphy severity stage and arm dermal backflow (DB) stage on ICG lymphography could work synergistically to evaluate lymphedema severity. As the author states, to evaluate lymph kinetics comprehensively by using characteristics both of lymphoscintigraphy and ICG lymphography is important. However, a problem with the ICG lymphography severity stage is that it is often unclassifiable or inconsistent among raters, especially at modified MD Anderson Cancer Center (MDACC) stage, with a 10–20% inconsistency rate in our experience. Although there are less frequent cases compared with MDACC stage, arm DB stage has similar problems. Therefore, we are using universal ICG lymphography stage that can be used for both upper and lower extremity lymphedema, which we have developed by improving arm and leg DB stage.[2–5]

Table 1 Universal ICG lymphography stage for upper/lower extremity lymphedema.

	ICG lymphography findings
Stage 0	Linear pattern only (No DB pattern)
Stage I	Linear pattern + Splash pattern*
Stage II	Linear pattern + Stardust/Diffuse pattern (1 region)**
Stage III	Linear pattern + Stardust/Diffuse pattern (2 regions)**
Stage IV	Linear pattern + Stardust/Diffuse pattern (3 regions)**
Stage V	Stardust/Diffuse pattern only (No Linear pattern)

DB, dermal backflow. ICG, indocyanine green.
* Splash pattern is usually seen around the axilla/groin.
** Upper/lower extremity is divided into 3 regions; the upper-arm/thigh, the forearm/lower-leg, and the hand/foot.

In the universal ICG lymphography stage, the upper and lower limbs are divided into three regions: the upper arm/thigh, the forearm/lower leg, and the hand/foot. Severity classification ranges from stage 0 to stage V, according to visibility of Linear pattern and differentiation and extension of DB patterns. In ICG stage 0, only linear pattern is seen without DB pattern. In ICG stage I, Linear pattern and Splash pattern are seen. From ICG stage II through stage V, Stardust and/or Diffuse (SD) pattern are seen; in ICG stage II/III/IV, SD pattern is seen in 1/2/3 regions with Linear pattern, respectively, whereas only SD pattern is seen without Linear pattern in stage V (Table 1). Unlike other severity stages, there is no unclassifiable case so far, and inter-rater reliability is higher than others, as criteria of classification is clearer than previous ones.

Reproducibility of evaluation is important in any medical examination; therefore, it is assumed that universal ICG stage is more useful than previous classifications for lymphedema severity evaluation using ICG lymphangiography.

Ethical approval

This study was conducted under a National Center for Global Health and Medicine ethics committee-approved protocol, and all patients gave written consent to the study.

Prior presentations

None.

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None.

Declaration of Competing Interest

None

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Kenta Aso
Department of Medical Education, National Center for Global Health and Medicine, Tokyo, Japan

Reiko Tsukuura
Department of Plastic and Reconstructive Surgery, National Center for Global Health and Medicine, Toyama 1-21-1, Shinjuku-ku, Tokyo 162-8655, Japan
E-mail address: reikotsukuura@gmail.com (R. Tsukuura)

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Reply to: Letter comments on: Correlation of ICG lymphography and lymphoscintigraphy severity stage in secondary upper limb lymphedema

Dear Sir,

We would like to thank the authors for their well-informed comments on our paper.[1] Of the various indocyanine green (ICG) lymphography staging criteria introduced till date, no gold standards have so far been established. Currently, the scoring is performed according to findings that are focused on each. To add a bit of background, the lymphoscintigraphy and ICG lymphography staging in this study had similar classification criteria among the various stages. Between the two tests, the pattern of progressing from proximal to distal side was similar to the pattern in accordance with pathologic processes of the lymphedema that extends from the proximal to the distal upper limb.[2] Therefore, the arm dermal backflow (ADB) stage showed a higher correlation with lymphoscintigraphy than modified MD Anderson Cancer Center (MDACC) stage, with classification being based on the number of patent lymphatics among the two ICG stages analyzed in this regard.

In a recent review on the qualitative grading system of lymphoscintigraphy, no grading system was found to have standards similar to the universal ICG lymphography staging.[2] However, it would be worthwhile to further analyze the correlation between the two tests for lymphedema severity stages after evaluating the two tests with similar criteria. Although, lymphoscintigraphy may have limitations in analyzing the lymphatic flow or dermal backflow pattern of the hand or foot, which are the most distal part of the universal ICG lymphography stage.[3]

The universal ICG lymphography stages that you have recommended have clear staging criteria and show consistency, which is essential for scientific reasoning. The fact that staging name was not aligned with the 'universal ICG lymphography staging' seems to be the reason why it is not used interchangeably. In addition, reliability of most ICG lymphography stages has not been assessed properly. Therefore, evidence on reproducibility of evaluation would be necessary as in lymphoscintigraphy.[3,4]

Additionally, we would like to offer a few suggestions to complement the existing ICG lymphography staging. While ICG lymphography is limited in that it can on visualize superficial properties of lymphatic system, grading can still be performed while considering other aspects, such as evaluating the state of the circumference superficial lymphatic system at various angles. In this study, we divided the dermal backflow stages into anterior, and posterior aspects of severity. It is thought that supplementing the findings of each subdivided area with staging may help evaluate lymphatic preservation with increased precision.

Lastly, in a recent study on the relationship between clinical and ICG staging in lymphedema, it was observed that there was a low correlation between clinical stage and ICG stage.[4] Although advances have been made in the treatment of lymphedema, there is a lack of universally accepted assessment tools that show correlations between clinical and functional findings. The purpose of these tests is not only to evaluate surgical indications, but also evaluate the severity of lymphedema and verify the effects of treatment, and thus, there is a need to supplement the existing ICG functional assessment stage with additional parameters. In particular, since clinical exams and ICG functional assessment provide different information on the lymphatic stage, a combination of clinico-functional results through clinico-functional staging[5] would lead to the development of comprehensive method of staging, mimicking the TNM (tumor, node, metastasis) staging in oncology.[5,6]

We are grateful for this opportunity to discuss more on this topic. We hope to continue these discussions on the reliability of ICG lymphography staging and the recommended universal ICG lymphography stages and on validated stages to evaluate the severity of lymphatic stages and lymphedema more accurately.

Ethical approval

N/A.

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Declaration of Competing Interest

None.

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Jin A. Yoon, MD, PhD, Myung Jun Shin, MD, PhD, Yong Beom Shin, MD, PhD
Department of Rehabilitation Medicine, Pusan National University School of Medicine and Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea

Keunyoung Kim, MD, PhD
Department of Nuclear Medicine and Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea

Heeseung Park, MD, PhD, Taewoo Kang, MD, PhD
Department of Surgery, Busan Cancer Center, Pusan National University Hospital and Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea

In Joo Kong, M.Ed.O.T
Department of Rehabilitation Medicine, Pusan National University School of Medicine and Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea

Hyojeong Kim, MD, PhD
Department of Hemato-oncology, Pusan National University Hospital and Pusan National University School of Medicine, Republic of Korea

Min Suk Park, MD, Joo Hyoung Kim, MD, PhD*
Department of Plastic and Reconstructive Surgery, Pusan National University School of Medicine and Biomedical Research Institute, Pusan National University Hospital, Busan, Republic of Korea

*Corresponding author at: Department of Plastic and Reconstructive Surgery, Pusan National University School of Medicine and Biomedical Research Institute, Pusan National University Hospital, 179 Gudeok-Ro, Seo-gu, Busan 49241 Republic of Korea.
E-mail address: medic144@hanmail.net (J.H. Kim)

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A national shortage and increasing demand: Dispersing evidence-based use of hyaluronidase in plastic surgery

Dear Sir,

Hyaluronidase, available as 1,500IU ampoules of Hyalase® in the United Kingdom (Wockhardt UK Ltd, United Kingdom), is a degrading enzyme which is commonly used as a pharmaceutical adjunct in plastic surgery.[1] Hyaluronidase is a licenced ancillary treatment for managing extravasation injuries. It is also used for other clinical applications including enhancing the efficacy of local anaesthetic (LA) distribution and off-label for the treatment of hyaluronic acid based dermal filler complications.[2] Presently, there is a reported national shortage of the product.[3] In view of this, we aim to provide a concise summary of the evidence of its use, safety profile and current clinical applications.

Hyaluronidase's substrate hyaluronic acid (hyaluronan, HA) is a high molecular weight glycosaminoglycan (GAG) which is found in the extracellular matrix of various human tissues including synovial joints and dermis.[1] HA is a hygroscopic molecule (able to adsorb or 'hold' water molecules) and its ability to hydrate tissues confers them with specific biomechanical properties (e.g. pliability).[4] Endogenous hyaluronidases are implicated in a multitude of biological processes including inflammation, ageing and wound healing.[1] However, it was their presence in snake venom that inspired research into tissue diffusion and drug delivery enhancement.[1,4] Hyaluronidase breaks HA down from

long polysaccharide chains into the D-glucuronic acid and N-Acetyl-D-glucosamine disaccharide.[1] The degradation of the HA component of extracellular matrix in the skin alters the permeability of tissues facilitating enhanced diffusion of endogenous and exogenous compounds.[1] This is the principal mechanism of action of exogenously administered hyaluronidase in plastic surgery, coupled with a possible contribution from the bioactive disaccharide breakdown products which may further alter tissue diffusion properties.[1,2,4]

An extravasation injury results from the inadvertent infiltration of intravascularly delivered therapeutic substances into the surrounding soft tissues. The properties of the culprit agent and volume infiltrated determine the extent of local tissue damage and risk of complications including skin necrosis.[2] Surgical intervention (e.g. saline flush out) may be warranted when toxic drugs such as cytotoxic vesicants are implicated, neurovascular impairment or compartment syndrome occurs, or if there is concern of impending tissue damage.[2] Infiltration of hyaluronidase is utilised to disperse and dilute the culprit agent and evidence from randomised studies in the literature suggest that it reduces the incidence of tissue necrosis.[1,2]

Hyaluronidase is frequently used in conjunction with LA in plastic surgery to improve its efficacy and there is a supportive body of evidence in the literature.[1] In particular, the use of hyaluronidase has been reported to assist single injection local anaesthesia for split thickness skin grafts by dispersing LA reliably over a greater surface area.[5] The quality of scientific evidence is generally low and the results are mixed. However, there remains a general consensus in the literature that it is of clinical benefit.[1,5] Anecdotally, hyaluronidase can be added to liposuction tumescent solution prior to infiltration to enhance its dispersion. Use of a single standard 1,500iu vial to an amount of up to 1 L of tumescent infiltrate is usually described.

The use of HA based compounds as a temporary dermal filler is growing, and they are predominantly used within the sphere of aesthetic plastic surgery.[1,6] Hyaluronidase may be used off-label as a primary treatment to correct contour deformities, nodules, pain and bumps caused by the administration of HA.[6] Additionally, it is commonly used to manage acute complications of HA dermal filler injection including tissue ischaemia as a result of pressure effects or arterial embolization.[6] Chronic complications such as oedema may also benefit from treatment with hyaluronidase.[1]

Commercial preparations of hyaluronidase are often derived from animal tissue (Hyalase® is ovine-based (sheep)), however human-recombinant products have more recently become available (e.g. ENHANZE®, Halozyme Theapeutics Inc, United States of America).[1,6] Animal-derived products may contain contaminants such as animal proteins which are theoretically associated with greater risk of hypersensitivity reactions such as anaphylaxis.[1] The only reported complications secondary to hyaluronidase administration are hypersensitivity (allergic) reactions which may be immediate or delayed.[1,6] Allergic reactions have been reported to occur in less than 0.1% of cases with higher doses associated with greater risk.[6] Anaphylaxis is rare, but has been reported in a variety of use-case scenarios including co-administration with LA.[1] It is therefore important for plastic surgeons to remain vigilant in detecting such complications when using hyaluronidase in clinical practice.

Hyaluronidase is widely used within plastic surgery and although there are risks associated with its administration, the reported incidence is low. The use of hyaluronidase may continue to increase given the trend of increasing popularity of HA-based dermal filler in addition to its other established uses within the speciality. National shortages have occurred on multiple occasions and represent a significant safety concern given the ongoing and increased demand. More research is required to determine if human-derived hyaluronidase is a safer alternative to animal-derived products and whether it is cost-effective.

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Declaration of Competing Interest

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Michael Gallagher, Andrew R McKean
Department of Plastic Surgery, St Thomas' Hospital, Westminster Bridge Road, London, SE1 7EH UK

Peter Macneal
Department of Plastic Surgery, St George's Hospital, Blackshaw Road, London, SW17 0QT UK

Shakeel Rahman, Jenny L C Geh
Department of Plastic Surgery, St Thomas' Hospital, Westminster Bridge Road, London, SE1 7EH UK
E-mail address: michael.gallagher@doctors.org.uk (M. Gallagher)

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New era in upper eyelid rejuvenation: A brief overview of non-surgical blepharoplasty techniques

Upper eyelid aging often presents with excess, loose and inelastic skin (dermatochalasis) or soft and bone tissue volume loss (hollow eyes). For years, the treatment of choice was traditional surgical blepharoplasty, utilizing either excess tissue removal or fat grafting, respectively. However, techniques such as hyaluronic acid fillers, fractional CO_2 laser application, and plasma exeresis are currently emerging as minimally invasive therapeutic alternatives.[1-5] This study aimed to assess the effectiveness of these non-surgical upper eyelid rejuvenation techniques.

Our search was conducted according to the PRISMA guidelines.[6] All databases were searched by two authors (SATC and TN) for studies published in the English language from January 2010 to January 2019 (Figure 1). The research question followed the *PICOS* format: *Patients* (upper eye-

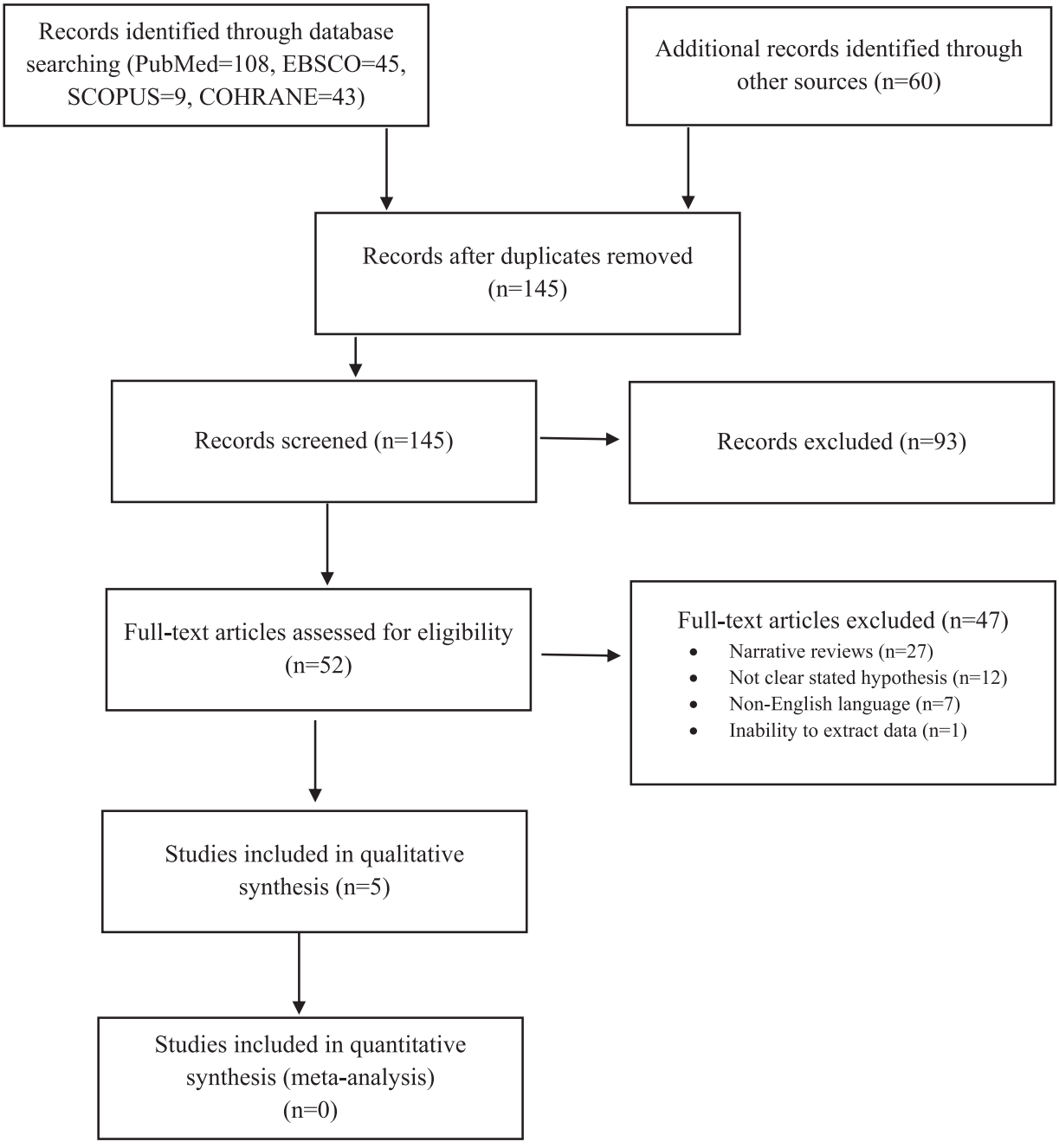

Figure 1 Selection of articles in the study based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (*PRISMA*).

Table 1 Main characteristics of the included studies.

First author	Country	Study type	Treatment	Sample size	Age range	Sex	Race	Follow-up
Romeo (2015)	Italy	Prospective	Intervention: Hyaluronic acid filler Control: Surgical blepharoplasty	154 patients	36-64	Female	NA	12 months
Liew (2011)	Australia	Prospective	Hyaluronic acid filler	36 patients	NA	NA	NA	3 months to 3.5 years
Toyos (2016)	USA	Retrospective	Fractional CO2 laser	16 patients	34-68	Female	Caucasian, Pacific Islander, Asian	6 months
Balzani (2013)	Italy	Prospective	Fractional CO2 laser	20 patients	30-68	Female	Caucasian	6 months
Rossi (2017)	Italy	Retrospective	Plasma exeresis	10 patients	40-72	Female	Caucasian	30-45 days

NA: information not available.

lid ptosis, dermatochalasis or other aging-related defects); *Intervention* (non-surgical upper eyelid rejuvenation treatment; hyaluronic acid fillers, fractional CO2 laser, or plasma exeresis); *Control* (traditional surgical blepharoplasty, when present); *Outcome* (treatment effectiveness); *Study types* (retrospective or prospective studies). A standardized form was used for data extraction, the risk of bias was assessed, while the quality of each study was graded using the GRADEpro program (Supplementary Material).

We found five studies eligible for qualitative analysis. These included a total of 236 patients, 30 to 72 years old; most were females, of Caucasian origin, and with Fitzpatrick skin phototypes I to IV (Table 1).

Two studies evaluated the effect of hyaluronic acid fillers in upper eyelid symmetry and volume restoration. In the first one,[1] 154 patients with upper eyelid volume loss were divided into three groups (*Group I*: hyaluronic acid filler, *Group II*: surgical blepharoplasty followed by hyaluronic acid filler, *Group III*: surgical blepharoplasty). The outcome was based on the m-value (pretarsal skin show) assessed on clinical images. All *Group I* patients showed an m-value $>$7 mm and 96% of them had asymmetry between their eyes at baseline; after therapy, the m-value was found between 2 and 7 mm (ideal range) in all patients, while asymmetry was detected in 56 of them (44%). All *Group II* and *III* patients showed an m-value $<$2 mm and 42% of them had asymmetry between their eyes at baseline; after therapy, all patients showed an m-value between 2 and 7 mm, while asymmetry was detected in just two of them, respectively. The second study[2] showed favorable and long-lasting results for all 36 enrolled patients with upper periorbital volume loss, while no significant treatment-associated morbidities were reported.

Two observational studies evaluated the effect of fractional CO_2 laser. In their retrospective study, Toyos et al. measured the marginal reflex distance of the upper eyelid, the palpebral fissure distance, and the upper lid crease of 16 patients with upper eyelid dermatochalasis at baseline and six months after treatment. While, on average, the marginal reflex distance and the palpebral fissure raised from 0.7 to 2.2 and 5.2 to 6.7 mm, respectively, the upper lid crease remained relatively unaffected (5.5 to 5.3 mm). All post-treatment complications were resolved up to two weeks after the procedure.[3] Similarly, Balzani et al. demonstrated a statistically significant elevation of the eyelid skin crease — 1.62 +/- 0.69 mm at 3 months, 2.11 +/- 0.66 at 6 months after treatment; p-value $<$ 0.001 — and the brow position — 1.63 +/- 0.68 mm at 3 months, 2.3 +/- 0.68 at 6 months after treatment; p-value $<$ 0.001 — in 20 prospectively enrolled patients with upper eyelid dermatochalasis, compared to their baseline measurements. Patient satisfaction with the treatment was assessed with a four-scaled structured questionnaire; 60% of patients evaluated the treatment as good, 20% as excellent, and 20% as fair.[4]

Lastly, Rossi et al. evaluated the effect of plasma exeresis in 10 patients with upper eyelid dermatochalasis that underwent three treatment sessions each [5]. To rate dermatochalasis in this study, the authors applied the facial laxity rating scale (absent, mild, moderate, and severe dermatochalasis). At baseline, four patients showed moderate and six severe dermatochalasis, while all patients exhibited collagen degeneration under reflectance confocal microscopic (RCM) examination. However, at 4-6 weeks after treatment, seven patients improved by three grades, two by two grades, and one by a single grade (overall clinical improvement: 2.6°). In contrast to their baseline examination, all patients showed predominant long, straight collagen fibers under RCM examination post-treatment. No significant complications were noticed at any time during this study.

In conclusion, existing evidence suggests that non-surgical techniques for upper eyelid dermatochalasis and volume loss correction could be effective alternatives to the traditional surgical blepharoplasty. Although these results seem promising, more studies including males, non-Caucasians, and with skin phototypes V and VI, should be conducted to provide safer conclusions. Future prospective studies in the form of randomized controlled trials are needed to address long-term effectiveness and safety.

Declaration of Competing Interest

None declared.

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Ethical approval

Not required.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2021.01.008.

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Sofia-Andriani Theodorelou-Charitou
School of Medicine, European University Cyprus, Nicosia, Cyprus

Theodoros Xanthos
School of Medicine, European University Cyprus, Nicosia, Cyprus
Hellenic Society of Cardiopulmonary Resuscitation, Athens, Greece

Ilias P. Nikas
School of Medicine, European University Cyprus, Nicosia, Cyprus

Trisevgeni Ntinioti
School of Medicine, European University Cyprus, Nicosia, Cyprus
Ophthalmos Research and Educational Institute, Nicosia, Cyprus
E-mail address: soniaxaritou@yahoo.gr (S.-A. Theodorelou-Charitou)

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Dynamic facial reanimation using active implantable prosthesis: Restoring blink

Dear Sir,

While lack of symmetrical smile in facial nerve paralysis (FNP) is a major aesthetic problem, loss of blink reflex poses a serious threat to the eye.[1] On average, an adult human spontaneously blinks between 10 and 20 times per minute to preserve the cornea by formation of a tear film.[1] A range of nerve transfer and muscle substitution techniques for dynamic restoration of blink has been described, yet none to date has achieved consistent success.[2] Numerous implantable devices have been proposed to fill the void. Upper lid loading with gold or platinum weight is the most commonly used method. Lid loading enables gravity assisted eye closure in the dependent position without however restoring blink.[2] With recent technological advances in implantable prostheses, new methods of restoring dynamic function are being explored.[3] Herein we present a novel use of an implantable actuator in combination with a dynamic sling for effective closure of the eyelids. The primary aim was to compare implant-activated eye closure in cadaveric models to spontaneous blink in healthy individuals.

The bionic lid implant for natural closure (BLINC) achieves eye closure by application of an eyelid sling tensioned by the action of a magnetic actuator, akin to temporalis transfer. Following institutional ethics approval (Anatomy Governance Committee Faculty of Medicine and Health Sciences, Macquarie University and HREC X19-0250), three human cadavers were used for BLINC implantation. The device was placed in the temporal fossa and fixed to the zygomatic arch with the lateral end of the sling attached to the magnetic core (Figure 1). The device was energized in two ways; a steady current flow (DC power supply) or delivery of a high pulse of energy using a capacitor for rapid eye closure.

In addition, three live participants were recruited on voluntary basis for the control group. Each was recorded while gazing at a fixed object until the participant spontaneously blinked at least three times. A video recorder (Samsung Galaxy S9) with acquisition rate of up to 480 frames per second was used to record the eye. Each video was analyzed for eyelid displacement using MOVAVI Video Editor Version 14 (Movavi Software Limited, Saint Louis, MO). The results were measured as percentage-closure by dividing the eyelid displacement over the iris diameter. A generalized estimating equation (GEE) was used to compare the speed and degree of eye closure between the three groups of blinking, i.e. capacitor and DC powered BLINC closure and natural spontaneous blink.

In both modes of powering the actuator was charged to 10 V. Time to complete closure using the capacitor, the DC power supply and during the spontaneous live blink

Presented at: None.

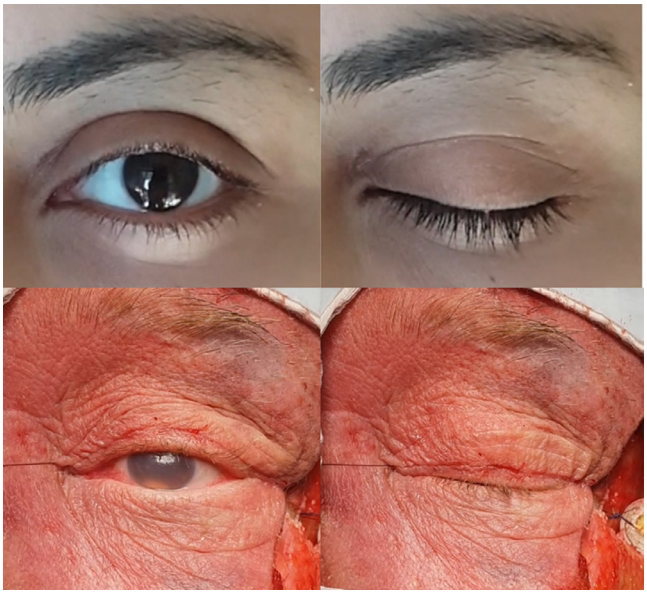

Figure 1 Comparing BLINC-powered blinking in a human cadaver (bottom row) to spontaneous natural blinking (top row). The device is fixed to the zygomatic arch using a screw. A Prolene suture is used as the sling in this case (far left). It attaches to the device on one end and runs along a supraciliary incision on the top eyelid and is anchored to the medial canthal insertion on the other end. Its length is calibrated to allow closure of the eye when tensioned by the actuator. The sling is passed through a hole in the lateral orbital wall to allow efficient transfer of force in closing the eye.

were 22.1 ± 5.7 ms, 31.2 ± 10.4 ms, and 82.3 ± 7.5 ms, respectively. The degree of closure measured as the percentage ratio of top eyelid displacement over the iris diameter in the same groups were $73.9 \pm 13.6\%$, $79.4 \pm 25.7\%$ and $82.6 \pm 7.1\%$, respectively (Figure 1). On regression analysis, there was no statistical difference in the degree of closure between using BLINC and human spontaneous blink. Time to closure, however, was significantly shorter for the BLINC compared to live controls, with quickest closure occurring with the capacitor-powered device, followed by DC power supply (Figure 2).

In this study, we have demonstrated the feasibility of restoring physiological blink kinematics in FNP using an implantable actuator. The down phase of normal blinking, which on average lasts less than 100 ms,[4] was successfully achieved by the BLINC method. By controlling the delivery of power to the actuator, a near-natural closure velocity is possible.

Ultimately, the physiological kinematics of blinking needs to be restored in FNP for effective lubrication of the eye. In patients with Grade IV-V House-Brackmann FNP, eye closure is typically less than 15° with a 75% reduction in peak velocity.[4] BLINC aids eye closure using an implantable actuator that is easily controlled. Senders et al. showed that a tension force of 627+/−128 mN with an excursion of at least 6 mm was required to achieve eye closure using the sling approach.[3] BLINC uses a magnetic field to generate motion, which obviates the need for any physical contact of moving parts with electrically active parts. This enables a contactless motion for sealing all active components, which is key to achieving implantability.

	Regression Coefficient	95% CI	p-value
Degree of Closure			
Capacitor	Ref		
DC power	3.89	- 10.66-18.45	0.60
Human	12.95	- 0.25-26.15	0.06
Time to closure			
Capacitor	Ref		
DC power	9.07	2.00-16.12	0.012
Human	60.15	53.09-67.21	<0.001

Figure 2 Regression analysis comparing the degree and time to closure between capacitor DC-powered BLINC eye closure and natural spontaneous blink. The degree of closure is measured as the percentage ratio of the top eyelid displacement over the iris diameter. There is no statistical difference in the degree of closure between the three groups. Time to closure was fastest using the capacitor followed by DC-powered BLINC followed by spontaneous live blinking.

The rate at which the BLINC device is powered can be controlled to adjust for the desired degree and speed of eye closure. When recreating physiological blink, it is not just the duration of blink but the entire kinematics that needs to be recreated. Hasmat et al. previously demonstrated BLINC replicates this kinematic by restoring the natural variation in the velocity of eyelid displacement.[5]

Restoring the complex mechanics of eyelid closure remains a major challenge. BLINC demonstrates that electromagnetic actuation combined with an upper eyelid sling is a feasible option for effective eyelid closure.

Declaration of Competing Interest

The authors have no conflicts of interest relevant to this article to disclose.

Funding

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Ethical approval

Institutional ethics approval (HREC X19-0250) was obtained for recruiting casual participants for this study. Individual participant consent was obtained for use of their images in this manuscript. Approval of the Anatomy Governance Committee at the Faculty of Medicine and Health Sciences, Macquarie University, was obtained for use of human cadavers in this study.

Financial disclosure

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All the authors confirm that the presented manuscript conforms to the Declaration of Helsinki.

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Contributors' statement

Shaheen Hasmat: conceptualized the study, collected data, drafted the initial and final manuscript, prepared the figures.

Jacinta Cleary: reviewed and revised the manuscript and approved the final manuscript as submitted.

Gregg J. Suaning: reviewed and revised the manuscript and approved the final manuscript as submitted.

Nigel H. Lovell: reviewed and revised the manuscript and approved the final manuscript as submitted.

Tsu-Hui (Hubert) Low: reviewed and revised the manuscript and approved the final manuscript as submitted.

Jonathan R. Clark: conceptualized the study, reviewed the manuscript and approved the final manuscript as submitted.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2021.01.001.

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Shaheen Hasmat
Faculty of Medicine, University of Sydney, Camperdown, NSW 2006, Australia
Department of Head and Neck Surgery, The Chris O'Brien Lifehouse, Camperdown, NSW 2050, Australia
Sydney Facial Nerve Service, The Chris O'Brien Lifehouse, Camperdown, NSW 2050, Australia

Jacinta Cleary, Gregg J. Suaning
School of Aerospace Mechanical & Mechatronic Engineering, University of Sydney, Camperdown, NSW 2006, Australia

Nigel H. Lovell
Graduate School of Biomedical Engineering, UNSW Sydney, NSW 2052, Australia

Tsu-Hui Hubert Low
Department of Head and Neck Surgery, The Chris O'Brien Lifehouse, Camperdown, NSW 2050, Australia
Sydney Facial Nerve Service, The Chris O'Brien Lifehouse, Camperdown, NSW 2050, Australia

Jonathan R. Clark
Faculty of Medicine, University of Sydney, Camperdown, NSW 2006, Australia
Department of Head and Neck Surgery, The Chris O'Brien Lifehouse, Camperdown, NSW 2050, Australia
Sydney Facial Nerve Service, The Chris O'Brien Lifehouse, Camperdown, NSW 2050, Australia

Corresponding author at: Department of Head and Neck Surgery, The Chris O'Brien Lifehouse, 119-143 Missenden Road, Camperdown, NSW 2050, Australia.
E-mail address: shas9044@uni.sydney.edu.au (S. Hasmat)

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Liposuction-assisted brachioplasty in breast cancer-related lymphedema: Impact on volume reduction and quality of life

Dear Sir,

There was no clear recommendation about surgical management of advanced breast cancer-related lymphedema (BCRL). Liposuction combined with compression therapy is suggested as an effective approach to treat stage II lymphedema.[1] However, lymph accumulation is associated with the activation of keratinocytes, fibroblasts and especially adipocytes that resulted in skin thickening and subcutaneous tissue fibrosis.[2] Skin modifications could explain why, in our experience, liposuction is often inadequate in advanced BCRL stage II/III. The aim of this study was to determine if an innovative surgical procedure combining liposuction and brachioplasty improved advanced and refractory BCRL volume and patients' quality of life (QoL).

A prospective study was conducted between 2014 and 2016. After multidisciplinary decision, only patients with disabling unilateral BCRL, stage II, with a difference in limb volume greater than 20% despite optimal treatment were included. All patients had undergone a minimum of 1 year of conservative therapy with therapeutic ed-

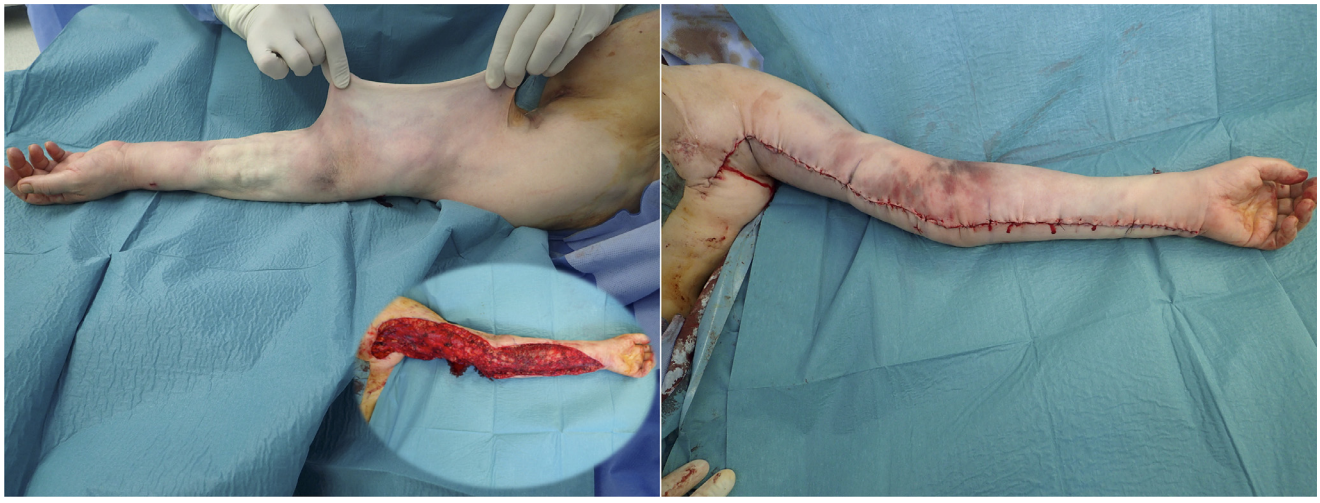

Figure 1 Surgical procedure with *on the left:* the skin excess after the liposuction, skin incisions and excision of subcutaneous tissues and *on the right:* post-operative scar of the lymphedematous limb.

ucation, intensive complete decongestive therapy (CDT) and optimal maintenance (compression garment, manual lymphatic drainages, auto-compression therapy with a short-stretch bandage). The procedure combined a pre-operative hospitalization with CDT one month before surgery to decrease limb circumference, therapeutic education and dietary management. The operative protocol included the liposuction-assisted brachioplasty (LaB) under general anesthesia with prophylactic antibiotics (cefazolin). Circumferential manual liposuction was performed in supine position with arms abducted to 90° using specialized Helixed Tri Port III cannulas (22 and 30 cm long, 4–5 mm wide). The entire arm, forearm and dorsum of the hand were addressed through a series of small incisions along the limb, using tumescent technique with adrenalin without tourniquet. Cutaneous excision was then performed to remove excess of skin for esthetic and functional result. Subcutaneous tissue was excised and skin flaps as thin as 5 mm were raised while preserving the latticework of subcutaneous and lymphatic vessels (Figure 1). A 2-layer closure was then performed without suction drains. If necessary, a classic dermolipectomy was performed on the non-lymphedematous limb to obtain symmetry (Figure 2). Only one patient required blood transfusion. Short-stretch compression bandages were used immediately in the post-operative period. On the third day, therapists applied multi-layered compression bandages. Patients were instructed to use the same protocol of bandaging for the next two weeks, until sutures were removed. The third week, therapists initiated intensive CDT. On the fourth week and during the follow-up, patients used daily 25–30 mmHg compression garment.

Lymphedema volumes were measured after the pre-operative CDT, 10 months after surgery and in the follow-up period. QoL was evaluated with the EQ-5D scale and the Upper Limb Lymphedema 27. Fourteen patients were included with a median age of 56.5 years (range 43–77) and a median BMI at 28.7 kg/m^2 (21.4–39.6).

The median preoperative excess arm volume was 894.5 ml (310–2286) which corresponds to a median difference in limb volume between the normal and the lymphedematous arm of +31.6% (10.7–79.5). It rapidly decreased to 45 ml (−285–677); i.e. a reduction with 94.3% (189.1–51), between 0 and 10 months, and 143 ml (−322–693); that is a reduction with 85.4% (177.2–33.9), which corresponds to a median difference in volume between the limbs of +7% (−15.6–27.9) after 10 months. The median post-operative follow-up period was 20.5 months (1.1–36.9). None of the patients had surgical complications. Patients' QoL improved in the physical, psychological and social health domains (Supplementary Table 1).

Our pilot study evaluated LaB in patients with advanced and refractory BCRL with the calculation of the reduction of the excess volume. Despite the addition of skin resection, we didn't identify any complication. The combination of liposuction and brachioplasty was already recognized in the treatment of brachial ptosis after massive weight loss or in esthetics, with a low complication rate.[3] In Chen's study among patients with upper lymphedema, LaB was performed in 13 patients and 6 underwent liposuction alone. The postoperative protocol required rigorous compression usage. The results suggested the reduction of postoperative complications of LaB comparatively to liposuction alone.[4] In the present study, the bandages were worn for less time, garment compression were less strong and worn only during the day as compared with the post-operative protocol in Chen's study. Nevertheless, we noted satisfactory immediate and long-term results in terms of volume reduction and QoL.

We didn't identify surgery-related complications at the difference with studies using liposuction alone.[1,5] Compression therapy with a short-stretch bandage used immediately in the post-operative period decreased the incidence of hematoma and fibrosis and prevented delayed healing and infection. Moreover, although other authors have demonstrated adequate skin retraction with liposuction alone, we

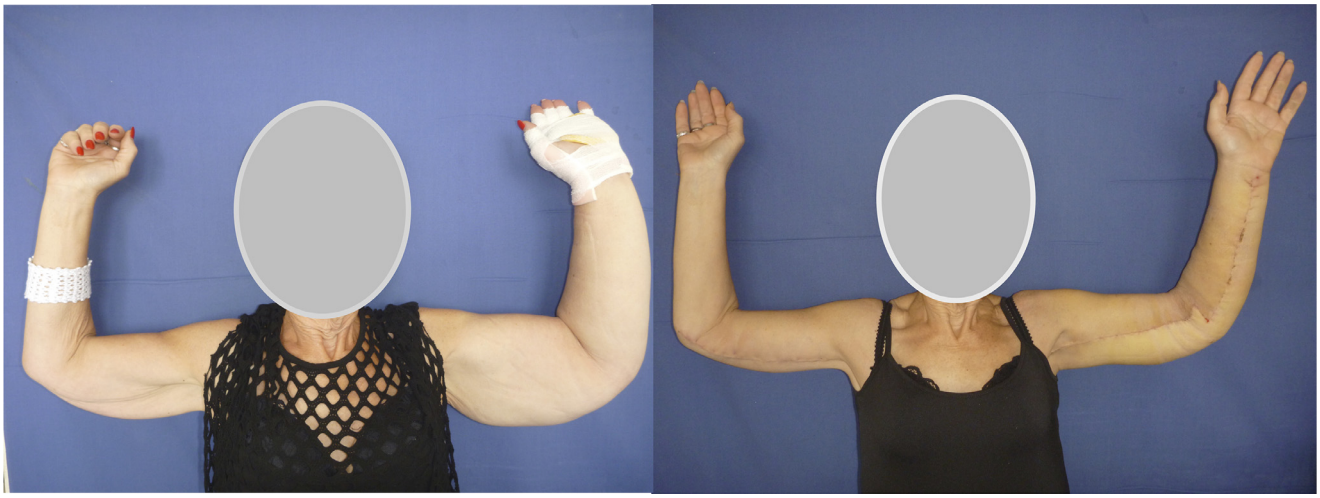

Figure 2 A 65 Years old woman with non-pitting arm lymphedema lasting from years after breast cancer treatment with *on the left* pre-operative drawing and *on the right* post-operative result at one year.

found more consistent esthetic results with LaB. Our results highlight the safety of this procedure but also the interest to combine liposuction/brachioplasty in terms of BCRL volume reduction and improvement in patients' QoL. Treatment and follow-up in a multidisciplinary specialist team approach are essential.[5] The present results suggest LaB as a promising procedure for advanced BCRL treatment.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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Ethical approval

An institutional review board has approved the study. All the patients gave their oral and written consent for the use of their medical data and photographs.

Financial disclosure statement

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2020.11.025.

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C. Chollet
Département de Chirurgie Oncologique, Centre Hospitalier Universitaire de Toulouse, Institut Universitaire du Cancer de Toulouse-Oncopole, 1 avenue Irène Joliot-Curie, 31059 Toulouse, France

J. Malloizel-Delaunay
Service de Médecine Vasculaire, Centre Hospitalier Universitaire de Toulouse, Toulouse, France

B. Cabarrou
Département de Biostatistique, Institut Claudius Regaud, Institut Universitaire du Cancer de Toulouse-Oncopole, Toulouse, France

E. Chantalat, H. Leray
Département de Chirurgie Oncologique, Centre Hospitalier Universitaire de Toulouse, Institut Universitaire du Cancer de Toulouse-Oncopole, 1 avenue Irène Joliot-Curie, 31059 Toulouse, France

B. Garmy-Susini
I2MC, INSERM UMR 1048, Université de Toulouse, Toulouse, France

A. Yannoutsos
Service de Médecine Vasculaire, Hôpital Paris Saint-Joseph, Paris, France
INSERM, UMR1153 Epidémiologie et Statistique, Sorbonne Paris Cité Centre Recherche (CRESS), Paris, France

B. Chaput
Service de Chirurgie Plastique et des Brûlés, Centre Hospitalier Universitaire de Toulouse, Toulouse, France

C. Vaysse
Département de Chirurgie Oncologique, Centre Hospitalier Universitaire de Toulouse, Institut Universitaire du Cancer de Toulouse-Oncopole, 1 avenue Irène Joliot-Curie, 31059 Toulouse, France
E-mail address: vaysse.c@chu-toulouse.fr (C. Vaysse)

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Reply to: 'Liposuction-assisted brachioplasty in breast cancer-related lymphedema: Impact on volume reduction and quality of life'

Dear Sir,

We wish to commend the authors of "Liposuction-assisted brachioplasty in breast cancer-related lymphedema: impact on volume reduction and quality of life" on their objective analysis of their approach to patients with unilateral stage II BRCL. We agree with the authors' combination approach to address both lymphedema and the resultant skin excess. In our experience, we have found that without concurrent skin excision, the skin often does not retract sufficiently and can lead to wound healing complications. Our group recently published our experiences utilizing a similar approach to patients with solid predominant extremity lymphedema. We demonstrated that the combination of skin excision and liposuction decreased contour irregularities, seroma/hematomas and skin necrosis compared to liposuction only.[1] Lymphedema patients are a unique cohort in regards to their soft tissue consistency, skin vascularity and propensity for wound complications. Thus, to achieve desirable results, it is often required to think critically and potentially analyze some of the dogmas of plastic surgery. Historically, the combination of circumferential liposuction and simultaneous brachioplasty has been considered e unsafe. However, the senior author has been performing concurrent liposuction with brachioplasty in lymphedema patients for seven years with a low complication rate. As lymphedema patients are at a high risk for wound complications, it reasons that this approach may also be safe in patients without lymphedema. However, well-done studies are needed to evaluate the safety and efficacy of this technique in cosmetic patients and to further analyze surgical approaches to aid in the treatment of lymphedema and its complications.

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Rebecca Knackstedt
Wei F. Chen*
Department of Plastic Surgery, Cleveland Clinic, 2049 E. 100th Street, Mail Code A 60, Cleveland, OH 44195, United States

*Corresponding author.
E-mail address: chenw6@ccf.org (W.F. Chen)

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Tissue hypoxia and frequent cellulitis in lymphedematous limbs

Dear Sir,

I read with the great interest the article entitled "Treatment of toes as an integrated part of infection control for advanced lower limb lymphedema" by Yildirim, et al. (J Plast Reconstr Aesthet Surg. 2020 Aug 21 [Epub ahead of print]).[1] As the authors report, fibrotic skin changes of the toes significantly affect prognosis of patients with severe lower extremity lymphedema (LEL), leading to frequent cellulitis attacks. Frequent cellulitis attacks can be seen not only in elephantiasis cases, but also in moderate-to-severe LEL cases. Although physiologic procedures including lymphatic reconstructive surgeries are effective to prevent cellulitis, some patients suffer from cellulitis even after such interventions with unknown cause of the attacks.[2-5]

Various evaluations have been tried to detect differences between regions with and without frequent cellulitis, and tissue hypoxia is noted in frequently-attacked regions. Tissue oxygen saturation was measured in the medial and the lateral aspects of the thigh and the lower leg of 5 limbs of LEL patients with frequent cellulitis episodes using a near-infrared tissue oximeter monitor (OXY-2, ViOp-

tix Inc., Fremont, CA, USA). The 20 regions were divided into regions affected by frequent cellulitis (cellulitis group; $n = 12$) and regions not-affected by frequent cellulitis (control group; $n = 8$). Although not statistically significant, there was a tendency that tissue oxygen saturation was lower in cellulitis group than in control group ($61.8 \pm 16.9\%$ vs. $73.3 \pm 13.7\%$, $P = 0.112$). There was no other statistically significant difference between the groups.

Although the results were not associated with statistically significant difference and the number of examinees was too small to conduct comprehensive analysis, tissue hypoxia may have a possible relationship to frequent cellulitis, which should be investigated in future studies.

Funding

None.

Conflict of interest

None declared.

Ethical approval

This study was conducted under a Tokyo Metropolitan Bokutoh Hospital ethics committee-approved protocol, and all patients gave written consent to the study.

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Nana Yamamoto
Department of Plastic and Reconstructive Surgery, National Center for Global Health and Medicine, Tokyo, Japan
Department of Plastic Surgery, Tokyo Metropolitan Bokutoh Hospital, Tokyo, Japan
E-mail address: tayamamoto@hosp.ncgm.go.jp (N. Yamamoto)

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Tissue hypoxia and frequent cellulitis in lymphedematous limbs☆

Dear Sir,

We would like to thank Dr. Yamamoto for interest and comments regarding our article, 'Treatment of toes as an integrated part of infection control for advanced lower limb lymphedema'.[1]

I agree with Dr. Yamamoto's opinion, although the size of study group was small and there was no statistically significant difference in the results of his study.

Apparently, in our patients fibrosis is the key factor of recurrent cellulitis. The fibrosis could lead to two effects: (1) Less blood supply with decreased oxygen saturation as mentioned by Dr. Yamamoto. (2) More tendency for harboring of bacteria. This is found more often in the lower limb than the upper limb because more stasis of lymph in the lower limb. It is seen not only in the thigh or leg, but also in the toes. The bacteria invasion often starts from the web space or the skin crypts.

In our experience, hyperbaric oxygen is helpful to decrease the swelling and is beneficial for even severe cases of lymphedema. This further explains why oxygen saturation is related to cellulitis.

Microlymphatic surgery such as lymphaticovenular anastomoses may decrease the lymphedema, but it is not almighty. Other procedure should be employed to minimize the chance of infection.

We encourage Dr. Yamamoto to expand their study regarding oxygen saturation and cellulitis in the future.

Funding

None.

Ethical approval

Not required.

Declaration of Competing Interest

None

Reference

1. Yildirim MEC, Chen SH, Weng HC, Mousavi SA, Chen HC. Treatment of toes as an integrated part of infection control for advanced lower limb lymphedema. *J Plast Reconstr Aesthet Surg* 2020 Aug 21 [Epub ahead of print].

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Mehmet Emin Cem Yildirim
Department of Plastic Surgery, China Medical University Hospital, 2, Yuh-Der Rd, Taichung, Taiwan

Shih-Heng Chen
Department of Plastic Surgery, Chang Gung Memorial Hospital, Taipei, Taiwan

Hui-Ching Weng
Institute of Gerontology, College of Medicine, National Cheng Kung University, Tainan, Taiwan

Seyed Abolghasem Mousavi, Hung Chi Chen
Department of Plastic Surgery, China Medical University Hospital, 2, Yuh-Der Rd, Taichung, Taiwan
E-mail addresses: dr.cem_yildirim@hotmail.com (M.E.C. Yildirim), shihheng@icloud.com (S.-H. Chen), d19722@mail.cmuh.org.tw (H.C. Chen)

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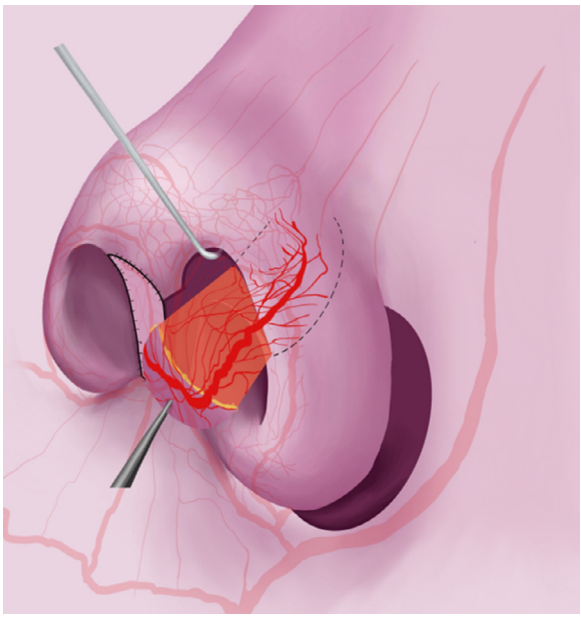

Figure 1 Diagram of transposing of flap from left side of alar groove to columellar site and suturing the flaps between lifted columella edge and the basement.

Supra Alar island flap and costal cartilage for "Arrow Tail" short nose deformity correction

Dear Sir,

Short nose is a common deformity with highest prevalence in Asian people. Here we termed an oriental short nose deformity as an "arrow-tail" nose characterized by deficient nasal midline skin and mucosa, retruded short columella with relative bilateral alar ptosis, as well as a poorly defined nasal tip (Supplementary Figure 1A). As a proof of principle, we implemented an approach of anthropometric measurement of nasal proportion to identify the arrow tail short nose by analyzing the relationship between columella and alar. We named it nasal caudal triangle (NCT), referring to a triangle identified by two bilateral lowest points of alar base (Supplementary Figure 1B, b, c and b', c') and the vertical projection of alar columella breakpoint on the coronal plane (Supplementary Figure 1B, a and a'). If the columella points on or posterior of the line of two lowest points, we consider it as short nose. In the first stage of surgery, flaps are usually used in columella reconstruction in order to complement deficient nasal soft tissue, mainly including but not limited to vascularized free auricular flaps and prolabial flap combined with Abbe flaps.[1] Here we present a novel flap named "supra alar island flap", as an alternative for "Arrow tail" short nose correction. To achieve a suitable esthetic goal, secondary stage of surgery is needed. We used costal cartilage grafts implantation to further overcome contractile force from the nasal skin envelope, stabilize reconstructed columella, and augment nasal dorsum with a proper tip projection.

The procedure included two surgical stages. In stage 1, V shaped columella and bilateral marginal incisions were made at the basement of columella and along the caudal edge of the lower lateral cartilages respectively in order to lift up columella and tip to the normal height. Then we designed a crescent shaped supra alar island flap within bilateral alar-facial grooves. The blood supply of the pedicle of the flap includes muscle and the nasal anastomoses among the marginal nasal rim and columellar arteries[2] (Supplementary Figure 1C). Finally, to lengthen nasal columella, we transposed the flaps across a subcutaneous tunnel between the alar groove to nasal tip and then sutured the flaps between lifted columella edge and the basement (Figure 1 and Supplementary Figure D). All flaps survived completely. After 3 to 6 months, we performed flap trimming and implanted costal cartilage to achieve a satisfactory esthetic goal. Firstly, harvested costal cartilage was carved separately into a dorsal onlay graft, a caudal septal extension graft, two U-shaped grafts[3] (Supplementary Figure 1E). Then, a dorsal onlay graft was placed under the dorsal periosteum of the nose; we connected a caudal septal extension graft to the anterior and posterior feet of the caudal in the end of the septum to extend septum and maintain the morphology of columellar; two U-shaped grafts were inserted to augment the maxilla and improve the projection of the alar base.(Figure 2) After the two stage procedures, the short nose was corrected with a lengthened columella, reduced alar flares, as well as a projected tip (Supplementary Figure 2). In addition to regular assessments,[4] we assessed NCT again and nasal columella points from posterior to anterior of the line of two lowest points in the triangle.

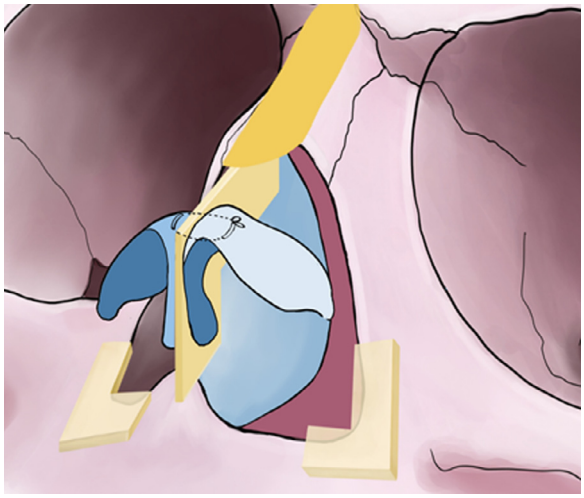

Figure 2 Positions of four pieces of costal cartilage grafts.

There is currently no universally accepted definition of the short nose. We defined a short nose based on a local nasal proportion instead of a universal facial proportion because we focused much more on individualized aesthetics. Introduction of the concept of the caudal nasal triangle (NCT) presented a measurable guidance for evaluation of short nose pre-/post- operation. In the first stage of surgery, we aimed to restore absolute deficiency of soft tissue in nasal columella using bilateral supra alar island flaps. Asian people have a bigger tissue reservoir on alar compared with occidental people, which makes supra alar island flaps possible for correcting deformity of columella nasi.[5] It is a feasible therapeutic approach for lengthening the columella and to increase the tissue reservoir for the second stage of cosmetic rhinoplasty. In addition, this flap also provided local vascularized tissue for potential tip and alar rim reconstruction. Unlike application of vascularized preauricular flap in correction of short nose, our flap doesn't need microvascular reconstruction and can be used in rural areas without microsurgical equipment. Implantation of costal cartilage grafts after proper trimming of the flaps in the second stage of surgery maintained the stereoscopic nasal structure and stabilized the nasal skin soft tissue through addiction of cartilage to nasal septum and alar bases. We revised nasal subunits through inserting four pieces of autologous cartilage on nasal dorsum, septum and bilateral bases in order to lengthen nasal dorsum, express tip projection, augment and stabilize nasal columella, simultaneously reposition alar. Scaring will be present on the columella and the donor sites, but that this would appear to be equivalent to other local flaps for columellar reconstruction.

Declaration of Competing Interest

The author declared no potential conflicts of interest with respect to the research, authorship, and publication of this article

Ethical Approval

Not required

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2020.12.105.

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Ye Liu
Department of plastic surgery, 901th Hospital Affiliated to Anhui Medical University, Hefei, China
Department of plastic and reconstructive surgery, The ninth hospital of Shanghai Jiaotong university school of medicine, 639 Zhi Zao Ju Rd, Shanghai, China, 200011

Jiao Wei, Chuanchang Dai
Department of plastic and reconstructive surgery, The ninth hospital of Shanghai Jiaotong university school of medicine, 639 Zhi Zao Ju Rd, Shanghai, China, 200011

Xiaojing Li[#]
Department of plastic surgery, The first affiliated hospital of Anhui Medical University, 218# Ji-Xi Road, Hefei, Anhui, China, 230022

.
[#]Contributed equally to this work.
E-mail address: 63610407@qq.com (X. Li)

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Plastic surgery training in Ibero-Latin America: A cross-sectional survey study

Dear Sir,

Ibero-Latin American countries share a common background, similar cultures and historical experiences. Despite this, plastic surgery training presents striking differences among these countries.[1] There are no studies in the medical literature that analyse training programs in the region.

An online cross-sectional survey designed following the research objectives was sent by email during May 2020 to key opinion leader plastic surgeons of 22 Ibero-Latin American countries. The survey, created using the Google drive Microsoft ™ forms tool, included 24 questions on the number of plastic surgeons, training modalities, requirements, program contents and duration, evaluations and certifying authorities. Additionally, plastic surgeons' density by country was calculated with the following formula[2]:

$$\frac{\text{Number of plastic surgeons}}{\text{Country Population}} \times 100,000 = \text{Density of plastic surgeons by country per } 100,000 \text{ inhabitants}$$

All invited surgeons accepted to participate and completed the survey.

Medical degree programs in Ibero-Latin America range from six to eight years in length. While some countries do not require any training in general surgery to be admitted in plastic surgery programs, countries like Portugal and Peru programs offer a general surgery training during the first year of residence. Average age of admission to training programs is 27.9 years (range 25–32 years) (Fig. 1a).

Four countries in the region (Bolivia, Panama, Guatemala and Puerto Rico) do not offer any training program. Sixteen countries have only residency programs; Venezuela and Ecuador have only postgraduate programs, while Argentina, Brazil and Cuba have both modalities. All postgraduate programs are ad honorem, usually requiring the payment of tuition and fees by the postgraduate student. The average salary in residency programs is 880 USD (range 30 to 2400 USD).

Plastic surgery training programs range between two years in Chile to six years in Portugal, however in most countries the program lasts three years (Fig. 1a). Modality of admission to training can be through a knowledge test, interview, and recommendation letters. Regarding contents, most of the programs cover the most important fields of the specialty such as aesthetic surgery, general plastic surgery, oncologic surgery, craniomaxillofa-

Fig. 1 (a) Top left: average age of admission into a plastic surgery training program in the Ibero-Latin American countries; (b) top right: plastic surgery training length in the Ibero-Latin American countries; and (c) bottom: the map shows the gradation color-coding density levels of plastic surgeons per country.

Table 1 Information obtained from the questionnaire. Abbreviations: KT: Knowledge Test; I: Interview; RL: Recommendation Letters; y: years; mo: months; PuH: public hospital; pH: private hospital; C: clinic; MH: Ministry of Health; U: University; MC: Medical Council; USD: US dollars.

Country	Argentina	Bolivia	Brazil	Chile	Colombia	Ecuador	Paraguay	Peru	Uruguay	Venezuela	Mexico	Spain	Portugal	Costa Rica	Cuba	El Salvador	Guatemala	Honduras	Nicaragua	Panama	Puerto Rico	Dominican Republic
Modalities of admission	KT/I		KT/I/LR	I	KT/I	KT	KT/I	KT	KT	I	KT/I/ LR	KT	KT	KT	I	KT		KT/I/ LR	KT/I			KT/I
Age starting plastic surgery program	30		28	32	27	26	30	29	27	29	29	25	25	27	27	N/A		28	29			26
Plastic surgery residency total programs	50		90	2	10	3	2	3	1	12	3	1	1	1	1	2		1	1			1
Annual positions	77		230	3	25		4	13	4	60	60	41	10	2	N/A	7		2	3			3
Training centers	PuH/pH/C		PuH/pH/C	PuH/pH/C	PuH/PH	PuH/PH	PuH	PuH/C	PuH	PuH	PuH	PuH/PH	PuH	PuH	PuH	PuH		PuH/PH	PuH			PuH
Salary in USD	750		800	1000	780	0	400	1700	900	30	380	2400	1500	1500	70	1200		700	200			650
Duration medicine program (y)	6	6	6	7	7	7	6	7	7.8	7	6.5	6	6	6	6	7	6	8	6	6	4*	6
Duration general surgery program (y)	4		3	3			3			1	1			3		3		3	1			1
Duration plastic surgery program (y)	3		3	2	4	4	3	3	3	3	4	5	6	3	4			3	3			6
Duty hours (per week)	40		40	60	66	40	55	40	44	40	70	40	40	40	48	76		50	40			40
24 h shift for emergencies	yes		yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes		yes	yes			yes
Minimum number of surgeries required	250		260							200	300	315										
Research required during residency	yes		yes	no	yes	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes		yes	no			yes
Frequency of examination during residency (mo/y)	6 mo/12mo		1 mo/1y	3 mo/1y	1y	1 mo	1 mo	1mo	6 mo	3 mo	3 mo	3 mo/1 y	1 y	6 mo	1 mo	1mo/3mo		3 mo	3 mo			3 mo
Examination after residency	yes		yes	yes	no	no	yes	yes	yes	no	yes	no	yes	yes	yes	yes		yes	yes			no
Certifying authorities	MH/U/ MC		MH/U/ SS	U	U	U	MH/SS	U	U	MH/U	U	MH	MC	U	MH/U	U		MH/U	U			MH/U
Total number of plastic surgeons	2000	120	8000	180	1500	400	65	500	135	700	1900	1200	150	60	150	37	55	32	62	37	20	200
Registered plastic surgeons	800	88	6500	150	870	250	55	200	109	620	1800	898	80	45	110	26	40	26	34	37	18	195
Plastic surgeons / 100,000 inhabitants	4.4	1.06	3.8	0.96	3.02	2.34	0.93	1.56	3.91	2.42	1.5	2.56	1.42	1.2	1.3	0.58	0.32	0.33	0.96	0.88	0.63	1.88

KT: knowledge test.
I: interview.
RL: recommendation letters.
y: year.
mo: months.
PuH: public hospital.
pH: private hospital.
C: clinic.
MH: Ministry of Health.
U: university.
MC: medical council.

cial surgery, congenital abnormalities, microsurgery, hand surgery and burns/trauma surgery. Nevertheless, not every program offers hands-on experience in each one of these fields.[3,4] In some countries a minimum number of surgeries is required during training (range 200 to 315). Average weekly workload in the region is 48 h and residents usually work a 24 h shift carried out at the emergency department.

In most countries, research leading to scientific presentations or publications is mandatory during training. Some programs include mandatory clinical rotations at other departments from the same hospital or city, while some others also include short-term elective rotations at international medical centers. Accredited training medical centers can be public hospitals, private hospitals, or private clinics.

During training period, evaluations are carried out with a variable frequency, which can be monthly, quarterly, semesterly or annually. In some countries, the approval of a final knowledge test is required to obtain a plastic surgery degree that is awarded by the ministry of health, university, scientific society or medical council.

The percentage of plastic surgeons associated with their respective national scientific societies ranges from 100% in Panama to 40% in Argentina and Peru (average 74%).The country with the highest plastic surgeons' density is Argentina with 4.4 per 100,000 inhabitants followed by Uruguay (3.91) and Brazil (3.8). The countries with the lowest density of plastic surgeons are Guatemala and Honduras, being 1.72 the average for the region (Fig. 1b). These figures are of great importance to determine the adequate number of plastic surgeons that a country needs and should train per year. Main findings of this study are summarized in Table 1.

The results of this survey show the great heterogeneity of training programs in Ibero-Latin America. A previous study showed similar heterogeneity between the United States and Europe.[5] Knowledge of the similarities and differences of these programs could generate opportunities for improvement that will result in the training of better professionals. Standardization of these programs will surely improve the interaction between the different training centers, thus facilitating collaboration and academic exchange. Additionally, this will pave the way for automatic recognition of degrees for those interested in working in other countries of the region.

This study is limited by the subjective selection of survey participants. Certainly, the participation of all program directors in the region would provide greater validity to our results. However, given the multiplicity of programs and number of countries, it would have been difficult to achieve a significant participation. Although there may be a bias in data collection, this study represents the first attempt to know the reality of plastic surgery training. Further studies to obtain more precise data about the training in our specialty in Ibero-Latin America are warranted.

Ethical approval

N/A.

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Declaration of Competing Interest

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Horacio F. Mayer
Plastic Surgery Department, Hospital Italiano de Buenos Aires, University of Buenos Aires School of Medicine, Hospital Italiano de Buenos Aires University Institute, Buenos Aires, Argentina

Oscar M. Jacobo, Gabriella Grattarola
Department of Plastic, Reconstructive and Aesthetic Surgery, Clinical Hospital "Dr. Manuel Quintela", University of The Oriental Republic of Uruguay (UDELAR) School of Medicine, Montevideo, Uruguay

Corresponding author.
E-mail address: horacio.mayer@hospitalitaliano.org.ar (H.F. Mayer)

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Podcasts in plastic surgery, why we should start listening

Dear Sir,

What do 1/10 people of the UK and 1/5 Americans have in common? They listen to podcasts every week.[1,2] 30% of the medical community will be unfamiliar with "podcasting",[2] but we believe it has fantastic potential as a resource

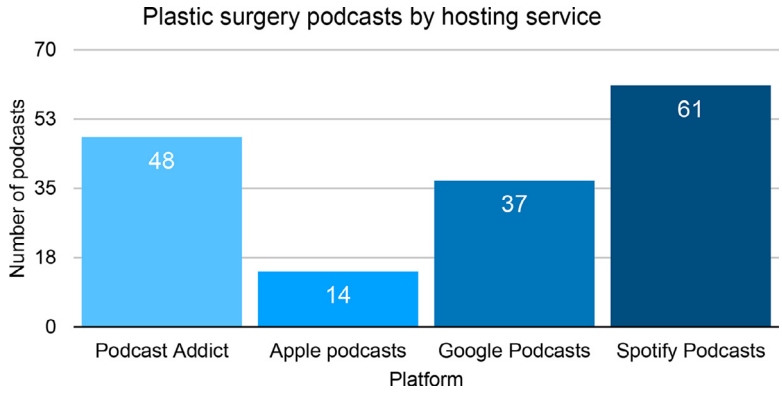

Figure 1 Plastic surgery podcasts by hosting service.

for education and engagement on a global platform. In this letter, we discuss a brief history of podcasts and how they reach and engage with the worldwide audience. At a time when a global pandemic has forced us to re-evaluate how we communicate with each other, digital formats like this have become hugely impactful in education. Although podcasts have been widely used in medical specialties, for those interested in plastic and reconstructive surgery, there is a lack of consistent, high-quality material.

Reformatting radio into downloadable audio files was introduced to the world in 2004, and today there are over 850,000 active podcasts with over 30 million episodes in 100 languages.[3] Although America has seen the biggest boom in this area, podcasting is becoming increasingly popular in the UK, with weekly listeners doubling in the last five years.[2] The majority are free, usually downloaded onto smartphones and listened to mainly at home or driving.[3] Despite health being one of the top 5 podcasting genres,[3] it is relatively new to the medical community with a recent review of podcasting in medicine by specialty finding only 152 active podcasts across 19 significant specialties.[4] It is a slowly expanding format for education with small studies suggesting that regular podcast listening is associated with an increase in perceived overall knowledge and awareness of current literature.[5]

Some specialties have embraced podcasting to a much greater extent, particularly emergency medicine, which has over twice the volume of content when compared to the next two most active specialties combined.[4] Similarly, in our analysis, when comparing plastic surgery to general surgery, we found general surgery had 2.4 times more educational podcasts. We reviewed the number of plastic surgery podcasts across the leading hosting services (Figure 1). We discovered that 'Spotify' was a clear leader with 61 podcasts, 'podcast addict' (the number 1 podcast host on android) having 48, 'google podcasts' 37, and 'apple podcasts' only 14. 'Plastic surgery' in the media is heavily weighted towards the cosmetic aspects of our specialty, and the podcast world is no exception with the most seemingly targeted towards patients contemplating aesthetic surgery.

We did, however, identify seven podcasts that appear aimed at trainees and consultants with an emphasis on education and research: PRS, PRS GO, Plastic surgery journal club, Plastic surgery revision, JAMA, JPRAS, and EJPS. The total number of episodes varied from 2 to 151, with an average number of episodes per month, ranging from 0.4 to 2.65 (Figure 2). Average episode lengths varied from 6 to 56 min with an overall mean of 30 min. The most common format was that of the journal club with summaries of current papers and lively discussion among trainees and experts in their field. We find they are an enjoyable way of passively partaking in a journal club regularly and keeping up to date on current research. There is a considerable work-load in producing high-quality material regularly, but a few of the better established of these podcasts have made a sustained effort. Only two of these podcasts are UK-based. One, a journal club which started this year and has four episodes. The second, an educational podcast aimed at FRCS preparation with 107 episodes. It is disappointing to see such minimal representation of the UK body of plastic surgeons in the podcast community. When you consider that apple podcasts had 1 billion subscribers in 2013, it feels that we're maybe slightly behind the curve.

The Covid-19 pandemic has highlighted how we can use technology to communicate and educate each other within the medical community. It has prompted truly international collaboration with information sharing helping to develop a more global community of doctors. Plastic surgery, like many other specialties, has seen a considerable rise in online material, particularly webinars, which are highly educational and will be fantastic future resources. However, along with this enthusiasm for the 'webinar', it is also unsurprising to see the introduction of the term 'webinar-fatigue', the lack of engagement that comes from being overwhelmed by such a format. With the ongoing pandemic, we must re-evaluate how we teach each other and share ideas remotely. Perhaps the podcast may be a less 'formal' format, and we can explore that may encourage more consistent long-term engagement. Especially given the ability to multitask whilst listening to podcasts, plastics trainees could find their daily commute to be more educational than expected.

Declaration of Competing Interest

The Authors declare no conflict of interest and no funding.

Ethical approval

N/A.

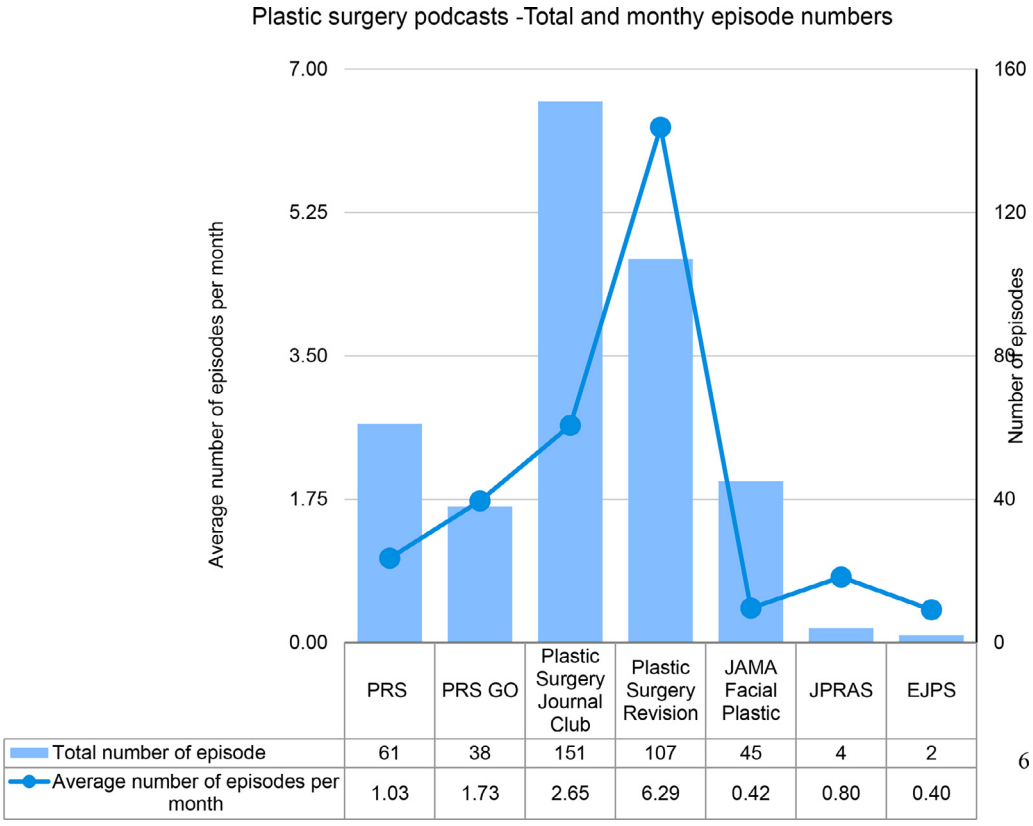

Figure 2 Plastic surgery podcasts – total and monthly episode numbers.

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Cameron Clarke, Rushabh Shah, Maleeha Mughal
Guy's and St Thomas NHS Foundation Trust, Westminster Bridge Road, London SE1 7EH, United Kingdom

E-mail address: Cameron.clarke@nhs.net (C. Clarke)

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Zooming into the future of plastic surgery education

Dear Sir,

We read with great interest the article entitled "The Emergence of Virtual Education during the COVID-19 Pandemic: The Past, Present, and Future of the Plastic Surgery Education" by Cho and Pio.[1] As medical students with a keen interest in plastic surgery, their findings and summary of recent changes in medical education resonated with our own experiences here in the United Kingdom.

Their analysis of its future implications, particularly the replacement of traditional in-person teaching with entirely virtual lectures, captures the major benefits. However, while predominantly based on the ease of accessibility, Cho and Pio also emphasised the concerns of reduced audience-lecturer interaction and the "lack of hands-on opportunities". These remain underexplored aspects of virtual education as workshops and practical teaching sessions play critical roles in supporting juniors to both meet surgical competencies and further their interests in surgery.[2,3] In-person teaching ultimately provides the invaluable, and irreplaceable, personal experience which helps acquire practical skills and underlies an important part of surgical

education. The limitations of virtual education are particularly pertinent given the prevalence of dissatisfaction amongst doctors and students in meeting fundamental surgical competencies such as basic suturing skills; overzealous use of virtual learning could potentially increase the already large number of students and junior doctors who lack confidence in these GMC mandated skills, negatively affecting the future surgical workforce. Moreover, as the service disruption by COVID affects both the amount and nature of clinical exposure to the speciality for medical students and junior doctors alike, further exacerbating the issues facing aspiring plastic surgeons.[4] In particular, the lack of physical engagement and involvement of learners might also limit their understanding of plastic surgery and, thus, hinder their interest in the speciality.

Our own experience of online learning during the pandemic also highlighted the adjustments needed for virtual education to work. Despite its rapid growth, educators may still struggle to tailor their teaching to suit the audience and platforms. This includes the need to address the "inadequate customization of learning processes" and psychological differences in the learning process.[5] The element of disconnect presents a hurdle in both teaching and learning: the lack of direct engagement can turn teaching into an unfulfilling process for the teacher and, similarly, the lack of opportunity to practice learning can impair the learning experience. Additionally, the effects on attention span should be considered, as the unengaging nature of online learning can become tedious, resulting in learners being easily distracted compared to traditional face-to-face teaching. Despite the many pitfalls, the past months of online learning have provided educators with ample opportunities to tailor their teaching to the new modality. Through maximising interaction and quality of student-centred teaching programs, virtual learning has the potential to be an unparalleled pedagogical tool for future surgeons.

In short, the work by Cho and Pio provided excellent insight into the trends in virtual learning, however, more is to be done to adapt, tailor and perfect virtual teaching to meet the needs of future surgeons. The reduced exposure to the speciality and limited capacity for developing practical skills present serious concerns to be considered as the shift towards virtual learning continues; yet another balancing act in the ever-evolving nature of surgical and medical education.

Ethical approval

N/A

Declaration of Competing Interest

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Funding

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Statement of Author Contribution

Study conception and design: JM, KSF Drafting of manuscript: JM, KSF Critical revision: JM, KSF

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Joshua McKenna[1]
Swansea University Medical School, Swansea University, Swansea, United Kingdom

Ka Siu Fan[1]
Institute for Medical and Biomedical Education, St George's University of London, Cranmer Terrace, London, United Kingdom

[1]Both authors (JM and KSF) contributed equally to this work.

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Wide-awake local anesthesia and temporary tourniquet for tendon surgery of the hand

Dear Sir,

The wide-awake local anesthesia and no tourniquet (WALANT) technique is useful in tendon-related hand

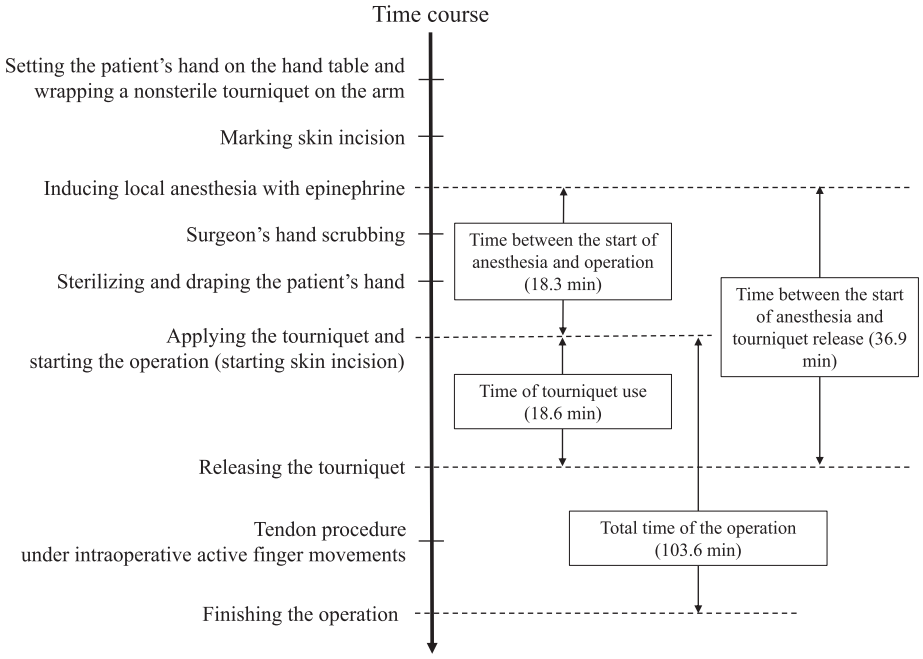

Figure 1 Operative time course of the wide-awake local anesthesia and temporary tourniquet (WALATT) technique.

surgery to achieve a bloodless field without tourniquet use and maintain intraoperative voluntary patient's finger motions, but the waiting time is around 30 min after epinephrine injection.[1,2] To save the purposeful waiting time and start the operation immediately, we have routinely performed the wide-awake local anesthesia and temporary tourniquet (WALATT) technique. Here, we present the WALATT technique and the actual operative time course involving the corresponding calculated waiting time in tendon surgery of the hand. The guidelines published by the Journal of Plastic, Reconstructive and Aesthetic Surgery and STROBE were followed in this paper.

The operative time course of the WALATT technique is shown in Figure 1. The local anesthesia with 1% lidocaine with 1:100,000 epinephrine was performed on the marked skin incision in a main operating room by the surgeon himself prior to scrubbing his hand and setting the cleaned surgical site. The operation started immediately without the purposeful waiting time by applying the tourniquet, which was released after around 20 min before the patients requested tourniquet release due to patient's complaint of discomfort or tolerance to the tourniquet pain, and then the operation was maintained without tourniquet.

We retrospectively reviewed consecutive Japanese patients who underwent hand surgery under local anesthesia in a single hospital from April 2018 to April 2020. Inclusion criteria were patients who underwent the tendon-related hand surgery using the WALATT technique that requires more than 30 min to perform, in which active finger movement had to be evaluated to set the optimal tension or excursion in tendon procedures. Exclusion criteria were patients who underwent simple short duration hand surgeries for less than 30 min, surgeries that utilized the WALANT technique, and tendon-unrelated surgeries in which evaluation of the active finger movement was not needed. From a total of 258 hands in 224 patients that underwent hand surgery under local anesthesia, 20 hands of 17 patients who underwent tendon surgery using the WALATT technique were included. The demographic characteristics of the 20 hands are shown in Table 1. We evaluated the operative time between the initiation of anesthesia and operation, tourniquet use, and between the initiation of anesthesia and release of the tourniquet and the total operation time with the primary, additional, and total amount of local anesthesia, the total lengths of incision and bleeding volume. Intraoperative blood loss was estimated by the differences in weighing of the pre- and post-procedure gauze using the gravimetric method because blood is mostly absorbed by gauze in hand surgery.

Wide-awake tendon surgery for 103.6 min (average) was feasible and safe under 19.4 mL of 1% lidocaine with epinephrine for an average of 88-mm skin incision, keeping the bloodless fields and intraoperative voluntary patient's finger motions (Table 1). No case had perioperative complications and conversion to another anesthesia because of uncontrolled pain. The mean time between anesthesia initiation and operation and tourniquet use was 18.3 and 18.6 min, respectively. The mean corresponding calculated waiting time was 36.9 min. Tourniquet release in the WALATT took >35 min after the initial epinephrine injection to achieve an optimum hemostasis effect, minimizing the total blood loss to <15 g, although the operation started immediately without having to wait for sufficient time to allow epinephrine vasoconstriction.

Recently, only a few studies have been published on the similar WALATT technique.[3-5] However, these reports described the WALATT technique applied for limited simple short duration hand surgeries or emergency traumatic hand surgeries. Few studies to date have investigated the WALATT technique for tendon surgery of the hand, which was considered as the best indication for the WALANT technique. Xing and Mao described that purposeful waiting time

Table 1 Demographic characteristics and results in the present study.

Demographic characteristics			Results		
Age*(year)		63.6 (29-88)	Amount of local anesthesia (mL)*,**	Initial injection	18 (7-30)
				Additional injection	1.5 (0-10)
Sex (hands)	Female	5		Total injection	19.4 (8-37)
	Male	12			
Laterality (hands)	Right	11	Length of incision (mm)*		88 (25-150)
	Left	9			
			Blood loss (hands)	< 10 g	15
Diagnosis (hands)	Flexor tendon rupture	6		10 g	2
	Postoperative tendon adhesion	4		15 g	1
	Extensor tendon subluxation	4			
	Extensor tendon rupture	3	Time between the start of anesthesia and operation (min)*		18.3 (11-32)
	Median nerve palsy	2	Time of tourniquet use (min)*		18.6 (7-39)
	Tenosynovitis	1	Time between the start of anesthesia and tourniquet release (min)*		36.9 (16-57)
			Total time of the operation (min)*		103.6 (35-193)
Operation (hands)	Tendon transfer	12			
	Tendon stabilization	4	Conversion to another anesthesia (hands)		0
	Tendon grafting	2	Disability of intraoperative active finger movement (hands)		0
	Tenolysis	2	Complications (hands)		0

* The values are given as the mean, with the range in parentheses.
** The value was calculated as the amount of 1% lidocaine with 1:100,000 epinephrine.

after injection of local anesthesia with epinephrine was actually unnecessary because it already took 20-30 min after injection following that they routinely started sterilizing the surgical filed, scrubbed, and prepared the instruments in addition to intraoperative temporary tourniquet use for around 10 min.[3,4] We agree with their opinions and actually demonstrated the more exact operative time course in detail in the present study, clarifying the calculated corresponding waiting time involving the preparation time and temporary tourniquet time after injection of the local anesthesia. Especially in Japan, almost all operating surgeons perform local anesthesia injection just before incision after draping the sterilized surgical field in the main operating room, while anesthesiologists or surgeons often administer the local anesthesia ahead of time in minor procedure rooms outside the main operating room in the other countries. Most awake patients can tolerate an arm tourniquet for 20-30 min without major discomfort [5]. In the present study, temporary tourniquet was actually applied for a mean of 18.6 min, which was tolerable enough and was the accepted time. The present stury has several limitations. The scales of the tourniquet pain in the WALATT technique were not evaluated using the visual analog scale or numerical rating scale, although the tourniquet time was acceptable depending on the patient's tolerance. We evaluated the motion of the finger in setting the optimal tension on tendon transfer or grafting sometime after the tourniquet release. In conclusion, to save the purposeful waiting time after injection of local anesthesia with epinephrine, the WALATT technique was useful for tendon surgery, allowing surgeons to start the operation smoothly, minimizing intraoperative bleeding, and *maintaining* intraoperative active movements of the patient's fingers.

Funding

None.

Ethical approval

The study was approved by our institutional review board and informed written consent was obtained from the patients.

Declaration of Competing Interest

None declared.

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Yusuke Miyashima
Department of Orthopaedic Surgery, Osaka General Hospital of West Japan Railway Company, 1-2-22 Matsuzakicho, Abeno-ku, Osaka 545-0053, Japan

Takuya Uemura
Department of Orthopaedic Surgery, Osaka General Hospital of West Japan Railway Company, 1-2-22 Matsuzakicho, Abeno-ku, Osaka 545-0053, Japan
Department of Orthopaedic Surgery, Osaka City University Graduate School of Medicine, 1-4-3 Asahimachi, Abeno-ku, Osaka 545-8585, Japan

Sadahiko Konishi
Department of Orthopaedic Surgery, Osaka General Hospital of West Japan Railway Company, 1-2-22 Matsuzakicho, Abeno-ku, Osaka 545-0053, Japan

Hiroaki Nakamura
Department of Orthopaedic Surgery, Osaka City University Graduate School of Medicine, 1-4-3 Asahimachi, Abeno-ku, Osaka 545-8585, Japan

Corresponding author at: Department of Orthopaedic Surgery, Osaka General Hospital of West Japan Railway Company, 1-2-22 Matsuzakicho, Abeno-ku, Osaka 545-0053, Japan.
E-mail address: t-uemura@med.osaka-cu.ac.jp (T. Uemura)

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WALANT and sickle cell disease: A cautionary tale

Dear Sir,

We would like to highlight a potential hazard of using wide awake local anaesthetic no tourniquet (WALANT) in patients with sickle cell disease. Currently, the COVID19 pandemic has rapidly increased interest in WALANT and many units have adopted this technique.

Sickle cell disease (SCD) is a rare inherited genetic disease affecting approximately 14,000 people in the United Kingdom and around 100,000 people in the USA. It is one of the most common serious genetic disorders in the UK. Erythrocytes with homozygous sickle haemoglobin (HbS) become deformed under stress, forming a classic 'sickle' shape. In patients with SCD, sickling of erythrocytes causes haemolysis, reduces the oxygen carrying capacity and can result in episodic microvascular occlusion leading to tissue ischaemia and painful 'crises' with serious and often life-threatening consequences.

Many publications have addressed the risk of extremity surgery in sickle cell patients.[1] However, none have focused on the use of adrenaline containing solutions in affected patients. In vivo studies have shown that adrenaline increases adhesion of sickle cell erythrocytes. It is known that adrenaline, a β-adrenergic receptor (β-AR) agonist, increases the erythrocyte surface density of active intercellular adhesion molecule-4 (ICAM-4) and basal cell adhesion molecule (BCAM/Lu) which bind to the receptors endothelial integrin $\alpha v\beta 3$ and laminin-α-5 (component of the endothelial subcellular matrix) respectively.[2,3] Abnormal erythrocyte adhesion to the endothelium plays a crucial role in triggering vaso-occlusive episodes in sickle cell disease (SCD).

A combination of non-elastic cell aggregates and increased endothelial adherence in vasoconstricted vessels with low flow may lead to end artery occlusion when administering adrenaline combined with local anaesthetic in SCD patients. This may result in local necrosis or loss of digits. Similarly, adrenaline may cause wider systemic effects such as triggering a crisis.

Unfortunately, there are no studies regarding the safety of using adrenaline containing solutions in SCD patients. In the dental field, a retrospective review of outpatient procedures performed on SCD patients using of 2% lignocaine with 1:100,000 adrenaline had no complications. However, there was no mention of any volumes used.[4]

WALANT uses large volumes of lignocaine with adrenaline which has been proven to be safe. In a series of 3110 patients, the authors did not experience any complications when using WALANT.[5] Interestingly, there was no mention if any of the patients had SCD or any safety advice regarding SCD.

At present, having performed an extensive literature research we could not find any studies either substantiating or disproving our concerns in the upper limb. We are strong advocators and practitioners of WALANT however, we would like to voice a theoretical risk of using WALANT in patients with SCD. Although this group of patients represents a very small proportion of the population, the consequences of using WALANT could be deleterious.

Declaration of Competing Interest

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Ethical approval

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M. Thakkar
Department of Plastic and Reconstructive Surgery, St Mary's Hospital, Praed Street, London W2 1NY, United Kingdom

B Bednarz
Department of Plastic and Reconstructive Surgery, Southmead Hospital, Southmead Road, BS10 5NB, United Kingdom
E-mail address: m.thakkar@nhs.net (M. Thakkar)

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Re: Should walant surgery be included in the training curriculum?

Dear Sir,

We read with interest the above communication by Thakkar and Bednarz.[1] We feel that now is an opportune time to respond, as registrars on the ground, in the midst of the second wave of the UK COVID-19 pandemic.

The authors proposed the introduction of WALANT and ultrasound guided nerve blocks into the Plastic Surgery or Hand Surgery subspecialty curriculum. Although we fully support attempts to help alleviate the workload of our critical care colleagues in these unprecedented times, we would like to raise a few points for discussion.

Firstly, the authors referenced the use of 1% lignocaine with 1:200,000 adrenaline as WALANT tumescence solution. Indeed, such a preparation is widely available pre-mixed and is useful for minor procedures such as nail bed and extensor tendon repairs in the trauma clinic, where bipolar cautery may not be available. However, waiting for 15 to 20 min, as advised by the BSSH Handbook,[2] may not always be possible due to patient volume in a busy clinic setting[3] and "provided the right equipment is available", as the authors alluded to themselves. More importantly, it should be noted that the range of concentration of adrenaline can vary from 1:100,000 to 1:400,000, depending on the extent of the injury and thus, the area that requires infiltration.[4] We have found the technique endorsed by Lalonde, mixing 1:100,000 adrenaline with 1% lidocaine, gives optimum haemostatic effect for the repair of flexor tendons at all levels of injury. This concentration is safe, widely adopted in the literature, and enhanced by waiting 25 min before the first surgical incision.[5]

Secondly, we disagree with the authors' statement regarding trainees not being comfortable with the transition from carpal tunnel surgery to flexor tendon repairs using WALANT. Performing carpal tunnel surgery without a tourniquet has taught us to operate in a wetter operative field, minimise the discomfort of local anaesthetic injections, and perhaps most importantly, how to reassure and communicate with our patients throughout the procedure. All of these have proven invaluable in performing more complex hand trauma operations, including flexor tendon repairs using the WALANT technique.

Finally, the authors appear to have contradicted themselves in their conclusion. They state that the Hand Diploma or subspecialty interest in Hand Surgery curriculum could include training on regional blocks, but with the caveat that this would be an adjunct for smaller cases, with regional anaesthesia remaining the remit of anaesthetists. Would such "smaller cases" not be amenable to WALANT alone? For longer lasting postoperative analgesia, infiltration of 0.25–0.50% levobuvipacaine locally or as a standard wrist block, is quick, effective and does not require training in ultrasound guided regional blocks.

Ultimately, while Thakkar and Bednarz's discussion has no doubt been written with the best intentions, we do not feel that a curriculum change is necessary. Instead, successful adoption of WALANT, as evidenced through logbook and PBAs, will be one of many ways in which trainees can demonstrate attainment of the speciality-specific Capabilities in Practice (CiPs) – "*Safely assimilates new technologies and advancing techniques in the field of Plastic Surgery into practice*" – as required by the new surgical curriculum come August 2021.

Declaration of Competing Interest

None

Funding

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Ethical Approval

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Zhi Yang Ng
Mountbatten Department of Plastic Surgery, Queen Alexandra Hospital, Portsmouth, England, United Kingdom

Calum Honeyman
Department of Plastic and Reconstructive Surgery, Ninewells Hospital, Dundee, Scotland, United Kingdom
E-mail address: zyng@doctors.org.uk (Z.Y. Ng)

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Response to "Re: Should WALANT surgery be included in the training curriculum?"

Dear Sir,

We read with great pleasure the reply to our correspondence by Yang Ng and Honeyman.[1] Our aim was to stimulate a constructive discussion regarding the current curriculum. However, we feel that the authors failed to grasp the crux of our article and we would like to clarify a few points.

We are slightly perplexed by their statement regarding the waiting time for optimal haemostasis to take effect after injecting and the authors somewhat contradict themselves by suggesting that waiting for 15–20 min is too long, on the other hand waiting 25 min for flexor tendon repairs is reasonable. We never proposed using WALANT as a means of clinical assessment or treating minor injuries such as extensor tendons in a busy clinical setting. The authors reference a letter from the senior authors institution regarding busy clinics without any numerical driven data[2] when in fact, the unit uses a separate trauma theatre for minor operations factoring in anaesthetic waiting time.

It is important to recognise that a pre-mixed solution of 1% lignocaine with 1:100,000 adrenaline is not readily available in the UK. Indeed, this concentration can be achieved by self-mixing however, this is not only time consuming, but it also introduces the risk of drug-mixing errors. By using the readily available 1:200,000 solution, this risk is eliminated, preventing any calculation errors and in our experience is quite effective even when diluted to accommodate larger volumes.

We are impressed that both authors were able to confidently transition from open carpal tunnel release to flexor tendon repairs using WLANT. In contrast, we did not find the same transition of skills amongst our colleagues due to early teething problems.

We would like to stress that our desire was to expand the skill set of plastic surgery trainees rather than substitute for anaesthetists and in our opinion, ultrasound guided blocks are a handy skill especially in the current climate. We would like to point out that the pain-relieving effect of bupivacaine lasts only half as long as the touch and pressure numbness and would not completely resolve post-operative pain but would eventually lead to a numb but painful finger.[3,4]

Finally, we welcome their input to our article and agree with their proposal that adoption of WALANT and demonstrating proficiency through formative work based assessments will ultimately be one of the many ways of achieving the speciality-specific Capabilities in Practice (CiPs) as part of the new curriculum launching August 2021.

Ethical approval

N/A.

Declaration of Competing Interest

None.

Funding

None.

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M. Thakkar
Department of Plastic and Reconstructive Surgery, St Mary's Hospital, Praed Street, London W2 1NY, United Kingdom

B. Bednarz
Department of Plastic and Reconstructive Surgery, Southmead Hospital, Southmead Road, BS10 5NB, United Kingdom
E-mail address: m.thakkar@nhs.net (M. Thakkar)

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Severe A-line infections in COVID-19 patients: A novel management algorithm in an emergency setting

Dear Sir,

Since its outbreak, COVID-19 caused almost 39,000 official deaths in Italy, with thousands of patients needing ICU management. This dramatic situation was already thoroughly showed and described by many colleagues fellow-countrymen.[1] Due to the sudden and complete ICUs saturation[2] we were forced to hospitalize a huge number of extremely critical patients in non-ICU inpatient wards.

COVID patients diagnosed with Acute Respiratory Failure (ARF) required several ABGs monitoring per day. To avoid repeated painful arterial punctures, they received an indwelling radial artery catheter (A-line) to provide continuous access to arterial blood. We unexpectedly noticed a significantly higher incidence of A-line infection compared to what is showed in literature[3].

All those patients who received a diagnosis of cath-related infection were clinically evaluated by an expert plastic surgeon along with an infectious disease specialist. The catheter was always removed and tip microbiological cultures were always performed. Patients were treated with broad-spectrum empirical antibiotics (Ciprofloxacin 400 mg plus Clindamycin 600 mg daily, both parenterally administered).

From February 23rd to June 23rd (121 days) 519 patients were admitted to our hospital with a SARS-CoV-2-positive severe interstitial pneumonia. Sixty-nine (69) of them needed ICU management and/or required invasive mechanical ventilation and therefore were excluded from our analysis. A total of 450 patients were hospitalized in non-ICU "COVID-19" wards (including Sub-Intensive Care Unit or Rehabilitation Unit). Eighty-eight (88) of them were diagnosed with ARF responsive to non-invasive mechanical ventilation and required a radial A-line placement.

Twelve patients (14%. Mean age: 61.8 yo) experienced fever and intense tenderness at the A-line site averagely 124.4 h after its placement. All patients received methylprednisolone, six of them were treated with additional hydroxychloroquine and just two patients also received Tocilizumab.

Table 1 Patients characteristics. Time to Diagnosis: hours from arterial line placement and clinical diagnosis of soft tissue infection. Time to surgery: hours from diagnosis to entrance in the Operatory Room. MSSA: methicillin-sensitive Staphylococcus Aureus. MSSE: methicillin-sensitive Staphylococcus Epidermidis. MRSE: methicillin-resistant Staphylococcus Epidermidis. Coag. Neg. Staph.: Coagulase-negative Staphylococcus.

Patient	Age	Sex	Hydroxychloroquine	Methylprednisolone	Tocilizumab	pathogen	time to diagnosis (h)	time to surgery (h)
1	57	male	yes	yes	yes	MSSA	130	23
2	67	male	yes	yes		Coag. Neg. Staph.	127	
3	59	male	yes	yes		MSSE	116	26
4	75	male	yes	yes		MSSE	119	23
5	63	male	yes	yes	yes	MSSA	140	
6	71	male		yes		Coag. Neg. Staph.	152	
7	60	male	yes	yes		MSSE	118	
8	63	male		yes		Coag. Neg. Staph.	119	22
9	58	male		yes		Coag. Neg. Staph.	116	
10	70	male		yes		Coag. Neg. Staph.	125	
11	40	male		yes		MRSE	116	25
12	59	male		yes		MSSA	115	19

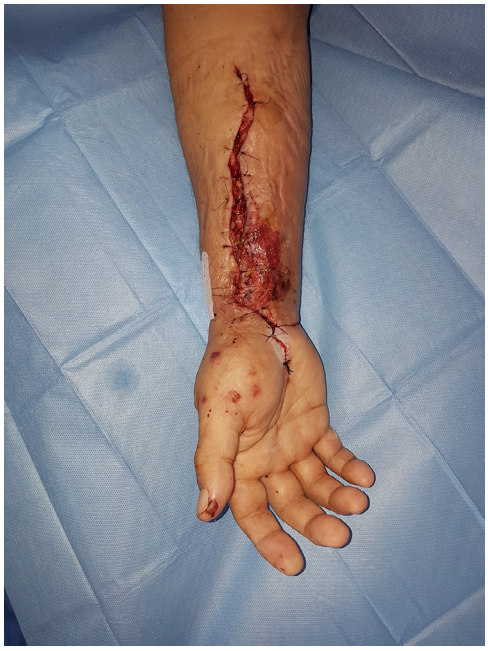

Figure 1 Severe soft tissue infection with skin necrosis and volar incisions for tendon sheaths irrigation, after 10 days from the surgical intervention. The patient developed a pseudoaneurism with infection and extensive soft tissue involvement. It is notable the extensive defect on the distal radial portion of the forearm.

Six patients (7%) experienced a clear improvement in tenderness associated with body temperature lowering after 24 h from the antibiotic treatment starting.

The remaining six patients (7%) rapidly worsened in few hours even with antibiotic therapy, developing extended subcutaneous cellulitis, local abscess and pyogenic flexor tenosynovitis of the Flexor Pollicis Longus and Flexor Superficialis of the second finger tendons (clinically showing a strong reduction of fingers active flexion associated with extremely severe pain elicited by fingers passive extension).

For each of them, the treatment included: surgical incision and drainage of the abscess; tendon sheath irrigation and drainage with an accurate surrounding necrotic tissue debridement; ligation of the radial artery; we always let surgical wounds heal by secondary intention; splint application to temporary immobilize fingers in slight flexion. The surgical procedure was performed after a mean time of 23 h from the diagnosis of infection. Patients characteristics are outlined in Table 1.

No functional loss or systemic infection were observed following the surgical intervention. All patients experienced rapid improvement of symptoms as well as a notable reduction of pain during active fingers flexion. Figure 1 shows case n.3 ten days after the surgical debridement.

A wide cluster of immunomodulating drugs have been commonly administered in COVID-19 patients worldwide. Between them, just the glucocorticoids still maintain a therapeutic evidence in the light of the latest updated clinical studies[4].

In our study, 14% of the patients with an A-line developed a local soft tissue infection. Half of them (7%) experienced an extremely severe soft tissue infection extended to tendon sheaths and requiring an immediate surgical debridement. In the updated literature reports, the incidence of local infection in radial artery line placements is around 0.8%[2].

We believe that this significantly higher reported incidence of complications is caused by different factors. First, immunomodulatory drugs decrease the immune response against bacterial infections. Furthermore, considering the national emergency setting, A-lines were often placed by not expertized personnel and/or paying less attention to antispesis. Lastly, we think that the biofilm deposition (produced by a combination of host factors – e.g. fibrinogen and fibrin – and microbial products[5]) on the external and internal surface of vascular catheters could be boosted by the COVID-related elevated levels of fibrinogen and D-dimer[6] in the serum, increasing the infectious risk in these patients.

Considering the rapid progression registered in half of the affected cases, we propose a useful diagnostic-therapeutic algorithm (Figure 2): clinical monitoring every 6 h after the A-line removal and splint application for the first 48 h; if signs of infection are noticed, we strongly

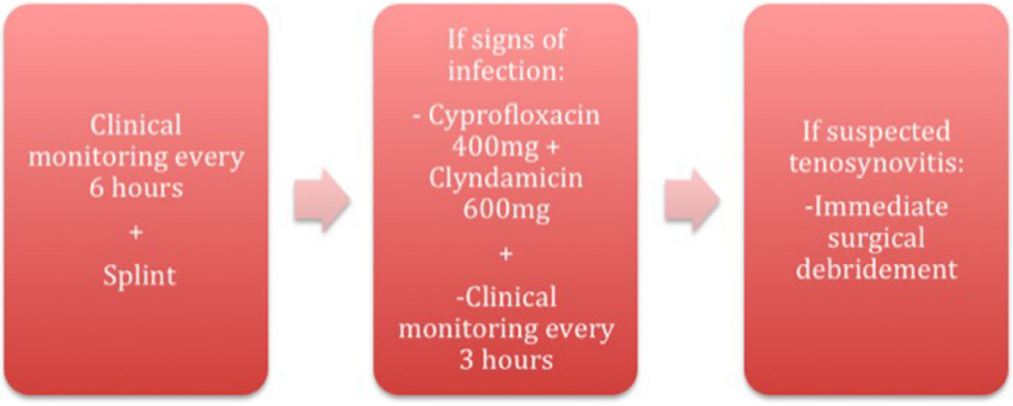

Figure 2 Proposed management algorithm for severe infections following radial A-line removal in COVID-19 patients, in an emergency setting. The antibiotic therapy is parenterally administered. The clinical monitoring must be performed by an experienced surgeon.

encourage immediate initiation of parenteral antibiotic therapy with Ciprofloxacin 400 mg plus Clindamycin 600 mg once daily, clinically assessing signs of local infection every 3 h; if purulent infection and/or clinical evidence of tenosynovitis are noticed, we suggest an immediate surgical debridement.

Following the overmentioned protocol, we did not observe permanent functional impairment or systemic progression of the infection. Local symptoms improved quickly and the hand function was preserved.

Declaration of Competing Interest

None

Funding

None.

Ethical Approval

None.

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Francesco Amendola[1], Giuseppe Cottone
Plastic and Reconstructive Surgery Department, I.R.C.C.S. Policlinico San Donato, Piazza Edmondo Malan, 2, 20097 San Donato Milanese, Italy

Giovanna Zaccaria
Department of Plastic and Reconstructive Surgery, Policlinico di Modena Azienda Ospedaliero-Universitaria di Modena, Via Largo del Pozzo, 71, 41125 Modena, Italy

Francesca Riccardi, Simone Catapano, Luca Vaienti
Plastic and Reconstructive Surgery Department, I.R.C.C.S. Policlinico San Donato, Piazza Edmondo Malan, 2, 20097 San Donato Milanese, Italy

[1]These authors contributed equally to this paper.
E-mail addresses: gcottone.md@gmail.com, giuseppe.cottone1@unimi.it (G. Cottone)

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Standards for treatment of open lower limb fractures maintained in spite of the COVID-19 pandemic: Results from an international, multi-centric, retrospective cohort study

Dear Sir,

The COVID-19 pandemic has severely disrupted provision of healthcare services, impacting both emergency and elective pathways.[1] In March 2020, the British Orthopaedic Association in conjunction with other relevant bodies published guidance for the treatment of limb-threatening injuries during the pandemic.[2] These were designed to minimise the risks of patients contracting COVID-19 from prolonged inpatient stay and reduce the burden on stretched health services. They recommended that multiple and complex procedures should be avoided and the threshold for early amputation reduced.

The aim of this study was to assess the safety of care pathways for patients sustaining open extremity injuries during the first wave of the COVID-19 pandemic. Our primary objective was to investigate the risk of SARS-CoV-2 related complications in this group of patients, including death. As a secondary objective we intended to capture deviations from the standard of care usually provided for these injuries and associated outcomes. Given the burden of trauma in developing countries even before the pandemic, we examined the impact on a global scale.

Methodology

We conducted an international, multi-centric, retrospective study in patients with open lower limb fractures, of any severity, treated between the 1st January and 31st May 2020. Participating units in the UK and overseas provided anonymised data using a pre-established proforma on a secure REDCap platform. Approval by clinical audit departments and independent board review in each collaborating hospital was sought as per local protocols.

Results

A total of 212 patients from 15 centres in the United Kingdom (36%), Chile (20%), Sudan (14%), Spain (10%), the

Table 1 Data gathered for cases submitted to the INTELLECT-COVID study. The second column presents results for the whole sample, with the following columns presenting national results for countries that represent 80% of included cases.

Demographics	Total ($n=212$)	UK ($n=79$)	Chile ($n=42$)	Sudan ($n=29$)	Spain ($n=21$)
Mean age	46 years (range: 6–98)	47 years	38 years	35 years	52 years
Male: Female	74:26	70:30	83:17	93:7	62:38
Location of fracture	Femur: 15% / Tibia-fibula: 69% / Foot: 16%	Femur: 10% / Tibia-fibula: 77% / Foot: 13%	Femur: 45% / Tibia-fibula: 31% / Foot: 24%	Femur: 0% / Tibia-fibula: 85% / Foot: 15%	Femur: 10% / Tibia-fibula: 76% / Foot: 14%
Mechanism of injury	Road traffic accident: 54% / Low-energy fall: 19% / High-energy fall: 12% / Work-related: 11% / Other: 4%	Road traffic accident: 39% / Low-energy fall: 35% / High-energy fall: 18% / Work-related: 5% / Other: 3%	Road traffic accident: 64% / Low-energy fall: 0% / High-energy fall: 6% / Work-related: 25% / Other: 5%	Road traffic accident: 80% / Low-energy fall: 4% / High-energy fall: 0% / Work-related: 4% / Other: 12%	Road traffic accident: 38% / Low-energy fall: 33% / High-energy fall: 24% / Work-related: 5% / Other: 0%
Fracture classification (Gustilo-Anderson)	I: 20% / II: 37% / III A: 17%, B: 21%, C: 5%	I: 19% / II: 27% / III A: 13%, B: 38%, C: 3%	I: 18% / II: 66% / III A: 16%, B: 0%, C: 0%	I: 22% / II: 39% / III A: 14%, B: 22%, C: 3%	I: 24% / II: 37% / III A: 24%, B: 5%, C: 10%
Treatment and outcomes					
Direct transfer to specialist centre	76%	80%	76%	62%	86%
Wound debridement within 24 h	77% / Median time to debridement: 11 h	72.2% / Median time to debridement: 20 h	93% / Median time to debridement: 5 h	66% / Median time to debridement: 10 h	86% / Median time to debridement: 9 h
Specialties involved in primary debridement	Orthopaedic surgeons: 64% / Plastic surgeons: 24.2% / Orthopaedic and plastic surgeons: 6.6% / Trauma surgeons: 5.2%	Orthopaedic surgeons: 34% / Plastic surgeons: 53% / Orthopaedic and plastic surgeons: 13% / Trauma surgeons: 0%	Orthopaedic surgeons: 95% / Plastic surgeons: 5% / Orthopaedic and plastic surgeons: 0% / Trauma surgeons: 0%	Orthopaedic surgeons: 86% / Plastic surgeons: 14% / Orthopaedic and plastic surgeons: 0% / Trauma surgeons: 0%	Orthopaedic surgeons: 95% / Plastic surgeons: 5% / Orthopaedic and plastic surgeons: 0% / Trauma surgeons: 0%
Median time to definitive skeletal fixation	2 days	1 day	1 day	4 days	5 days
Primary mode of definitive skeletal fixation	Casting: 5% / Uni-biplanar external fixator: 5% / Frame external fixator: 17% / Plate and screws: 32% / Intramedullary nail: 29% / Kirschner wires: 4% / Other: 8%	Casting: 8% / Uni-biplanar external fixator: 3% / Frame external fixator: 19% / Plate and screws: 23% / Intramedullary nail: 39% / Kirschner wires: 3% / Other: 5%	Casting: 0% / Uni-biplanar external fixator: 3% / Frame external fixator: 0% / Plate and screws: 52% / Intramedullary nail: 26% / Kirschner wires: 0% / Other: 19%	Casting: 10% / Uni-biplanar external fixator: 0% / Frame external fixator: 48% / Plate and screws: 14% / Intramedullary nail: 14% / Kirschner wires: 14% / Other: 0%	Casting: 5% / Uni-biplanar external fixator: 24% / Frame external fixator: 24% / Plate and screws: 24% / Intramedullary nail: 5% / Kirschner wires: 5% / Other: 13%
Soft tissue reconstruction required	36%	51%	19%	21%	19%

(*continued on next page*)

Table 1 (*continued*)

Demographics	Total ($n=212$)	UK ($n=79$)	Chile ($n=42$)	Sudan ($n=29$)	Spain ($n=21$)
Median time to soft tissue closure	10 days	4 days	29 days	37 days	35 days
Modality of soft tissue closure (Total $n=76$)	Conventional dressings: 3% / Negative pressure wound therapy: 5% / Skin grafting: 16% / Local flaps: 10% / Perforator flaps: 22% / Free flaps: 44%	Conventional dressings: 3% / Negative pressure wound therapy: 8% / Skin grafting: 13% / Local flaps: 11% / Perforator flaps: 21% / Free flaps: 45%	Conventional dressings: 0% / Negative pressure wound therapy: 0% / Skin grafting: 25% / Local flaps: 13% / Perforator flaps: 13% / Free flaps: 50%	Conventional dressings: 20% / Negative pressure wound therapy: 0% / Skin grafting: 40% / Local flaps: 20% / Perforator flaps: 20% / Free flaps: 0%	Conventional dressings: 0% / Negative pressure wound therapy: 0% / Skin grafting: 0% / Local flaps: 33% / Perforator flaps: 66% / Free flaps: 0%
Flap survival rates	Local and perforator flaps ($n=20$): Total flap failure 5% / Partial flap failure: 10% / Total flap survival: 85%. Free flaps ($n=29$): Total flap failure 6.8% / Partial flap failure: 6.8% / Total flap survival: 86.2%.				
Unexpected return to theatre in first 30 days	8%	9%	0%	10%	5%
Amputation	Immediate: 1.4% / Early: 4.3%	Immediate: 1.2% / Early: 2.5%	Immediate: 0% / Early: 4.7%	Immediate: 3.4% / Early: 3.4%	Immediate: 0% / Early: 0%
Median time to discharge	13 days	14 days	10 days	6 days	11 days
Patients diagnosed with COVID pre-admission	0				
Patients diagnosed with COVID during admission	1 (0.47%)				
Missing data 0.83%					

Netherlands (6%), Taiwan (5%), South Korea (5%), Mexico (2%) and Italy (2%) were included. Demographic data, injury characteristics, treatment received, and inpatient recovery were recorded (Table 1).

Despite the pandemic, all centres treated patients according to their usual standards with minimal deviation. Seven patients (3.3%) had their follow-up appointments delayed or adapted to telephone consultations. The majority underwent debridement in the first 24 h (73%), Median time to definitive skeletal fixation and soft tissue reconstruction, if required, from time of injury was two and ten days, respectively. Limbs preservation at discharge was achieved in 94.4% of the cases, with 12 patients (5.6%) requiring immediate or early amputation. Serious complications included three total (6%) and five partial flap failures (10%), 10 cases of acute wound infection (5%), two hematomas that required evacuation (1%) and two deep venous thrombosis (1%). Three patients in the flap failure group required further reconstruction: two with a local flap and one with a second free flap. Two patients in this cohort died because of their injuries and two succumbed to hospital acquired non-COVID pneumonias in the context of pre-existing COPD. No patients were diagnosed with SARS-CoV-2 prior to admission and only one tested positive as an inpatient (0.5%) on PCR and CT-scans and eventually made a full recovery.

Discussion

Even though there have not been any previous international studies of these characteristics, there are large cohort series published. For the UK subgroup, three of 79 patients (3.7%) required amputation which is similar to the recent UK WOLFF trial (2% of 460 cases).[3] Partial and total free flap failure rates (6.8% for both) are also similar to those reported by a recent study of 129 patients treated in the United States, which reported 10.8% partial and 14.7% total flap failure, and 7.8% requiring amputation.[4]

Our study is limited by its retrospective nature, geographic variability, different resource settings and limited

follow up (1 to 105 days). This design was necessary to achieve a rapid and global response during the ongoing COVID-19 pandemic. The incidence of patients with COVID-19 in this international sample of emergency admissions was very low. Despite guidance advocating the avoidance of staged procedures and limb salvage in borderline situations, almost all patients received standard care.

Our data demonstrate that lower limb trauma services across many countries have managed to adhere to their usual pre-COVID standard of care.[5] The outcomes so far have remained largely within modern acceptable outcomes. Provided standard surgical COVID-19 precautions are maintained, including screening patients with unknown COVID status upon admission, and routine use of personal protective equipment, it would be reasonable to follow pre-COVID guidance and expect similar outcomes during the current second wave of the pandemic.

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A protocol for this study has been submitted for publication as part of the RSTN-COVID group.

Disclosure

All the authors deny any conflicts of interest.

Ethical approval

Not applicable, as this is a service evaluation project.

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Juan Enrique Berner
Department of Plastic Surgery, The Newcastle upon Tyne Hospitals NHS Foundation Trust, Queen Victoria Rd., Newcastle upon Tyne, NE1 4LP, United Kingdom
Kellogg College, University of Oxford, 60-62 Banbury Rd, Oxford, OX2 6PN, United Kingdom

James K.-K. Chan
Department of Plastic Surgery, Stoke Mandeville Hospital, Mandeville Rd, Aylesbury, HP21 8AL, United Kingdom
Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Roosevelt Drive, Oxford, OX3 7FY, United Kingdom

Matthew D. Gardiner
Department of Plastic and Reconstructive Surgery, Wexham Park Hospital, Slough, SL2 4HL, United Kingdom
The Kennedy Institute of Rheumatology. Nuffield Department of Orthopaedic, Rheumatology and Musculoskeletal Sciences, University of Oxford. Oxford, OX3 7FY, United Kingdom

Hinne Rakhorst
Plastic and Reconstructive Surgery Department, Medisch Spectrum Twente, Enschede, Netherlands

Alina Ortega-Briones
Trauma and Orthopaedic Surgery Department, Hospital San José Quirónsalud, Madrid, Spain

Jagdeep Nanchahal
The Kennedy Institute of Rheumatology. Nuffield Department of Orthopaedic, Rheumatology and Musculoskeletal Sciences, University of Oxford. Oxford, OX3 7FY, United Kingdom

Abhilash Jain
Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Roosevelt Drive, Oxford, OX3 7FY, United Kingdom

[†]RSTN COVID - INTELLECT Collaborative investigators:
Hospital del Trabajador de Santiago (Chile): Nicolás Pereira, Gonzalo Bastías, Josefa Venegas
Imperial College Healthcare NHS Trust (UK): Harsh Samarendra
Ribat University Hospital (Sudan): Hassan Elbahari, Hytham K. S. Hamid
Norfolk and Norwich University Hospitals NHS Foundation Trust (UK): Samuel Norton, George Lafford, Joshua Thompson
The Hull University Teaching Hospitals NHS Trust (UK): Cher Bing Chuo, Chie Katsura
Hospital Universitario de Gran Canaria "Doctor Negrín" (Spain): Mónica Frances Monasterio, Ivan Beirutti, Jose Miguel Casarrubios Barrera
Dalin Tzu Chi Medical center (Taiwan): Honda Hsu

Medisch Spectrum Twente (The Netherlands): Kamilcan Oflazoglu, Iris Beijk
South Tees Hospitals NHS Foundation Trust (UK): William Eardley, Anthony Egglestone
Asan Medical Centre, University of Ulsan (South Korea): Joon Pio Hong, Jin Geun Kwon
Hospital Clínico Universitario "Virgen de Arrixaca" (Spain): Javier Martínez Ros, Ana Ortega Columbrans
Ibrahim Malik Teaching Hospital (Sudan): Ahmed Abugarja, Mohamed Awadelkarim
Hospital General "Dr. Manuel Gea González" (Mexico): Eric Santamaria, Sergio Vallejo
Università degli Studi dell'Insubria (Italy): Mario Cherubino, Leonardo Garutti
Salisbury NHS Foundation Trust (UK): Marios Nicolaou, Jack Pearce, Terry-Ann Curran
Pontificia Universidad Católica de Chile (Chile): Alfonso Navia, Rodrigo Tejos
E-mail address: juan.berner@kellogg.ox.ac.uk (J.E. Berner)

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Response to: "Managing hand trauma during the COVID-19 pandemic using a one-stop clinic" https://doi.org/10.1016/j.bjps.2020.05.026

Dear Sir,

Earlier in the year we wrote detailing the changes in our hand trauma service in response to the COVID-19 pandemic.[1] We have now been able to review our experiences during this period, and particularly whether changes to the service have impacted patient care.

As described previously,[1] during this period we made several changes to our hand trauma service. This included the introduction of the "one-stop clinic" – where patients underwent their initial plastic surgery assessment, surgery and initial hand therapy review +/- splinting on the same day. Other changes included the introduction of a "trauma co-ordinator" role staffed by a senior member of the hand therapy team 7 days a week who, amongst other things, was able to co-ordinate theatre bookings and patient attendance to maximise the use of our limited time in the operating theatre. Additionally, a consultant plastic surgeon was always present in both the trauma theatre and trauma clinic to ensure senior decision making on decision to operate vs conservative management. We also saw a shift away from general anaesthetic procedures to local anaesthetic and particularly the WALANT technique. As a result, our hand trauma service was one of very few non-COVID services that was able to continue uninterrupted throughout the entire pandemic.

We have reviewed cases of open tendon repair with regard to compliance with the BSSH hand trauma standards prior to COVID-19 (October-December 2019) and compared these outcomes with those during the first wave of the pandemic (late March – June 2020).

As experienced in other units,[2,3] our workload overall was significantly reduced during the COVID-19 period (63 tendon repairs March-June 2020 vs 103 repairs Oct-Dec 2019). However, during this period our compliance with BSSH standards were significantly improved. Time from injury to clinic improved from 2.5 days to 0.8 days (target 24 h) and time from injury to surgical repair improved from 5.6 days to 2.2 days (target 4 days). Of the 63 patients treated in the COVID-19 period 33.3% were treated in the "one-stop clinic" and 40% of patients treated saw hand therapy on the day of surgery. Time to hand therapy post-operatively improved from 3.9 days to 1.7 days (target 3–5 days).

Additionally, we saw a decrease in complication rates during this period. Rates of tendon rupture fell from 8.7% to 3% and post-operative infection rates fell from 6.8% to just 1.6%, this is despite much of the follow up care being conducted remotely.

Therefore, the rapid changes necessitated by the onset of the pandemic have actually resulted in an enhanced hand trauma service in our unit with improved outcomes for patients. We believe we must strive to consolidate these changes and integrate them into the long-term future of our service to allow us to continue to deliver this enhanced level of care as the caseload increases. For example, we intend to use this data to support long term funding for the trauma co-ordinator role in our hand trauma unit, as the efficiency of booking and managing patient flow through theatre lists becomes even more critical as the post-COVID workload increases.

We believe that many lessons can be learned from our experiences throughout the COVID-19 pandemic. Services were able to make structural changes rapidly without many of the bureaucratic processes and barriers that are routinely encountered in changing NHS practice and out of the crisis we have seen many new innovations take hold to streamline services and enhance patient experience and care.[4] As we steadily recover from the pandemic, we must ensure that these innovations and experiences are secured and built upon to avoid a return to the status quo.

Declaration of Competing Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This work has not been presented or published elsewhere.

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Informed consent

Not applicable.

Ethical approval

Royal Free Hospital NHS Trust does not require ethical approval for reporting individual cases or case series. The study was registered with the hospital audit department.

Contributorship

All authors were involved in drafting the manuscript. All authors have reviewed and edited the manuscript and approved the final version for submission.

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N. Redgrave, J. Bray, N. Burr, M. Anadkat, S. Haque, D. Nikkhah

Plastic Surgery Department, Royal Free Hospital, Pond Street, Hampstead, London, NW3 2QG, United Kingdom

E-mail address: natalie.redgrave@nhs.net (N. Redgrave)

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Impact of COVID-19 geographic distribution on advanced age plastic surgeons: A cross-sectional analysis

Dear Sir,

The outbreak of severe acute respiratory syndrome coronavirus 2, responsible for coronavirus disease 2019 (COVID-19), was first identified in Wuhan, China, and has since spread worldwide. Among countries struggling to contain the spread of COVID-19, the United States (U.S.) has been particularly heavily affected. Since recording a new single-day peak of 83,010 cases on October 23, 2020,[1] the U.S. has continued to experience record highs in daily confirmed COVID-19 cases and hospitalizations. Increased susceptibility to severe COVID-19 has been noted in certain populations (e.g., individuals over age 60).[2] Advanced age patients are at increased risk of COVID-19 morbidity and mortality, and represent a potential for nosocomial transmission to healthcare providers.[3]

Plastic surgeons are at especially high risk of COVID-19 nosocomial infection. Many head and neck procedures involve exposure to oral and nasal passages. Indications for surgery include traumatic/urgent (e.g., facial fractures) and cosmetic (e.g., rhinoplasty) reasons, and both physical examination and subsequent procedures expose plastic surgeons to the patient's airway, with potential transmission of COVID-19 via respiratory and aerosol droplets.[3] Given the surge in COVID-19 cases across the U.S., identifying geographic regions with susceptible physicians may allow for risk stratification, and provide guidelines for predicting and reducing transmission and mortality.[3] In this study, we compared the geographic distribution of US plastic surgeons $\geq$ 60 years of age to cumulative COVID-19 cases to better inform clinical guidelines.

Demographic data regarding practicing U.S. plastic surgeons age $\geq$ 60 were obtained from the most recent American Association of Medical Colleges (AAMC) State Physician Workforce Reports (2018).[4] COVID-19 latitude and longitude data on cumulative cases (as of November 15, 2020) were gathered from the Environmental Systems Research Institute.[5] The two data collections were superimposed in QGIS geospatial mapping software (version 3.12.1), onto state boundary files provided by the U.S. Census Bureau. States were grouped into color-coordinated quintiles based on relative proportion of plastic surgeons age $\geq$ 60, and case volumes were adjusted via logarithmic scale to create proportionally-sized data points, resulting in a heatmap representing the COVID-19 risk faced by older plastic sur-

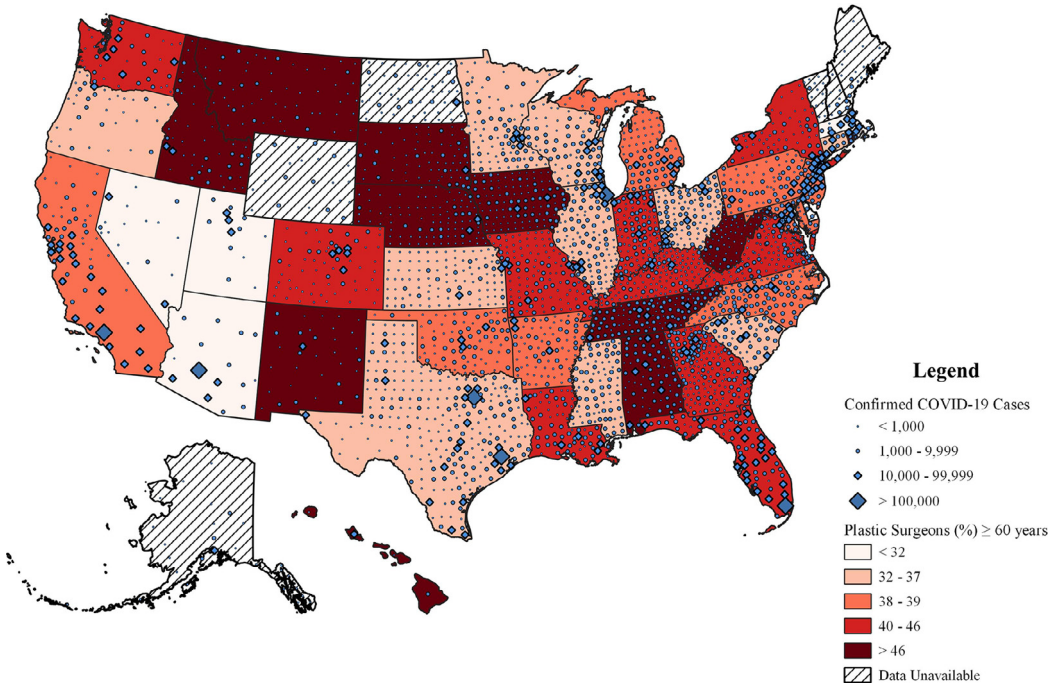

Figure 1 Geospatial distribution of cumulative COVID-19 cases and plastic surgeons age ≥ 60 in the United States. States were grouped into color-coordinated quintiles based on relative proportion of older plastic surgeons, and cumulative COVID-19 case volumes were adjusted via logarithmic scale to create proportionally-sized data points.

geons across the country (Figure 1). States with fewer than 10 plastic surgeons age ≥ 60 were excluded as, due to privacy reasons, greater than 10 physicians for a given category was the threshold for data publication by the AAMC. The COVID-provider ratio (CPR) was calculated by dividing cumulative COVID-19 cases by the number of plastic surgeons age ≥ 60, providing a more granular determination of risk for each state. This study was considered IRB exempt.

There were 7205 clinically-active U.S. plastic surgeons in 2018, of whom 2781 (38.6%) were ≥ 60 years of age. The five states with the highest percentage of plastic surgeons age ≥ 60 were South Dakota (71.4%), Hawaii (66.7%), Montana (65.0%), Alabama (55.4%), and New Mexico (54.2%), while the five states with the highest CPRs were Iowa (12,089), Wisconsin (10,439), Arkansas (10,167), Oklahoma (9388), and Nevada (7934). The proportion of plastic surgeons age ≥ 60 ranged from 30.3% in Arizona to 71.4% in South Dakota (Table 1).

In this study, we provide a cross-sectional analysis of the risk faced by older U.S. plastic surgeons during the COVID-19 pandemic. We identified several states with a particularly high CPR (Iowa, Wisconsin, Arkansas, Oklahoma, and Nevada), indicating both a high proportion of plastic surgeons age ≥ 60 and high COVID-19 disease burden. While South Dakota (6418) is among only the top 10 in CPR values, we remain concerned by this state having both the highest percentage of plastic surgeons age ≥ 60 (71.4%) and the highest COVID-19 test positivity rate (22.4%, as of November 15, 2020) in the nation.[1] These findings, along with the nearly 2.5-fold difference in proportion of older plastic surgeons across states (30.3% to 71.4%), provide justification for prioritization of PPE supply toward plastic surgeons in "higher risk" states.

We recommend that local entities (e.g., state plastic surgery societies) encourage hospital/university systems and private practices to take appropriate measures to guarantee the safety of the older plastic surgery workforce. These measures might include transitioning plastic surgeons age ≥ 60 to telemedicine services and modifying operating room protocol to minimize aerosolization and droplet transmission.[3] Moreover, we suggest that plastic surgeons be overly cautious in PPE usage (e.g., wearing a N95 respirator and eye protection, at minimum) when treating urgent cases asymptomatic for COVID-19. Limitations to this study include not exploring individual factors associated with COVID-19 severity (e.g., comorbidities, smoking history) and region-specific data (e.g., differing institutional practices) being unavailable for analysis. Regardless, we hope that our findings will assist in workforce management and continued assessment of safety guidelines. Plastic surgeons in higher-risk states, especially those over age 60 and/or with additional comorbidities, should strictly adhere to Centers for Disease Control and hospital guidelines, and consider delaying elective surgeries whenever possible.

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Table 1 United States plastic surgeon workforce profile† and confirmed COVID-19 cases by state, as of November 15, 2020.

	Total Number of Plastic Surgeons	Number of Plastic Surgeons ≥ 60	Percentage of Plastic Surgeons ≥ 60 (%)	Confirmed COVID-19 Cases	COVID-Provider Ratio‡
Alabama	74	41	55.4	215,843	5264
Arizona	156	47	30.3	273,053	5810
Arkansas	33	13	39.4	132,166	10,167
California	1127	439	39.0	1018,638	2320
Colorado	117	50	42.7	159,234	3185
Connecticut	86	32	37.2	88,645	2770
Florida	652	267	41.0	875,096	3278
Georgia	206	87	42.2	422,905	4861
Hawaii	27	18	66.7	16,652	925
Idaho	23	12	52.2	81,317	6776
Illinois	233	85	36.5	562,985	6623
Indiana	94	41	43.6	244,887	5973
Iowa	31	15	48.4	181,334	12,089
Kansas	63	21	33.3	117,505	5595
Kentucky	84	36	42.9	136,137	3782
Louisiana	88	37	42.0	201,981	5459
Maryland	181	68	37.6	164,090	2413
Massachusetts	174	55	31.6	186,142	3384
Michigan	178	69	38.8	275,792	3997
Minnesota	96	34	35.4	216,028	6354
Mississippi	53	18	34.0	133,340	7408
Missouri	110	49	44.5	240,209	4902
Montana	20	13	65.0	45,987	3537
Nebraska	32	15	46.9	94,922	6328
Nevada	49	15	30.6	119,006	7934
New Jersey	245	92	37.6	274,736	2986
New Mexico	24	13	54.2	63,171	4859
New York	594	238	40.2	551,163	2316
North Carolina	189	73	38.6	309,118	4234
Ohio	215	79	36.7	290,243	3674
Oklahoma	42	16	38.1	150,205	9388
Oregon	80	26	32.5	54,937	2113
Pennsylvania	261	101	38.7	264,222	2616
Rhode Island	19	10	52.6	41,529	4153
South Carolina	90	33	36.7	194,014	5879
South Dakota	16	10	71.4	64,182	6418
Tennessee	135	63	46.7	305,120	4843
Texas	637	221	34.7	1051,922	4760
Utah	72	22	30.6	151,141	6870
Virginia	189	77	40.7	200,799	2608
Washington	133	54	40.6	127,731	2365
West Virginia	30	16	53.3	32,792	2050
Wisconsin	86	31	36.0	323,604	10,439

Abbreviations: COVID-19, coronavirus disease 2019.
† States with fewer than 10 plastic surgeons age ≥ 60 (i.e., Alaska, Delaware, Maine, New Hampshire, North Dakota, Vermont, and Wyoming) were excluded due to lack of published information.
‡ COVID-provider ratio was calculated by dividing the number of confirmed COVID-19 cases for a given state by the number of plastic surgeons age ≥ 60 in that state.

Declaration of Competing Interest

The authors report no conflicts of interest relevant to this work.

Ethical approval

Not required.

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Michael Wells[#], Tarun K. Jella[#], David X. Zheng, Irene A. Chang, Alexandria L. Gerber
Department of Plastic Surgery, Case Western Reserve University School of Medicine, Cleveland, OH USA

Taral Jella
College of Arts and Sciences, Emory University, Atlanta, GA USA

James R. Gatherwright
Division of Plastic Surgery, MetroHealth, Cleveland, OH USA

[#]MW and TKJ share first authorship.
E-mail address: mxw664@case.edu (M. Wells)

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Reply to letter regarding "Percutaneous needle fasciotomy for Dupuytren's disease: A one-stop approach incidentally suited to the era of COVID-19"

Dear Sir,

We thank Dr Cilli for their comments[1] on our recent article, 'Percutaneous needle fasciotomy for Dupuytren's disease: A one-stop approach incidentally suited to the era of COVID-19'.[2] Additionally, we are delighted hear of their adaptations to practice, towards percutaneous needle fasciotomy (PNF), such that treatment for Dupuytren's may be continued throughout this 'second wave' of the pandemic.

We would concur that there is an associated learning curve when adopting PNF and it is a procedure which does require skill. However, we find that the technique can be used successfully in both proximal and distal interphalangeal joints. In our recently published series of PNF in 118 rays,[3] mean contracture release was not significantly dissimilar when undertaken in the proximal or distal interphalangeal joints in comparison to the metacarpophalangeal joint. Indeed, clinically satisfactory release of the PIPJ was achieved in 79% of cases with no major complications observed including no incidence of permanent sensory disturbance. Beyond this, the ability to achieve full passive extension may be limited by contracture of the collateral ligaments and volar plate over a period of fixed flexion.

The recent withdrawal of *Clostridium Histolyticum* collagenase therapy across European markets is indeed regrettable. However, it may be important to note that collagenase injection is not an insignificant undertaking. Patients will need to be informed of possible failures, allergic reactions as well as a perceived recurrence of up to 80%.[4] Furthermore, in a time of widespread scarcity of healthcare resources, it is important to consider a population perspective. Xiapex® when available, was associated with significant cost – approximately £780 per injection, with the majority of cases requiring at least two vials. In comparison, the material cost of PNF is rather inconsequential and has shown to be highly cost-effective especially in recurrent or high-severity PIPJ contracture.[5] Ultimately however, decisions regarding mode of treatment should be tailored to the requirements and preferences of the patient as well as the operator's ability, skill and training.

Funding

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Ethical approval

N/A.

Declaration of Competing Interest

The authors would like to confirm that there are no conflicts of interest.

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Manal I.A. Patel
University of Cambridge School of Clinical Medicine, Addenbrooke's Hospital, Hills Road, Cambridge, CB2 0SP, UK

Irshad A. Patel
Department of Plastic and Reconstructive Surgery, Royal Devon & Exeter Hospital, Barrack Road, Exeter, EX2 5DW, UK
E-mail address: mp778@cam.ac.uk (M.I.A. Patel)

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Plastic surgery in the time of Coronavirus in Italy. Maybe we should say: "Thanks Darwin we are Plastic Surgeons!"

Dear Sir,

We read with great interest the article: Plastic Surgery in the time of Coronavirus in Italy. Can we really say "Thanks God we are plastic surgeons?", by Elia et al.[1]

Lately, Intensive Care Units, Infectious Disease, Pneumology and Hygiene services played the main role in facing the pandemic. Nowadays, in the middle of the virus backfire, some specialties look somehow doomed to step back from the race for worldwide population salvation and face a second break of the daily activities.[2]

If during the first pandemic peak, the total admission rate to Italian plastic surgery units decreased,[1] we now risk to pay the overwhelming consequences of Covid-19 reorganization on waiting lists and management of those pathologies not considerable again as priorities, but still representing a worsening necessity. In fact, while stopping the pandemic remains mandatory, other serious and life-impacting diseases affect the population and plastic surgeons, among others, play a crucial role in guaranteeing a proper treatment. In this regard, Elia et Al. registered an increase of admissions due to hand trauma related to home accidents and domestic burn injuries.[1]

Nonetheless plastic surgery is versatile, a "border" specialty, playing a key role in oncologic surgery as well. Inspired by the Authors, we reviewed the database of a newborn multidisciplinary Oncologic and Reconstructive Breast Surgery Departments, reporting the number of surgical procedures performed from March 9th to May 18th 2020 in comparison to the trends registered before and after the pandemic onset.

During the two months of Italian lockdown, we counted 76 undeferrable breast surgeries (average 38/month), including oncologic demolitions, autologous/heterologous reconstructions and revision surgeries. 266 procedures (average 38/month) were performed in the first seven months (August 2019-March 2020), confirming surprisingly no impacting reduction rates due to the pandemic.

In the following six months (May 19th-November 26th 2020), we registered 215 undeferrable breast surgeries (average 36/month), −5% than during the lockdown. T-test was applied and p-value < 0.05 was considered significant. Despite a slight variation in our surgical activity, no statistically significant differences were evidenced among these periods. Though, if we consider minor or deferrable surgeries such as lipofilling or surgical revisions, 118 surgeries (17/month) were performed in the previous seven months while only 3 surgeries during lockdown, with a −97,5% rate. In the 6 months after the lockdown, 119 deferrable surgeries (20/month) were carried out (+97,5%) (**Figure 1**). Concerning only not urgent surgeries, we highlight a statistically significant difference among these periods.

In the battle against breast cancer during COVID-19, plastic surgeons answered present to the call of duty, ensuring the continuity of their surgical activity and a comprehensive oncologic and reconstructive treatment.

Moreover, the role of plastic surgeons in the Breast Units evolved, increasing in importance along with the concept of the "*aesthetic cancer cure*". The meaning of "*oncoplastic surgery*" goes far beyond the simple concept of both oncologic and plastic surgeries combination. It indicates a dynamic way of patient's care, with efficacious cancer surgery together with preservation or improvement of the breast aesthetic. An optimal result is achieved when the entire multidisciplinary skillset is at disposal. Usually, Italian Breast Unit surgical team is composed by general and plastic surgeons, who provide independent skills.

However, what if a single surgeon, dual-trained in breast oncology and plastic surgery, would handle the entire surgery? This thorough figure would benefit from a comprehensive understanding of the breast cancer treatment, leading to wider offer of oncological and reconstructive options and higher rates of successful outcomes.

We identify with this philosophy and have standardized it in our daily practice. Over the years our multidisciplinary group has developed this perspective, shared and consolidated mutual skills with good results, achieving the maintenance of constant volumes of surgical activity in the field of breast surgery, even during the lockdown.

Shaterian et al.[3] report that a dual-trained surgeon performing the entire surgery is associated to improved patient care and breast reconstruction rates, if compared to traditional team-approach.

As breast surgery definitely seems to follow this trend, the big question is: which specialty will be playing this role in the future?

According to Tagliacozzi and Zeis, Plastic surgery as it was conceived might not last forever. It is to be considered a dynamic and historical science, that has to modify its conclusions over time as knowledge changes.[4]

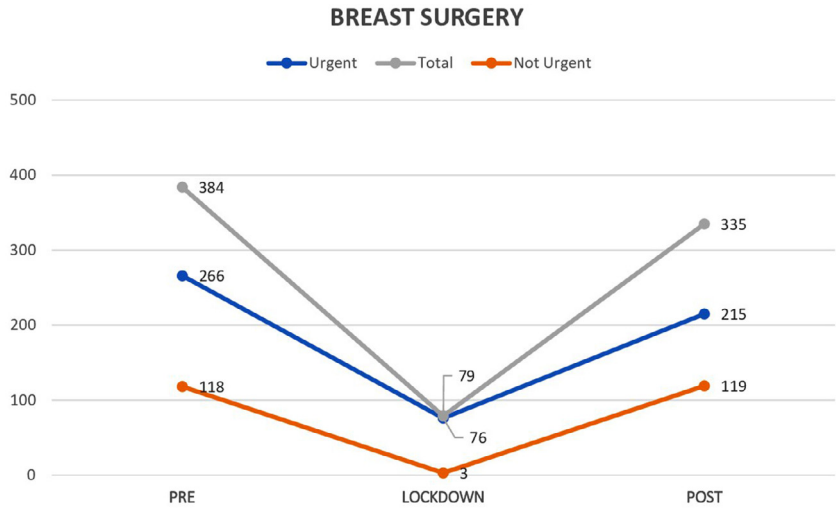

Figure 1 Data analysis from the newborn multidisciplinary Oncologic and Reconstructive Breast Surgery Departments (August 1°, 2019). The graphic shows the numeric trend of breast surgeries seven months before, during the two months of lockdown and six months after. The grey line shows the total numbers of surgeries performed, the blue one shows only urgent procedures, and the orange one shows not urgent procedures.

The Covid-19 disaster pushed us all to broaden our competences reconsidering our role in patients care, remarking how resilience is mandatory to face the new challenges of a constantly developing environment. In the Darwin's Origin of Species, it is not the strongest that survives, nor the most intelligent. It is the one that is most adaptable to change.[5]

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Ethical approval

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Declaration of Competing Interest

The authors have nothing to disclose.

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Marco Marcasciano
Department of Oncologic and Reconstructive Breast Surgery, "Breast Unit Integrata di Livorno, Cecina, Piombino, Elba, Azienda USL Toscana nord ovest", Leghorn, Italy. Via dell'Esquilino 38, 00185 Roma, Italy

Juste Kaciulyte, Francesco L.R. Mori, Federico Lo Torto, Diego Ribuffo
Sapienza University of Rome, Policlinico Umberto I, Department of Surgery "P.Valdoni", Unit of Plastic and Reconstructive Surgery, Roma, Italy

Donato Casella
Azienda Ospedaliera Universitaria Senese, UOC Chirurgia Oncologica della Mammella, Siena, Italy
E-mail address: dott.marcomarcasciano@gmail.com (M. Marcasciano)

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Will private plastic surgeons survive the pandemic? Analyzing the impact of COVID-19 on private practice

Dear Sir,

On December the 31st, 2019, a pneumonia of unknown origins detected in Wuhan, China, was first reported to the WHO Country Office. After that, the initial outbreak escalated into a global pandemic. Until May 2020, 5.27 millions cases of COVID-19 have been reported, including 340.000 deaths, affecting 210 countries[1].

Different measures have been taken by these countries to prevent the spread of the virus (such as social distancing), and Emergency Status was declared worldwide.

Public and private hospitals started to change protocols to treat both outpatient and inpatient settings, including suspension of elective surgeries and presential consultation being postponed[2,3].

How will these changes affect private plastic surgeons' life? Most of the studies are focused on hospital environment, none of them on private practice. We tried to determine how the pandemic has affected the life, job and economy of private plastic surgeons.

A 30-question anonymous survey entitled: "COVID-19 impact on plastic surgeon's private practice" was sent via the

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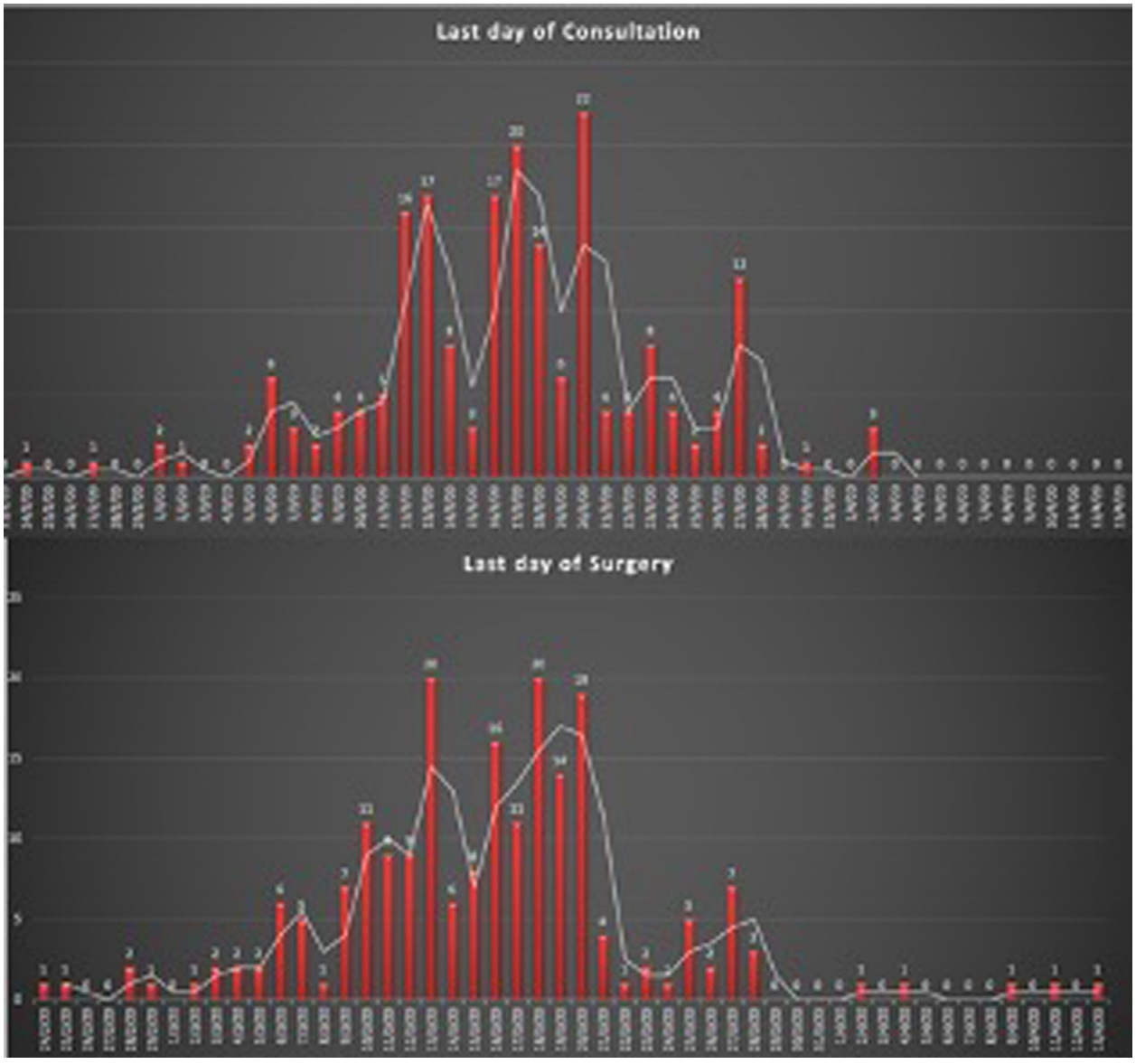

Figure 1 Last day of consultation and surgery in our participants.

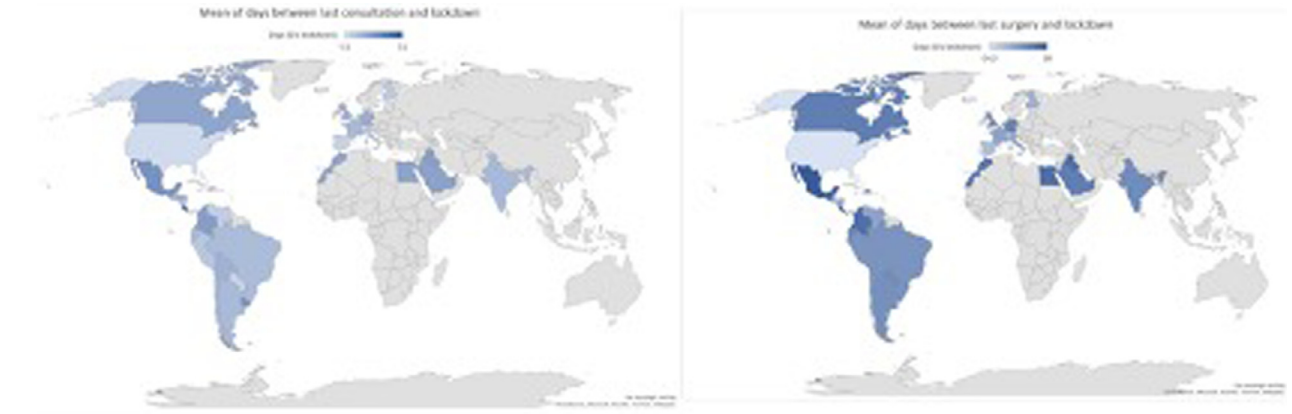

Figure 2 Distribution of the mean of days between last consultation and surgery and lockdown.

online system SurveyMonkey® only to Board Certified Plastic Surgeons around the World.

The questionnaire analyzed: 1) Current private practice setting; 2) Changes in surgeon's practice; 3) Forecast of consequences in own's practice due to the suspension of activity.

The survey was sent between the 28th of March and the 16th of April 2020, when awareness about the pandemic was rising.

The Scientific Community actively replied, 205 out of 300 surgeons (69%) across 34 different countries replied to the survey.

Most of the working time of our participants is dedicated to private practice and the income of 65% of them comes only from private practice.

The spontaneous interruption of the activity before authorities ordered the lock-out showed a responsible reaction of the medical community around the globe. 90% of surgeons stopped their activity in March; 68.7% for self-initiative, 27.7% for authority regulation and 3.6% stopped for other reasons, such as patient's cancelation, Figures. 1-2.

72% of the surgeons were able to offer telemedicine, which reflects the image of a modern surgeon (quite appreciated by patients) and reduces the distance between patient and physician. Unfortunately, there are some potential risks too. The most relevant problem is related to privacy since most of the platforms that allow video-communication do not fulfill the privacy requirements of most countries, exposing the surgeon to legal consequences.

Considering the socioeconomic aspects related to plastic surgeon, there is a great variation in the monthly income of the participants (17% reported an income of less than 5000€*, 33% between 5000 and 10.000€, 26% between 10.000 and 20.000€, 24% more than 20.000€).

When asked if they believe that COVID-19 caused a global economic problem, the surgeons gave a unanimous affirmative answer (98%).

As the pandemic forced to stop non-essential medical activities, most plastic surgeons decided to keep their staff at the original salary (73%) even when most of them (85% of the participants) received no support from their government.

Maintaining salaries with no income is also a difficult situation that becomes eventually unsustainable. 47.3% of our participants considered that they could stand this situation between 4 and 8 weeks, 15.7% less than 4 weeks and 37% more than 8 weeks.

Only 23,9% of them have a family member that could provide economical help during this situation and only 5,85% of our participants' insurances cover their lack of income during a pandemic. Even though, most of the participants (61.5%) did not consider working or returning to work (if they had done so before) in a public institution as an emergency economic measure.

At the time of the survey, 1% of the participants had contracted COVID-19, one of them suffered a serious clinical condition. Only 4% indicated that they have treated COVID-19 positive patients, but only 4 of them knew that the patient was infected before being in contact with the patient.

In conclusion, as any other private activity, plastic surgeons suffered the social and economic consequences of the pandemic. The practice will not be the same in the mid-term with the need of introducing safety and preventive protocols prior to surgery; this "new normality" will change our reality forever. Our fragilities have been exposed, but we have a chance to evolve to a more flexible and digitalized healthcare, reducing costs and improving services to our patients.

Ethical approval

N/A.

Conflict of interest

None.

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Marco Romeo
Private practice, Hospital Moncloa. Madrid, Spain

David Gonzalez-Peinado
Department of Plastic and Reconstructive Surgery, Hospital Universitario La Paz. Madrid, Spain

Hector Duran
Práctica privada Merida Yucatan México, ASPS, ASAPS, SAPS, AMCPER Mexico
E-mail address: Doctor@drmarcoromeo.com (M. Romeo)

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Chronicling the COVID-19 pandemic through the plastic surgery literature

Dear Sir,

The COVID-19 pandemic has dramatically affected plastic surgery across the globe. While its influence has readily been observed clinically, the pandemic has also affected the plastic surgery literature. The objective of this study was to characterize the effects of the COVID-19 pandemic on the plastic surgery literature.

Fifteen plastic surgery journals with the highest impact factor in 2019 from the *Journal Citation Reports* were selected. An advanced PubMed search was conducted to identify all articles published in these journals in 2020.[1] A total of 6815 articles were identified and were subsequently screened. Articles with titles containing "COVID", "SARS", "pandemic", "corona", "COVID-19″, or "SARS-CoV-2″ were included, resulting in a total of 220 articles (3.2% of total articles). Mann-Whitney and Chi-squared tests were used to assess continuous and categorical variables respectively.

Eleven journals published articles on the COVID-19 pandemic and the *Journal of Plastic, Reconstructive & Aesthetic Surgery* published the highest proportion of COVID-related articles (11% vs. 2.4% all other journals, $p < 0.001$, Fig. 1). A total of 23 countries were represented in authorship, with the most common being the United States (32% [$n = 69$]), the United Kingdom (26% [$n = 56$]), and Italy (9% [$n = 20$]). The median number of authors and institutions per article was four and two respectively. Notably, there were 27 first authors who published more than one article and their contributions accounted for 28% of the COVID-related literature in plastic surgery.

Sixty percent of articles discussed the effects of COVID-19 on the field of plastic surgery overall, whereas the remainder discussed implications for specific subspecialties: 14% craniofacial, 10% reconstructive microsurgery, 9% cosmetic, 5% hand, and 2% dermatology. The overwhelming majority of articles were editorials or commentaries (59% [$n = 131$]), followed by original articles (33% [$n = 72$]), and guidelines (8% [$n = 17$]). Of the original articles, 32 (42%) were cross-sectional studies, 17 (23%) reviews, 13 (17%) surveys, seven case reports (9%), and seven (9%) were articles describing innovative solutions to challenges posed by COVID-19 (Fig. 2).

The median time between submission and publication – either online or print – for all 220 articles was 55 days, with editorials having the fastest turnaround times (median for editorials, 47 days vs. non-editorial, 68 days; p-value = 0.003). Interestingly, median time to publication for original articles was 68 days, which is markedly faster than the 10.3 month publication timeline reported for plastic surgery journals before COVID-19.[2] The month of May had the highest number of articles published at 45, followed by September at 44; this coincides with an approximately two month publication delay after the first global COVID-19 peak in March and the second peak in July.[3] Manuscripts were relatively short in length, with a median word count of 822, and referenced a median of five sources. This is consistent with the finding that articles were predominantly editorials.

Despite the far-reaching effects of the COVID-19 pandemic, the plastic surgery community has demonstrated impressive resilience, mobilizing efficiently to meet the unique challenges imparted by the global crisis. A common theme throughout many of the early editorials was a call to action, with authors urging colleagues to consider their role in the pandemic. Inspiration soon gave way to collaboration, as authors from heavily affected regions, including Italy and China, chronicled their unique experiences and insights so as to arm the remainder of the community. The ensuing wave of original research articles made effective use of a growing body of data, providing granularity to the impact of COVID-19 on hospital systems, patient outcomes, and plastic surgery education.

Creativity and ingenuity have remained cornerstones of plastic surgery throughout the pandemic. Thus, despite a rapidly changing landscape, plastic surgeons have remained steadfast in the pursuit of excellent patient care, rigorous education, and the safety and longevity of the community. From embracing telehealth and virtual educational platforms to the use of 3-D printing in order to address shortages in personal protective equipment,[4,5] the plastic surgeon continues to adapt and innovate. Plastic surgery journals and their editorial teams have played an invaluable role in this process. By publishing articles in record time and enabling seamless, efficient communication, the field of plastic surgery can continue to progress rather than simply persist. This shared experience of being a part of the plastic surgery community during the COVID-19 pandemic will forever be preserved in the literature.

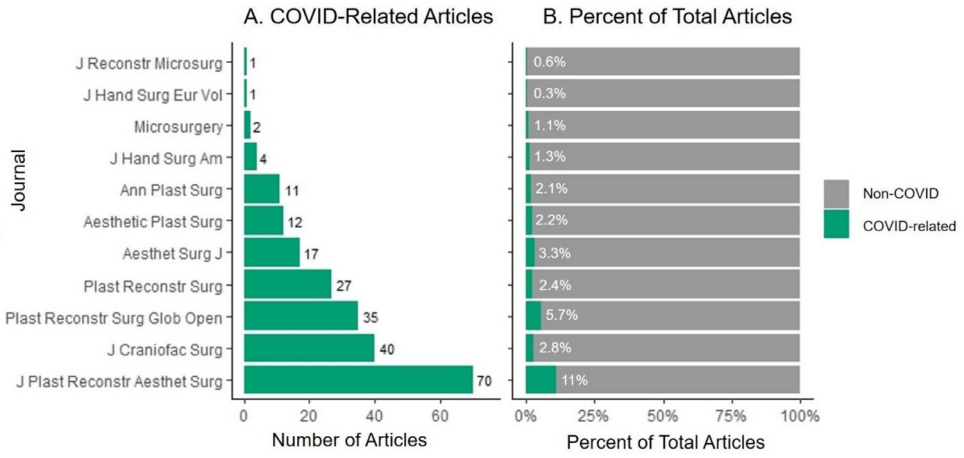

Fig. 1 Number of COVID-19 Articles Published by Journal. Eleven of the fifteen journals surveyed published articles on the COVID-19 pandemic at time of review, December 5, 2020. The remaining four, *The Cleft Palate-Craniofacial Journal, Clinics in Plastic Surgery, Journal of Plastic Surgery and Hand Surgery*, and *Seminars in Plastic Surgery*, did not have titles that matched our search criteria at time of review. A. Raw numbers of COVID-related articles published in each of the eleven journals. B. Proportion of COVID-related articles out of all articles published in 2020 in each of the eleven journals.

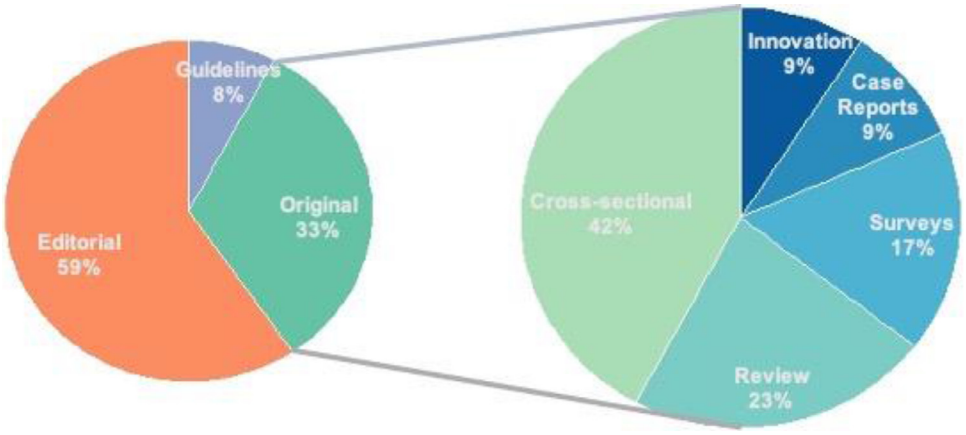

Fig. 2 Article and Study Type. The most common study type was editorials. Original articles represented a third of COVID-related literature and were comprised of cross-sectional studies, reviews, surveys, case reports, and innovative solutions.

Declaration of Competing Interest

None

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Ethical Approval

N/A

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Kshipra Hemal
Wake Forest School of Medicine, Winston Salem, North Carolina

Carter J. Boyd, Nicholas G. Cuccolo, Pierre B. Saadeh
Hansjörg Wyss Department of Plastic Surgery, NYU Langone, New York, NY, USA
E-mail address: cjboyd1@uab.edu (C.J. Boyd)

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The effect of COVID-19 on higher plastic surgery training in the UK: A national survey of impact and damage limitation

Dear Sir,

The long-term manifestation of COVID-19 is unlikely to be fully appreciated for years to come as global healthcare systems have been uniformly crippled during the peak of the pandemic and in the subsequent recovery. Despite the NHS rapidly restructuring service provision, the disruption to emergency and elective surgery is well recognised.[1] Professional development, training opportunities and progression have also suffered. The implementation of innovative solutions by some institutions and governing bodies has been an attempt to mitigate long term impact. The Joint Committee on Surgical Training (JCST) have dubbed this a "training emergency" in their #NoTrainingTodayNoSurgeonsTomorrow Twitter campaign. We sought to establish a national consensus on the state of plastic surgery higher surgical training (HST) in the UK and strategies adopted to minimise disruption.

Method

A 25-item questionnaire (Figure 2) was distributed via Google Forms to all Training Programme Directors as outlined by the JCST, for distribution to all Specialist Registrars (SpR) in the UK. The survey was opened in November 2020 for a period of one month, SpRs were requested to respond based on their experiences from the start of the COVID-19 pandemic. No financial remuneration was offered for completion and only a single submission was considered per registrar.

Results

A total of 56 responses was obtained, 89% of which held a National Training Number (NTN), with a spread of deaneries excluding Scotland and Ireland which returned no responses (Figure 1). 89% of responding registrars were in full time training and the remaining, less than full-time. A spread of training grades responded, with ST3 being the most representative group (20%). 84% of the sampled registrars felt that their training had been negatively affected by the COVID-19 pandemic despite only 21% being re-deployed to other specialities. 96% reported less surgical experience during this period and 93% reported a subsequent negative impact on their indicative surgical logbook numbers secondary to increased consultant led operating (51%). 64% expressed concerns regarding meeting the minimum threshold for elective operating as stipulated by the JCST for Certificate of Completion of Training (CCT). This concern was less pronounced for emergency operating (45%). Indicative elective procedures which trainees did not gain exposure to included Dupuytren's surgery (86%), aesthetic procedures (82%) and breast reconstruction (80%). Emergency procedures which trainees felt they lacked exposure to during the time period included microvascular anastomosis (53%), hand fracture fixation (50%) and lower limb trauma (42%). If given the opportunity to extend training, 46% would opt for this, with a further 36% considering it as a viable option. If an extension was taken, 35% would opt for 6 months and 20% either 3 or 12 months. In terms of mitigating the negative effects on training, 75% of SpRs indicated that webinars were the main source of training opportunity, with 18% reporting no in-house contingency. Very few units utilised simulation (1.8%), private sector operating (1.8%) or cadaveric training (3.6%) as viable training opportunities. 8.9% reported a negative impact on their fellowship, and 26% expressed that recent events had affected their decision to take exit examinations.

Discussion

Providing care to our patients and supporting colleagues who are under significant pressure remains paramount, however, we must ensure that we maintain surgical training standards. Our survey highlights a decline in training opportunities with subsequent knock-on effects on elective and trauma indicative numbers, preparation for exit examinations, and fellowships. The limitations of this study include a 16% response rate amongst NTN trainees, this is more challenging to quantify amongst the non-NTN trainees as the exact number is unknown. However, we believe the results to be representative as there is good spread across registrar grade and geography, with concordance across responses.

Despite the implementation of a vaccination programme, the effects of COVID-19 on plastic surgery HST are likely to

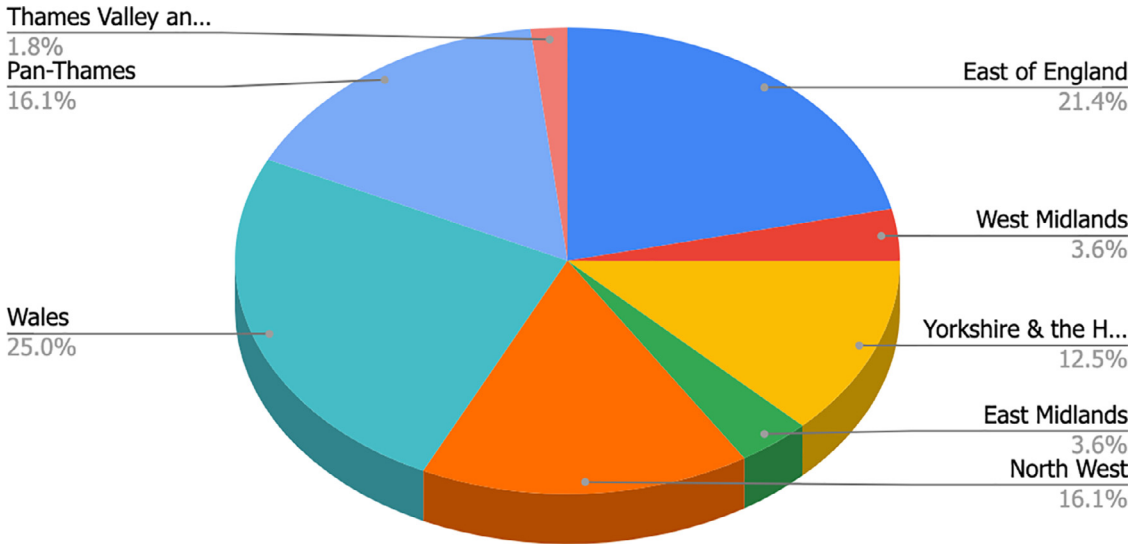

Figure 1 Distribution of Survey Results.

1) Which Deanery are you in?
2) Do you have a National Training Number?
3) Are you in Full Time or Less Than Full Time training?
4) What stage of training are you at currently?
5) Do you feel that your training has been affected by Covid-19?
6) Were you re-deployed to another speciality during Covid-19?
7) Do you feel that your surgical experience and logbook have been affected by Covid-19?
8) Have your indicative numbers been affected by Covid-19? (i.e. STS and above)
9) Have you missed indicative numbers due to consultant-led operating during Covid-19?
10) Do you have concerns about reaching the minimum requirement for elective operating as outlined by the JCST for successful completion of training due to Covid-19?
11) Do you have concerns about reaching the minimum requirement for trauma operating as outlined by the JCST for successful completion of training due to Covid-19?
12) Which of these elective procedures did you not have exposure to during Covid-19?
13) Which of these emergency procedures did you not have exposure to during Covid-19?
14) If given the option of extending training for missed exposure to plastic surgery, would you be happy to accept this?
15) If Yes, what duration of time would you be happy to extend training by?
16) Have you been given a Covid ARCP outcome? (Outcome 10)
17) Have you failed to progress at a recent ARCP? (Non Covid outcome)
18) If so, how much of this do you think is attributed to Covid-19?
19) Has your deanery implemented/planned any methods to mitigate loss of training opportunities?
20) Has your fellowship been affected by Covid-19?
21) Has Covid-19 affected how prepared you feel for your fellowship?
22) Has Covid-19 affected your decision as to when you will undertake your FRCS?
23) Have reduced outpatient clinics hindered preparation for part 2 of FRCS?
24) Has the cancellation of additional courses, conferences and research opportunities due to Covid-19 affected how prepared you feel for CCT?
25) Has Covid-19 affected how prepared you feel for a consultant job?

Figure 2 Questionnaire.

be long standing as elective operating recovers.[1] Implementation of webinars, although a useful modality,[2] provided as a standalone strategy is likely to suffer from fatigue. A multi-pronged strategy is required to ensure that training is provided despite the challenging circumstances. The JCST published guidance outlining methods to mitigate impact, ranging from greater use of independent sector training opportunities, testing of personnel in green zone operating areas and therefore permitting greater trainee operating, the use of remote observation and actively capitalising on learning opportunities.[3]

Our survey highlights that to date, the less traditional methods of training have yet to be implemented and further development (Figure 3) is required to prevent trainees becoming disillusioned. These findings are not limited to the first wave, and therefore long-term strategies are required to future proof for the unknown duration of the pandemic.

We must ensure we invest in the training of future plastic surgeons. Building on the findings of the UK Plastic Surgery Trainees Association (PLASTA) national plastic survey,[4] workforce planning is critical as key sub-specialities in the post COVID-19 recovery period become increasingly evident.

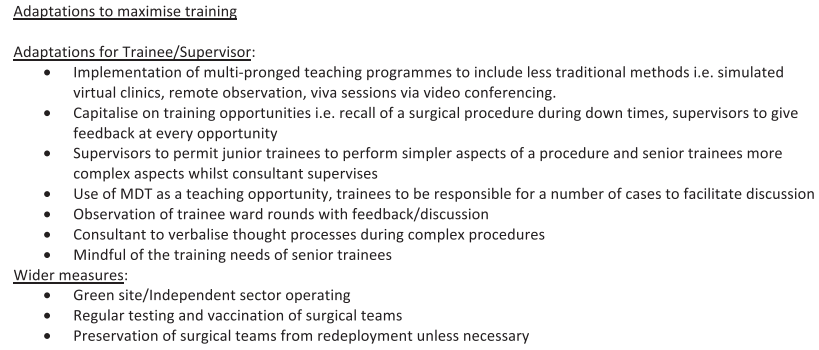

Figure 3 Methods to mitigate impact adapted from JCST recommendations.

Declaration of Competing Interest

Nil.

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Nil.

Ethical approval

Not required

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Nader Ibrahim*[1]
Reconstructive Surgery & Regenerative Medicine Research Group (ReconRegen), Swansea University Medical School, Institute of Life Sciences, Swansea SA2 8PP, UK
The Welsh Centre for Burns & Plastic Surgery, Morriston Hospital, Swansea SA6 6NL, UK

Harvey Rich
The Welsh Centre for Burns & Plastic Surgery, Morriston Hospital, Swansea SA6 6NL, UK

Stephen Ali, Iain S. Whitaker Prof.
Reconstructive Surgery & Regenerative Medicine Research Group (ReconRegen), Swansea University Medical School, Institute of Life Sciences, Swansea SA2 8PP, UK
The Welsh Centre for Burns & Plastic Surgery, Morriston Hospital, Swansea SA6 6NL, UK

*Corresponding author at: Reconstructive Surgery & Regenerative Medicine Research Group, Institute of Life Sciences, Swansea University Medical School, Swansea SA2 8PP, United Kingdom.
[1] Joint First Authorship.
E-mail address: nader.ibrahim@swansea.ac.uk (N. Ibrahim)

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