Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Correspondence and Communications

Relaxing fish-mouth incision for a tight coupler anastomosis

Dear Sir,

Microvascular anastomotic coupler devices (MACD) are a safe and effective alternativs to traditional hand-sewn anastomosis, being easier, faster, and requiring less technical skills [1]. The GEM Microvascular Anastomotic Coupler System (Synovis Micro Companies Alliance Inc, Birmingham, AL) allows anastomosis of vessels with an outside diameter of 0.8 to 4.3 mm [2]. Attempting to place a smaller tightly fitting vessel around a larger coupler ring can tear vessels and may require substitution with a smaller coupler device, which can not only add additional cost but also compromise the flap. Therefore, if there is a size discrepancy between the recipient and donor vessels, the company recommends use of the smaller vessel size in selection of the coupler size. However, if this difference is significant, it is not ideal to use the smaller size coupler. The described technique increases the vessel calibre, such that a larger size coupler can be utilized. This technique may also be useful in those cases that you have accidently overestimated the lumen size.

When there is a size discrepancy between the vessel and coupler calibre, a relaxing 'fish-mouth' incision can be made into the vessel lumen (Fig. 1). Prior to impaling the vessels' last three pins on the coupler ring, the longitudinal fish-mouth incision can be made into the vessel lumen. The incision creates two wings which increases the circumference of the vessel and facilitates easy anastomosis with between two vessels (Fig. 2, supplementary material 1).

The exact length of the longitudinal incision (l) can be calculated based on the vessel (x) and coupler (y) radius. The mathematical relationship of these variables is illustrated in the supplementary material (supplementary material 2). For example, if the coupler (y) and vessel (x) radius was 2 mm and 2.8 mm respectively, a 2.2 mm longitudinal incision would be required. However, if the vessel radius was 1.5 mm (with the same coupler radius), the required longitudinal incision would be 3.3 mm.

In practice, vessels have viscoelastic properties, unlike the theoretical linear calculations, and so there is to some degree more flexibility than suggested by those theoretical calculations. In our clinical practice we have noticed that a longitudinal incision 30–50% less than the length calculated by the equation is adequate depending on the elasticity of the vessel and the wall thickness.

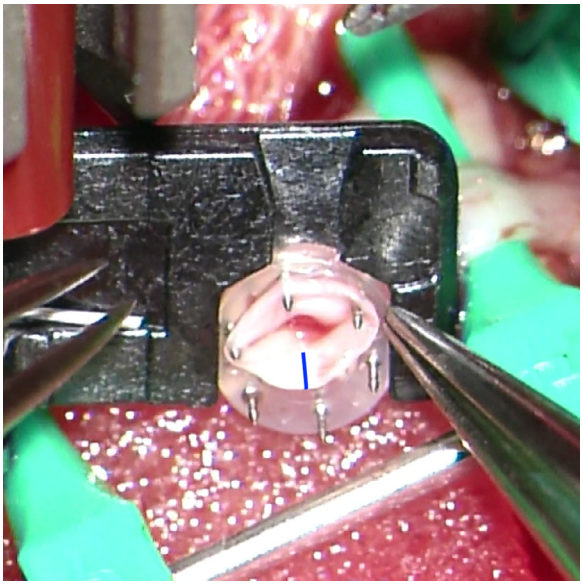

Fig. 1 Position of longitudinal fish-mouth incision (blue) when performed in clinical practice.

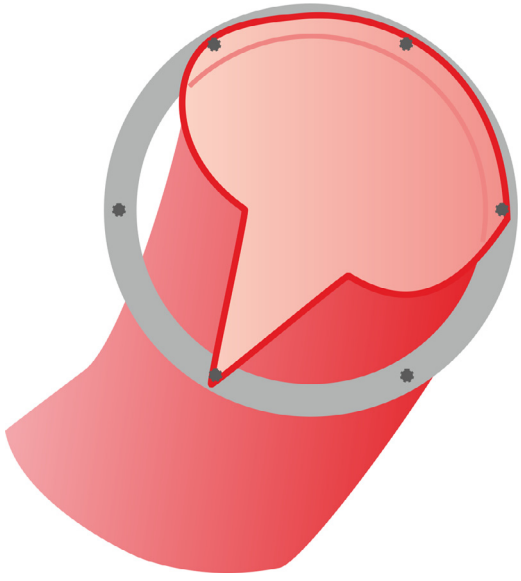

Fig. 2 A schematic representation of the relaxing fish-mouth incision for a tight coupler anastomosis.

In conclusion, the 'fish-mouthing' longitudinal technique has been successfully used in over 1000 microvascular anastomosis and is an easy technique to employ in one's practice when faced with vessel to coupler mismatch.

Declaration of Competing Interest

None.

Acknowledgments

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Ethical Approval

None

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2021.09.067.

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Facial vessels course in the cheek in open mouth position for intraoral microvascular anastomoses purposes

Dear Sir,

Growing experience and developments of the microsurgical techniques in head and neck reconstructive surgery impose improvements not only in functional, but also in cosmetic effects. In order to avoid extraoral scars, anastomoses can be performed intraorally.[1]

Cadaveric and in vivo studies describe anatomy of the facial vessels in closed mouth position [2-4]. However, intraoral anastomosis can be performed only with mouth wide open. The facial vessels' mobility and exact localization in such position has not been investigated to our knowledge. We aimed to determine facial artery and vein course in the cheek in the open mouth position.

31 healthy volunteers participated in the study (13 women and 18 men). Their average age was 24 years (range 19 to 29). Facial arteries and facial veins were located by Color Doppler Ultrasound (HITACHI EUB-7500) bilaterally in each participant, providing measurements on 62 sides.

All measurements were taken in a supine position with standard rubber-covered distractor (Hu-Friedy, L size) placed on the dental arch. Distractor was blocked proximally to the canines on the side opposite to the examined facial vessels, in order to keep the jaws open. The measurements were taken along the lower border of the mandible and along the line between cheilion and antitragus (Figure 1). Intraorally this level corresponds to the line between the cheilon and the orifice of Stensen's duct. Diameter of the facial vessels as well as the distance between the artery and the vein were measured in both locations. Then, the distractor was placed on the opposite side of the mouth and the same parameters were acquired.

Statistica 10 (STATSOFT, Tulsa, USA) and Mann-Whitney U test were used to compare groups and p-value <0.05 was considered statistically significant.

Main branch of the facial artery and accompanying vein were found at the lower edge of the mandible in all cases and on each side ($n = 62$). The facial artery mean diameter was 1.9 mm in men and 1.7 mm in women, facial vein sizes were 2.1 mm and 1.9 mm respectively ($p<0.05$). The distance between the facial vessels at the lower edge of the mandible was 1.3 to 6.6 mm (mean 4.14 mm), and it was significantly longer in men than in women (4,43 mm vs 3,75 mm, $p<0.05$).

At the line between cheilion and antitragus both artery and vein were found in 57 (91.9%) cheeks. The facial artery mean diameter was 1.2 mm in men and 1.3 mm in women, facial vein diameter was 1.5 mm and 1.6 mm respectively ($p>0.05$). Distance between the artery and the vein was 12 to 35 mm (mean 22). The difference between men and

Table 1 Facial vessels location, distances and sizes. Differences in measurements between both locations were statistically significant ($p<0.05$).

Measurements	Lower border of the mandible (range)	Line between oral commisure and antitragus (range)	*p*
Facial artery diameter	1.81 (1-2.3) mm	1.24 (0.5-1.9) mm	$p<0.01$
Facial vein diameter	2.0 (1.5-3) mm	1.5 (0.9-2.5) mm	$p<0.01$
Distance between artery - vein	4.14 (1.3-6.6) mm	22 (12-35) mm	$p<0.01$
Distance from oral commissure to facial artery	18.38 (10-25) mm		p<0.01
Distance from oral commissure to facial vein	40.57 (22-55) mm		

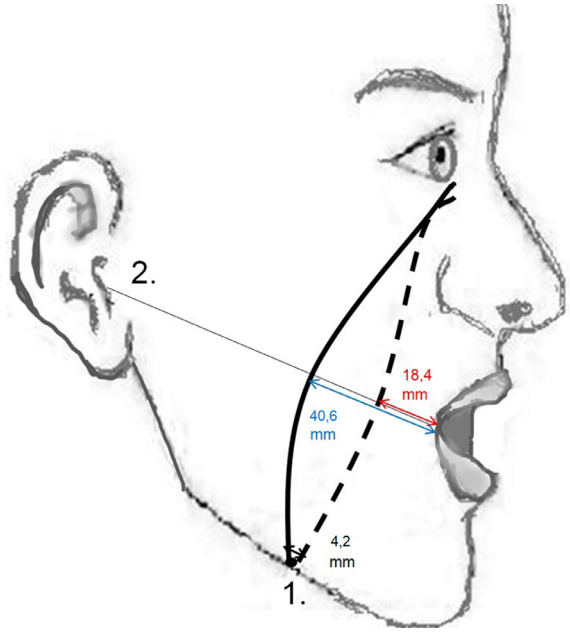

Figure 1 There were two measurements locations: 1. On the lower border of the mandible, 2 On the line between cheilion and antitragus. Vein course was marked with blue line and artery with red line.

women was not statistically significant (22.3 mm vs 21.8 mm respectively, $p>0.05$).

Diameter and distances between facial artery and vein are shown in Table 1.

Presented results show large variability of the facial vessels topography in open mouth position. Our experience with the intraoral anastomosis shows that identification of the facial vessels in the cheek via an intraoral approach is time-consuming. However, the intraoral approach can be both beneficial and reliable surgical armamentarium in consecutive cohort of cases.[5]

There are significant differences in position of the facial vessels with the mouth open in comparison to studies that investigated anatomy of these vessels with closed mouth. In Renshaw study performed also on healthy volunteers with closed mouth the distance from artery to vein at the cheilion level was 11,8 mm.[2] Basing on these anatomical data we were able to find neither artery nor vein in the described locations. Our study shows markedly longer distance of 22 mm and suggests that the distance increases with the mouth open. Better understanding of facial vessels topography and the discrepancies caused by the mouth opening can shorten the operative time and flatten the learning curve for newcomers to this approach. What is more, as mentioned by Brandter et al. intraoral approach enables shorter-length pedicles to be used. [5]

However, there is a significant variability in position, morphology, and distances between the facial vessels and anatomical landmarks in our study and in the literature. In view of this variability the most recommended procedure would be to plan the surgery with preoperative imagining studies, among others either Doppler USG or angio-CT imaging.[4] In authors opinion, planning of intraoral anastomoses is easier with sonography than with angio-CT scan. In our cohort, in 3 cases there were difficulties to localize vessels at chelion-antitragus line, no problems were reported while checking the mandible border level.

Surgeons should bear in mind that a change in jaws positioning during surgery has an impact on facial vessels topography. Anatomical data and preoperative or intraoperative USG localization of these vessels is advisable.

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Ethical approval

Not required.

Declaration of Competing Interest

None declared.

Acknowledgments

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Towards evidence based plastic surgery; how a national research agenda can unite research

Dear Sir,

Currently, many of the treatments that plastic surgeons offer to their patients are based on low scientific evidence. Research is essential to improve evidence-based medicine and provide value-based health-care, both key in delivering best practice to patients.[1] Unfortunately, completing high level studies takes time, effort and often has high costs.[2] Research funding is often limited and difficult to obtain. National focus on highly selected clinically relevant research topics increases the chance of obtaining funding and successfully conducting trials in small heterogeneous patient populations such as the field of plastic surgery. Prioritization, selection, broad support, and focus regarding research topics has been shown to increase output substantially in many instances.[3] A plastic surgery society can achieve this with a national research agenda. This communication is aiming to help others in starting and realizing similar projects.

In 2018, the Dutch Plastic Surgery Society (NVPC, approximately 450 members) initiated a committee to focus, connect, unify, and enhance research. Consultants, trainees, and the NVPC's managing director were part of the committee. The first assignment was development of a research agenda prioritizing the 10 most relevant topics in the field.

We used an objective method to collect and prioritize research questions successfully used by several other Dutch societies.[4,5]

The process to develop a top-10 of topics in clinical research followed a number of steps (Supplemental Table 1).[5] In the preparation phase a project group is composed (step 1). In phase 1 an inventory of important knowledge gaps was done. Research questions were obtained through national surveys sent to all members and important stakeholders and from highlighted knowledge gaps in current guidelines (step 2–4, see Figure 1). The project group removed duplicates and excluded questions that were (1) not related to plastic surgery, (2) not related to health-care evaluation, (3) formulated as a broad topic without specific questions, e.g., "patient reported outcome measures", or (4) existing evidence was already available but not yet incorporated in current guidelines. Selected research questions had to fit five criteria; (1) relevance (impact on patients, prevalence, costs, and urgency), (2) research feasibility (problems that lend themselves for a scientific study or trial), (3) social impact and connection with patient input, (4) research topics that are prioritized by a large number of members, patients, and other stakeholders, and (5) topics not currently addressed in a running clinical study (step 6). Subsequently, topics were ordered by subspecialty; hand surgery, reconstructive surgery, aesthetic surgery, paediatric plastic surgery, and general plastic surgery.

In August 2018, two prioritizing meetings with plastic surgeons from the 5 clinical subspecialties and stakeholders (32 participants) were organized. In a round table discussion the top priority research questions per subspecialty were selected based on criteria mentioned previously and considering three themes emphasized by Patient Federation of The Netherlands: attention to psycho-social care, long-term results and complications, and health-related quality of life. The meetings resulted in 40 research questions. (step 7)

In a final round of voting, all NVPC members and stakeholders were asked to select the 3 most important questions. The final top 10 was based on the number of votes and equal representation of all subspecialties resulting in a National Research Agenda in November 2018 (step 8, Table 1). The final step in phase 1; the board of the society and the Netherlands Patient Federation endorsed the research agenda (step 9).

Phase 2 consists of setting up research networks to answer the knowledge gaps. The first step; writing and publication of the report was finalized in the fall of 2019 (full report in Dutch available here). Next steps involve developing study protocols, funding and running the studies. Followed by publishing results and implementation in the medical field.

The effect of our agenda on answering these questions will be observed in the coming five years. The agenda of other Dutch societies led to research projects of which 40% were funded and have started.[3] As more research questions are being solved, other unanswered topics will gain importance, so a research agenda should be updated periodically or dynamically.

Based on our experience, we think the key factor towards success is a wide involvement and representation

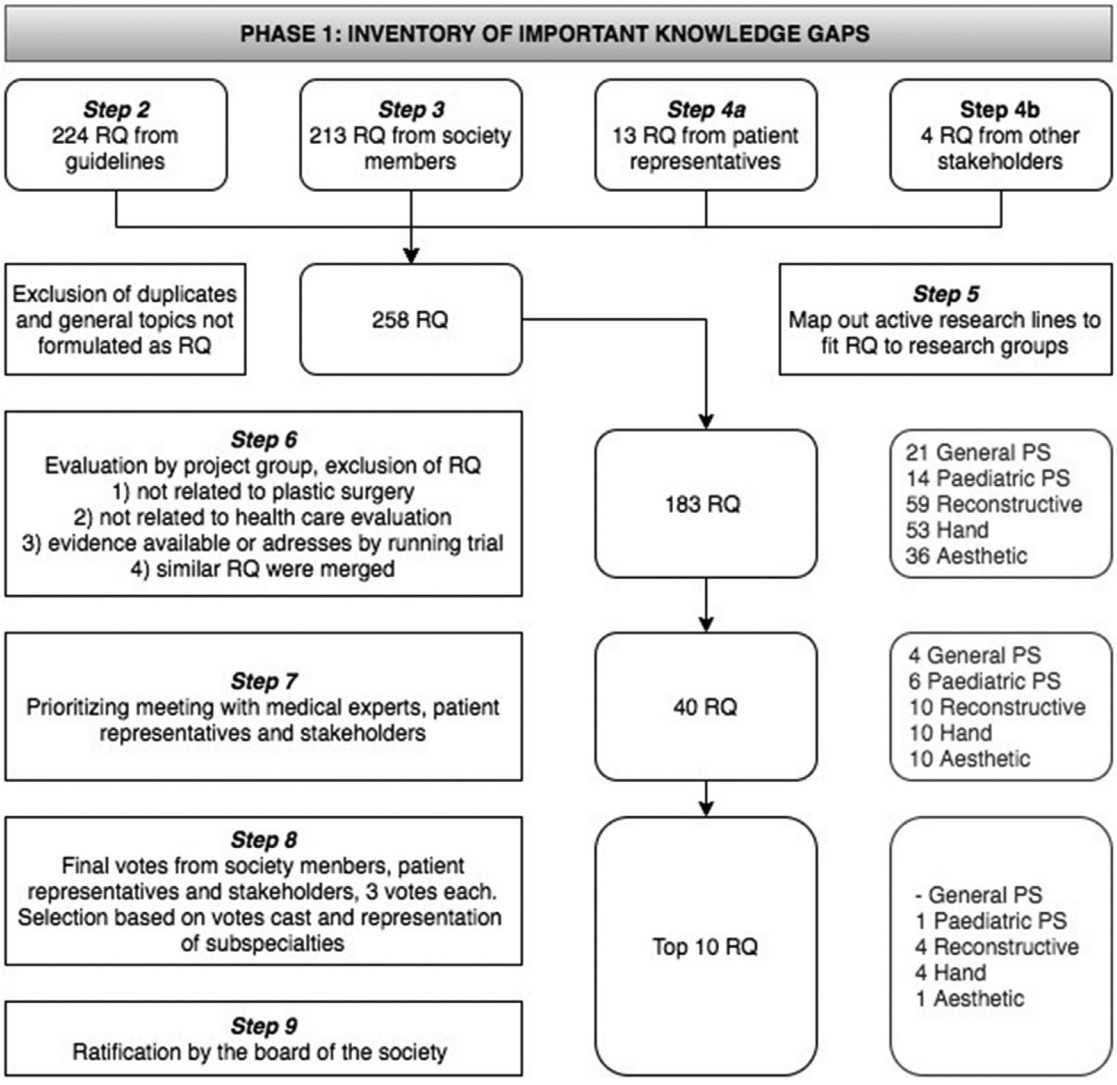

Figure 1 Flow diagram on selection of research questions. Flow-diagram illustrating Phase 1 of the step-by-step plan for development of a research agenda (see supplemental Table 1) and the results generated in this specific project. Not depicted are Phase 0: Preparation, including step 1: composing a project group, and Phase 2: Research program and setting up care evaluation networks, involving step 10–13. RQ: research question, PS: plastic surgery.

Table 1 Research agenda Dutch society of plastic surgery 2019.

Paediatric plastic surgery	What is the optimal timing and surgical technique for lip and for palate closure in cleft patients?
Aesthetic surgery	What long-term effects on health are caused by silicone implants and which patients are at higher risk of decreased health.
Reconstructive surgery	In treatment of skin cancer, what surgical technique has the best result on efficacy, cost-effectiveness, aesthetics, and quality of live?
	What breast reconstruction technique is advised when radiation therapy is indicated and what is the best timing of surgical procedures in relation to radiotherapy?
	What surgical lymphedema treatment is best for the different stages of lymphedema?
	What is the effect of lipofilling on radiated tissue?
Hand surgery	What are optimal conservative, minimal invasive, and surgical treatments of thumb base arthritis (CMC1)?
	What is the optimal treatment for persistent carpal tunnel syndrome symptoms after surgical decompression of the carpal tunnel?
	What is the efficacy of TFCC repair in degenerative TFCC injury?
	What is the optimal management of scapholunate dissociations?

of patients and other stakeholders (e.g. patient federation in the project group) assuring the research agenda is of high importance to all stakeholders. This facilitates funding, nationwide endorsement, and participation in multicentre studies.

Due to prevalence and societal impact, rare conditions will not likely appear on a research agenda. In these cases, a different approach with international collaboration is needed.

Besides National societies, international organizations could also create a research agenda to see which research questions plastic surgeons worldwide need answered. Now that international organizations are intensifying collaborations, a research agenda may help organize international research initiatives and meetings.

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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.2021.11.024.

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It may be time for a world-wide study to assess patient and parent perception of outcomes following autologous reconstruction, porous polyethylene and osseointegrated implants

Dear Sir,

First of all, we would like to thank the authors for responding to our questions about their study “Influential factors when considering reconstruction and post-operative outcomes: A survey of microtia patients and parents”.[1] Congenital microtia is one of the most common organ deformities affecting children’s physical and mental health. At present, the main treatment for severe microtia is auricle reconstruction. As the authors point out, auricle reconstruction is a challenging surgery. Plastic surgeons all over the world have made unremitting efforts in the development of auricle reconstruction. In 1957, Neumann first applied

Figure 1 The auricle framework made of autologous costal cartilage.

Figure 2 Application of the autologous costal cartilage auricle framework in auricle reconstruction.

the technique of tissue expansion to auricle reconstruction.[2] In 1971, Tanzer first used costal cartilage to make auricle frameworks.[3] The skin expander method combined with costal cartilage auricle framework for auricle reconstruction promoted by Zhuang Hongxing in 2006 is the main auricle reconstruction method currently used by plastic surgeons in China.[4] Although the auricle frameworks currently used in auricular reconstruction include autologous reconstruction (AR), porous polyethylene (PPE) and osseointegrated implants (OI), we mainly use autologous costal cartilage to make auricle frameworks for auricle reconstruction in China (Figures 1, 2). And we have successfully performed auricle reconstruction in nearly 10,000 patients using this method .[5]

We have also used PPE as auricle frameworks in our previous auricle reconstruction surgery. Although the PPE does not require the use of the patients' own costal cartilage, reducing the physical harm to the patients, there are many postoperative complications that lead to patients dissatisfaction with the auricle reconstruction surgery. Therefore, auricle frameworks used in auricle reconstruction surgery currently are basically made of autologous costal cartilage of patients. According to our working experience, we are not particularly fond of using PPE as auricle frameworks for auricle reconstruction surgery. Therefore, our doubts were expressed when we saw that the conclusion of the authors' study tended to recommend the use of PPE as auricle frameworks for auricle reconstruction.

Thanks again to the authors for their response to our questions. We wholeheartedly endorse the authors' proposal to carry out a global study. We can extensively seek the cooperation of plastic surgeons from all over the world and include patients with microtia from different countries, ethnicities, languages, and values in the study to assess patient and parent perception of outcomes following AR, PPE and OI. Perhaps this can lead to a more objective and referential conclusion. It provides reference for patients with microtia to choose the surgical methods of auricle reconstruction and plastic surgeons to carry out auricle reconstruction. Of course, we are willing to provide whatever support we can for this global study.

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Ethical approval

Not Applicable.

Declaration of Competing Interest

None.

Acknowledgements

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Technique for the prevention of hernia after pedicled transverse rectus abdominis musculocutaneous flap for breast reconstruction

Dear Sir,

Unlike the muscle-sparing transverse rectus abdominis musculocutaneous (TRAM) flap or deep inferior epigastric perforator (DIEP) flap, pedicled transverse rectus abdominis musculocutaneous (pTRAM) flaps are considered to have a significant risk of donor site morbidity, especially hernia.[1]

It is believed that hernia occurs due to two reasons. One is a defect in the anterior rectus sheath (fascia), the other is the removal or damage of the rectus abdominis muscle. Various methods including a synthetic mesh, autologous dermal graft, or acellular dermal matrix to cover the fascial defect have been used in the pTRAM flap procedure and have proven to be effective in preventing hernia. Preservation of the fascia was also shown to have a beneficial effect.[2]

Nevertheless, muscle defects cannot be compensated in the pTRAM flap procedure. Anatomically, the posterior rectus is composed only of transversalis fascia below the arcuate line and is physically thin and weak. Shaw et al. reported two cases of laparoscopic repair of a recurrent abdominal wall hernia after a TRAM flap. In this report, the hernia was below the arcuate line in both cases.[3] It is probable that one of the prominent sites of hernia is below the arcuate line.

The authors made some modifications to the pTRAM flap method (named island-type TRAM flap), and the details and results have been reported previously.[4] We attempted to overcome two drawbacks of pTRAM flaps. First, we preserved as much fascia as possible. The flap was dissected entirely from the fascia, except the perforator area, to minimise the fascial defect. The fascia was incised in a zigzag fashion, connecting the perforators (Figure 1). Second, the caudal portion of the rectus abdominis muscle was used to reinforce the posterior rectus sheath below the arcuate line. For this, the rectus muscle was always cut above arcuate line. The remnant caudal rectus muscle was fixed to the arcuate line with a 2-0 black silk suture (Figure 2). The fascia was repaired using the figure of 8 suture method. During the repair, the protruding tips of the fascia of each side were repaired to the depressed tip of the contralateral fascia. Finally, the fascia repair site was shaped as W-plasty. This could prevent the concentration of tensile strength in the area with maximal width in the fascial defect and disperse the tension strength as in W-plasty.

We analysed the effects of these techniques on the occurrence of hernia. A retrospective analysis of patients who underwent pTRAM flap surgery for breast reconstruction from 2009 to 2018 was conducted. Patients with a follow-up period of less than one year were excluded. The presence of hernia and bulge was assessed by physical examination.

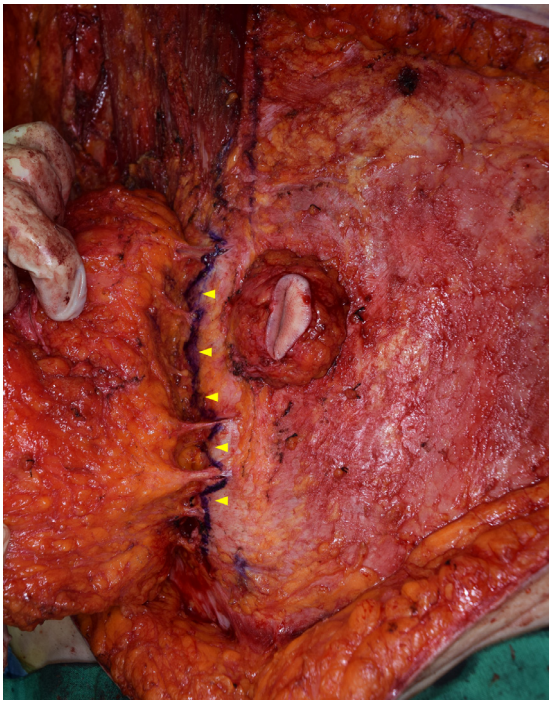

Figure 1 Lateral view after flap dissection. Note the designed incision on the anterior rectus sheath. Incision in zigzag manner connecting the perforators.

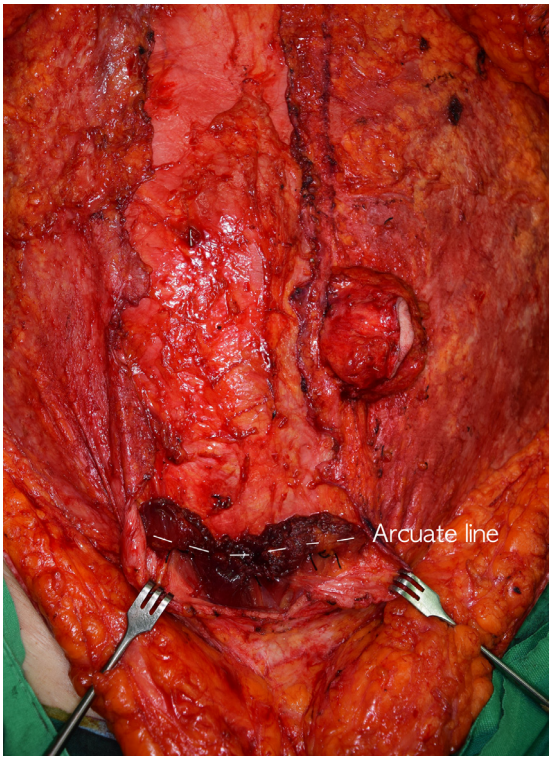

Figure 2 The remnant caudal portion of the rectus abdominis muscle was fixed to the arcuate line.

If hernia was suspected, an abdominal CT was performed to confirm the diagnosis.

A total of 94 patients were included in the study. The mean age at surgery was 49.45 years and the mean follow-up period was 29.52 months. Cases of immediate breast reconstruction were 80 (85%), and delayed breast reconstructions were nine (9.6%) patients. Paraffinoma was observed in four cases (4.3%), and capsular contracture was observed in one case (1.1%). Seventy-three patients (78%) had a history of vaginal delivery, and 19 patients (20%) had a history of caesarean section. Thirteen patients (14%) had a history of gynaecological surgeries such as hysterectomy and salpingo-oophorectomy. Four patients (4.3%) had undergone an appendectomy, and four patients (4.3%) had undergone surgery due to ectopic pregnancy. Of the total sample, 80 patients (85%) underwent unilateral and fourteen patients (15%) underwent bilateral reconstruction. In one patient with bilateral reconstruction, polypropylene mesh was added for reinforcement. Abscess or seroma occurred in five cases (5.3%). Wound dehiscence was observed in four patients, which was resolved with conservative management in two cases (2.1%); two cases (2.1%) were managed by surgery. Hernia occurred in two patients (2.1%). Both had undergone unilateral reconstructive surgery, and the hernia was diagnosed six months postoperatively.

There have been several reports with similar technical modifications for reducing the rate of hernia. One group tried to preserve the fascia completely. Among 97 patients, only one patient showed an abdominal bulge after bilateral-free TRAM flap harvest.[2] Another group tried to preserve the distal part of the rectus muscle and sutured it with polyester mesh and rectus sheath for reinforcement below the area of the arcuate line. No hernia was seen among 65 patients.[5] Fascial-sparing and reinforcement below the arcuate line area could be effective methods to prevent hernia. Our result of a 2.1% rate of hernia was fair in comparison with that in previous studies on the pTRAM flap.

The present study has several limitations. Since this study was a retrospective review, there is a possibility of a bias could exist. Objective parameters that could be important were not assessed, such as the area of fascial defect, the number of captured perforators, or intra-abdominal pressure. There was no control group. Therefore, the objective comparison was lacked.

Ethical approval

This study was approved by the Institutional Review Board (IRB No. 2020-10-003) our institute.

Declaration of Competing Interest

None.

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Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi 10.1016/j.bjps.2021.09.041.

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Hospital length of stay and hospital readmission after immediate breast reconstruction in the United States: Implications for quality measurement

Dear Sir,

The American Society of Plastic Surgeons (ASPS) has developed several breast reconstruction-related quality mea-

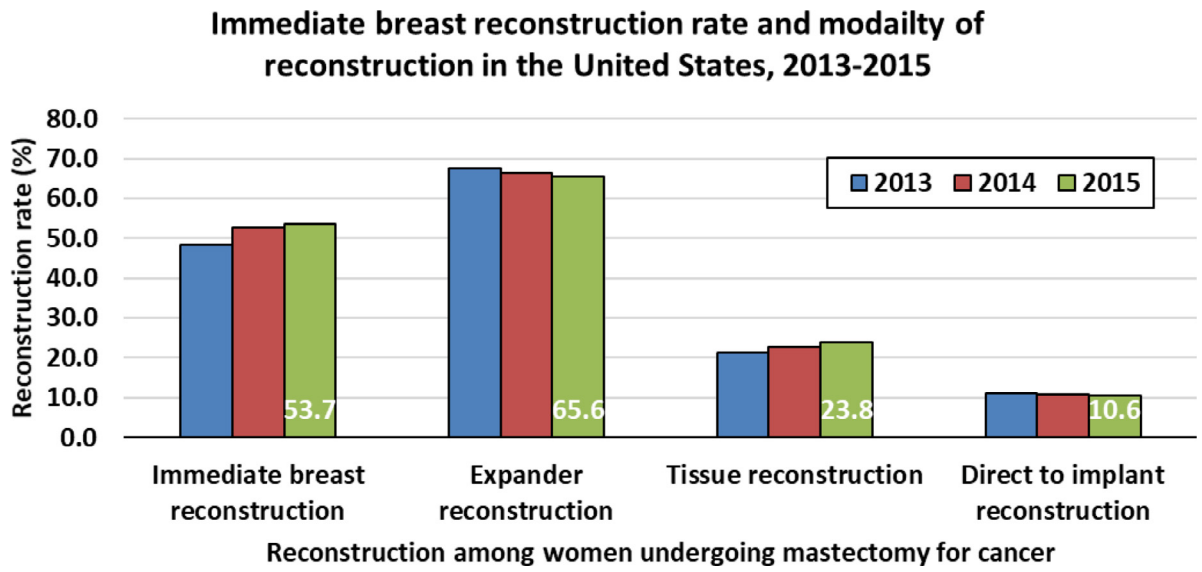

Fig. 1 Immediate breast reconstruction rate by modality of breast reconstruction.

sures to aid plastic surgeons in monitoring performance,[1] including hospital length of stay and 30-day readmission. However, few nationally representative studies have been published to estimate benchmarks for either outcome. Establishing national benchmarks could help better inform local and national quality programs. Therefore, we conducted this study to estimate national rates of hospital length of stay and readmission for women undergoing mastectomy for breast cancer.

Using the Nationwide Readmissions Databases (NRD),[2] a nationally representative collection of inpatient discharges in the United States, we identified adult aged women who underwent mastectomy for breast cancer from January 2013-August 2015. Next, we excluded discharges with two or more reconstructive procedures; where patients had metastatic disease; or where the discharge disposition was "unknown" or "death." If a patient had more than one discharge, the first was selected for study inclusion. Next, women were grouped by surgical treatment: mastectomy alone or with expander, tissue, or direct-to-implant (DTI) reconstruction. Finally, the mean hospital length of stay (days) and rate of 30-day readmission (%) was calculated. We used regression models to determine significance in trends, while accounting for differences in patient mix. To account for the complex data sampling design, we used the PROC SURVEY procedures in SAS, version 9.4 (Cary, North Carolina). This study was considered exempt by the Institutional Review Board at Wright Patterson Medical Center.

The final sample included 109,592 patients who underwent mastectomy alone (48.8%) or with expander (33.8%), tissue (12.0%), or DTI (5.5%) reconstruction. The average patient was aged 58.0 years, had Private insurance (52.7%), and underwent unilateral mastectomy (64.0%) for invasive-node negative disease (66.6%). During the study, the immediate breast reconstruction rate increased from 48.3% to 53.7% ($p<0.001$) with expander reconstructions decreasing (67.5% to 65.6%, $p = 0.003$) and tissue increasing (21.4% to 23.8%, $p = 0.002$; see Fig. 1).

The mean length of stay for the overall population was 2.3 days. In the adjusted analysis, hospital length of stay increased (2.17-2.28 days; $p < 0.05$) over the study period, which was not explained by changes in the surgical approach. Specifically, length of stay increased for the mastectomy alone group (2.02 vs 2.17 days, $p < 0.05$) and trended lower for tissue reconstructions (4.06 vs 3.84 days, $p = 0.06$). Concurrently, the overall readmission rate was 6.4% and remained stable, overall and for each subgroup ($p = 0.725$; see Fig. 2). Hospital readmissions most often occurred 14.8 days from discharge for diagnoses of infection, prosthetic complications, or cancer treatment. On average, readmissions lasted 4.5-days and generated $47,373 in charges.

From 2013-2015 in the United States, women undergoing mastectomy for breast cancer more often underwent breast reconstruction while experiencing a slightly longer hospital stay and stable hospital readmission rates. The increase in hospital length of stay was primarily seen among patients undergoing mastectomy alone. Conversely, a gradual decrease was noted in the tissue reconstruction subgroup, potentially related to early-recovery pathways.[3] While the hospital readmission rate did not increase, it also failed to decrease. By evaluating the timing, diagnoses, and rates of readmission, further quality improvement efforts could be developed to improve patient outcomes.

Additionally, the immediate breast reconstruction rate increased significantly throughout the study period and may relate to legislature initiatives, improved patient awareness, and a growing number of local advocacy efforts.[4] We found that the rate of implant-based reconstruction decreased slightly, while tissue-based reconstruction increased. This may represent a change in patient preferences and reconstructive goals, particularly as implant-related safety has been a cyclic concern over the last several decades.[5]

In conclusion, as the frequency of breast reconstruction increases in the United States, the associated rate of hos-

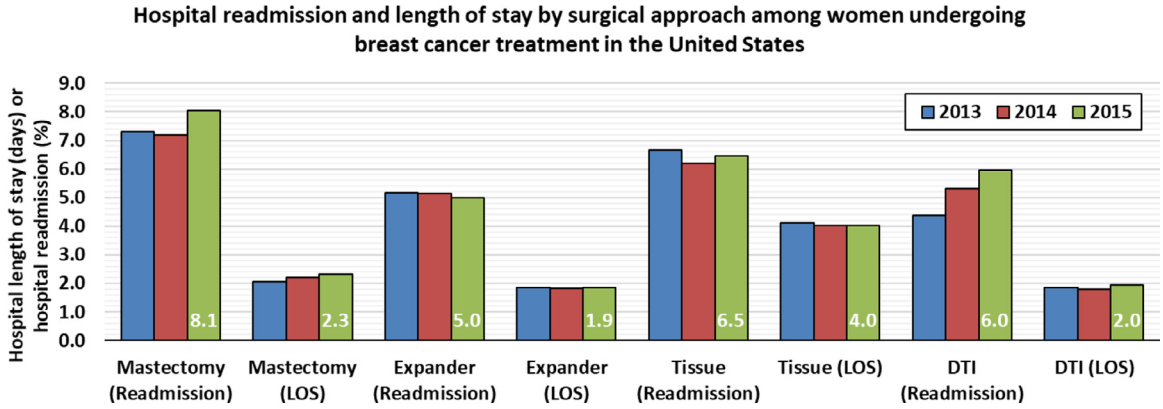

Fig. 2 Hospital readmission and length of stay by modality of breast reconstruction.

pital readmission has remained stable, while the length of stay has increased slightly. This study serves to establish baseline rates for each of these outcomes which may help inform quality improvements initiatives among women undergoing mastectomy for breast cancer.

Declaration of Competing Interest

None.

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Ethical Approval

Our study is chart review of de-identified data, but has also been approved by the IRBs of our institutions (Wright Patterson Medical Center, Wright State University)

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Pneumothorax following plastic and reconstructive breast surgery

Dear Sir,

Plastic and reconstructive breast surgery is considered a relatively safe surgical field, with low complication rates. Reports of pneumothorax and additional life-threatening adverse events are scarce in the literature.

In attempt to investigate the incidence and pathogenesis of pneumothoraces following plastic surgery of the breast, we conducted a literature search in the

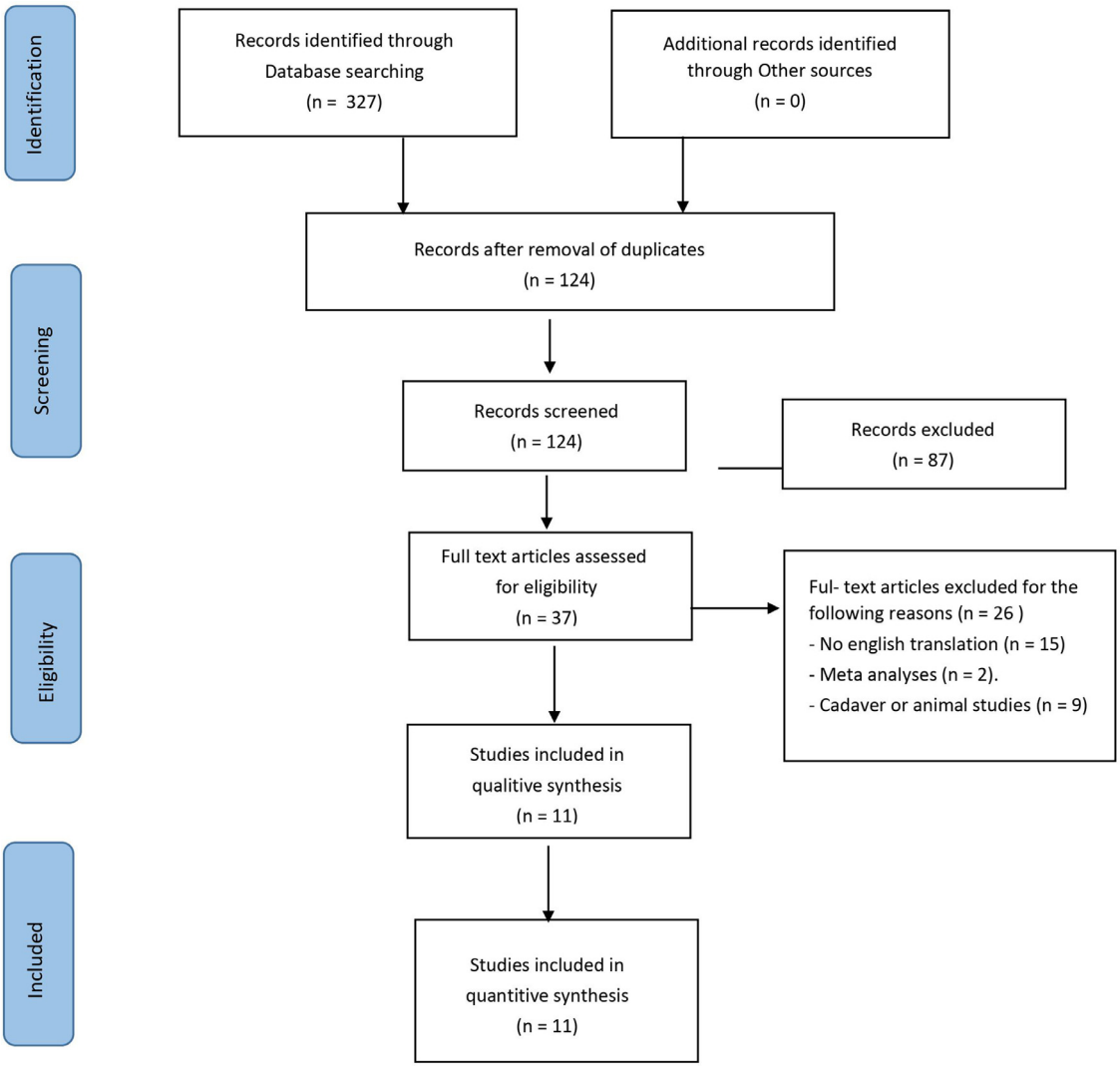

Figure 1 PRISMA flowchart outlining the study inclusion process.

databases of PubMed, Scopus, Embase and Cochrane-Library-Databases. Figure 1 depicts the search and selection process.

Eleven publications, reporting 18 cases of pneumothoraces following plastic and reconstructive breast surgery were included in this review. Data extracted from the publication is described in Table 1

To better clarify the incidence of pneumothoraces following plastic surgery of the breast, Osborn and Stevenson [1] sent a fax survey to members of the California Society of Plastic Surgeons.

The survey focused on experience with pneumothorax as a complication of plastic surgery for the breast. Analysis of responses, revealed that 30% all members have encountered one or more patients, developed pneumothorax following plastic surgery of the breast.

Following review of the literature, we propose a classification system of potential mechanisms leading to pneumothorax in breast-plastic surgery.

The first potential mechanism and the most common one, as suggested by analysis of the reviewed cases, is "iatrogenic pleural-injury": Kaye et al. [2] described a patient developing tension pneumothorax during breast-augmentation surgery with general anesthesia.

The complication was attributed to the pleural injury during infiltration of local anesthetic agent

The authors suggest that in breast-related procedures, pneumothorax may be avoided by local anesthetic infiltration of anatomic locations adjacent to the pleural space, use of a smaller-diameter needle and placement of the infiltration needle tangentially to the chest wall rather than at right angles.

A significant portion of reports on pneumothorax in plastic and reconstructive breast surgery are attributed accidental intra-operative pleural injury. The pleura was damaged either during dissection of the sub-muscular pocket,

Table. 1 Data extracted from each of the relevant publications, and subcategorized in accordance to presumed pathophysiology of injury.

Pathophysiology of pneumothorax	Number of Patients	Average age, (range)	Comorbidities	Procedure	Average time of symptoms onset, (range)	Tension or simple pneumothorax	Outcome	References
Secondary Pneumothorax	$n = 4$	47.5 years (range 38-55)	Smoking ($n = 2$)	ELD* breast reconstruction ($n = 3$), Breast augmentation ($n = 1$)	1.5 Days (range 0-4)	Simple ($n = 3$), Tension ($n = 1$)	Complete resolution	Gandamihardja et al. (2013), Pfulg et al. (2005)
Barotrauma	$n = 2$	33.5 years (range 26-41)	Smoking ($n = 2$)	Breast augmentation ($n = 2$)	3 Days (range 0-6)	Simple ($n = 2$)	Complete resolution	Fayman et al. (2005), Averick et al. (2011)
Iatrogenic Pleural Injury	$n = 12$	52 years (range 32-66)	Obesity ($n = 4$) Smoking ($n = 3$)	TRAM ($n = 1$) Tissue expander breast reconstruction ($n = 3$) DIEP ($n = 4$), Breast Augmentation ($n = 3$), Breast reduction-mammoplasty ($n = 1$)	0 Days (range 0-4)	Simple ($n = 9$), Tension ($n = 3$)	Complete resolution	Patel et al. (2010), Schneider et al. (2014), Kelling et al. (2021), Vera-Merchancano et al. (2014), Kaye et al. (1995), Marvidis et al. (2013)

*Senthilkurman et al. was not added to the table, as the cause of pneumothorax was not evaluated or discussed in the manuscript.
*Extended Latissimus Dorsi Flap.

or during preparation of the internal mammary vessels for autologous breast reconstruction.

Patel and Malata [3] describe a patient that developed pneumothorax during free muscle-sparing TRAM flap breast reconstruction. The complication was attributed to an iatrogenic pleural injury that occurred during preparation of the Internal Mammary vessels.

In addition, the authors describe the findings of previous anatomical studies demonstrating that the transversus thoracis muscle in the 3rd costal cartilage region, lies between the parietal pleura and the internal mammary vessels.

Therefore, they suggest, that during preparation of those vessels, the surgeon should be extremely careful and educated on the anatomy to avoid pleural injury. In a scenario of suspected intra-operative pleural injury, a water seal test should be performed to promptly diagnose potential pleural injury. During a water seal test, a sterile saline solution is used to fill the surgical site, and the surgical team examines the suspected site of pleural injury for air bubbles.

The second potential mechanism identified is "Barotrauma": Fayman [4] describe a case of pneumothorax following breast-augmentation procedure and propose barotrauma as a potential mechanism for the complication.

The authors attribute the complication to air trapped in the sub-pectoral pocket, which was sealed by the implant at the axillary wound. Due to the high pressure created in the sub-pectoral pocket by the advancing implant, the trapped air was forced into the pleural cavity.

Fayman [4] describe a technique of air drainage, that could potentially decrease the incidence of pneumothorax following breast-augmentation surgery.

The authors presented a prospective cohort conducted on patients undergoing breast-augmentation surgery. Intra-operatively, the authors drained the sub-pectoral pocket from air before insertion of implants. Over the course of the first 24 h following surgery, patients were assessed for pneumothoraces through serial physical examinations and chest radiographs. Of 24 patients, not a single women developed post-operative-pneumothorax

The conclusive results of the study demonstrated the utility of the air drainage technique in decreasing the incidence of post-operative pneumothorax.

The third potential mechanism identified is "secondary pneumothorax": Seven of the eighteen patients (58.3%) reported in the literature had a medical history remarkable for prolonged smoking.

Longstanding smoking, is commonly associated with the development of bullous emphysema; a chronic lung disease that is considered a risk factor for spontaneous pneumothorax.

Performing pre-operative chest imaging as a routine evaluation of patients with a history of prolonged smoking, could assist in the diagnosis of associated lung diseases and decrease the risk for pneumothorax.

Gandmiharja et al. [5] states that during procedures of extended Latissimus Dorsi (ELD) flap harvest, the patient is placed in a lateral decubitus position. The combination of the patient's position and history of longstanding smoking, cause a ventilation perfusion mismatch that can contribute to the development of pneumothoraces.

Despite commonly held believes, pneumothorax following plastic and reconstructive breast surgery is not a rare complication, and analysis of the current literature demonstrates several potential mechanisms of injury.

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Declaration of Competing Interest

declared.

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Development of guidelines for the management of patients with open fractures: The potential cost-savings of international collaboration

Dear Sir,

Open fractures can be severe life-changing events and management in a multidisciplinary setting has been advocated to optimize long-term outcomes. Clinical guidelines for the management of these injuries provide evidence-based recommendations, offering a framework that optimizes outcomes and utilization of resources, and also establishing norms for future audit and research. However, the development of these documents is a long and expensive process.

We compared the 2009[1] and 2020[2] *British Orthopaedic Association (BOA) – British Association of Plastic, Aesthetic and Reconstructive Surgeons (BAPRAS) Standards for the Management of Open Fractures, National Institute for Health and Care Excellence (NICE) 2016 Complex Fracture Guidelines*[3] and *Dutch Federation of Medical Specialists 2017 Lower Extremity Fracture Guidelines*[4] to examine on their content, recommendations, associated time investment and costs.

We found that there was extensive overlap in the topics covered by the four guidelines. For interventions that occur during the first week of the patient's journey following injury, the overlap was 89% (Table 1). Recommendations were equivalent, with differences largely confined to areas for which there is a lack of evidence and where the authors relied on expert opinion.

The AGREE II grading tool involves 7 different domains, including scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. This tool assesses the risk of bias in clinical guidelines. We found that the quality of the guidelines improved over time (Figure 1). The BAPRAS/BAO 2009 the NICE 2016 and Dutch 2017 scored higher than the BAPRAS/BAO 2009 standards. The use of systematic review protocols was an important factor contributing to this improvement, reducing the risk of bias for the included recommendations. However, higher quality and more robust methodology incurs additional expense. The cost of developing the Dutch and NICE guidelines was £60,608 and £311,434 respectively, if only the lower limb recommendations are considered. This was the sum of expenses associated with literature research, process supervision, office space, secretarial costs, catering, travel expenses, and the support of focus groups. The production cost of the BAPRAS/BOA guideline in 2009 was £20,000 and 2020 £17,252, as the two surgical associations covered organizational expenses and authors were not paid for their contribution. The publication costs were paid by private companies to cover Open Access costs. The time invested for the development of the studied guidelines ranged from 24 up to 60 months.

National guidelines on the management of open extremity fractures are relatively uncommon. For example, Italy and Spain are countries with well-established health systems that, despite considerable efforts, at present do not have their own national guideline on open extremity trauma. In 2016 the Italian Orthopaedic (SIOT), Plastic Surgery (SICPRE), Hand (SICM) and Microsurgery (SIM) Societies agreed to work together to produce an upper and lower limb open fractures guideline, using the BAPRAS/BOA 2009 document as a starting point. Unfortunately, this joint effort has come to a halt due to the lack of financial resources to cover the administrative costs of the process required by the Italian National Centre for Clinical Excellence, Quality, and Security (CNEC). In Spain, the management of these injuries varies across units. Nevertheless, some efforts for standardization have occurred, such as the participation of the Spanish Orthopaedic Surgery Society (SECOT) in the development of an International Consensus on Musculoskeletal Infections,[5] which includes open fractures. Additionally, in the absence of an interconnected major trauma network, regional ambulance services in Madrid (SAMUR), Valencia (SAMU) and Barcelona (SEM) have developed protocols for the transfer patients to the most appropriate trauma centre in their area.

Considering that more than £500,000 have been spent in The Netherlands and the United Kingdom to produce these guidelines, resulting in wide overlapping and matching recommendations, we propose that societies in other countries consider cost and time-saving alternatives. International cooperation may result in the production of high-quality

Table 1 Recommendation comparison across the open fracture guidelines. Major differences are underlined. A Cross means not described in the guideline.

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Prehospital management and transfer	X	Airway management, controlling haemorrhage, pain control, saline soaked dressings, prophylactic antibiotics, and splinting. Transport to major trauma/specialized centre.	Follow Netherlands National Protocol of Ambulance Care and Prehospital Trauma Life Support principles. Saline soaked dressings, align fractures, pressure bandage, and splinting. Transport to specialized centre.	Prehospital Trauma Life Support principles, Antibiotics, splinting, documentation of neurovascular status and saline soaked dressings. Transport to major trauma/specialized centre.
Multidisciplinary approach	Orthopaedic and plastic surgeons in specialized centres.	Orthopaedic and plastic surgeons in specialized centres.	Trauma/orthopaedic and plastic surgeons and rehabilitation physicians in specialized centres.	Orthopaedic and plastic surgeons, medical microbiologists, rehabilitation specialists in specialized centres.
Management in the Emergency Department	ATLS principles. Photographs and X-rays. Avoid wound exploration or irrigation. Antibiotics and tetanus prophylaxis. Cover wounds with saline soaked dressings and splinting.	ATLS principles. Photographs and X-rays. Avoid wound exploration or irrigation. Antibiotics and tetanus prophylaxis. Cover wounds with saline soaked dressings and splinting. Whole-body CT only in adults (16 or over) with major trauma.	ATLS principles. Photographs and X-rays. Avoid wound exploration and irrigation, remove only large (none perforating) foreign bodies. Antibiotics and tetanus prophylaxis. Cover wounds with saline soaked dressings and splint if not done previously. Administer pain relief. CT only on indication.	Photographs and X-rays. Antibiotics and tetanus prophylaxis. Avoid wound exploration or irrigation, remove only large foreign bodies. Cover wounds with saline soaked dressings and impermeable membrane, splinting. For multilevel injuries or polytrauma: head to toe CT, incl. angiogram if indicated. DVT prophylaxis.
Antibiotic administration	Within 3 h of injury, preferably co-amoxiclav or cephalosporin. Add gentamicin at time of debridement. At time of definitive fixation and soft tissue coverage administer. Continue antibiotics until soft tissue cover or 72 h.	Within 1 hour of injury, either pre-hospital or in emergency department.	As soon as possible, cefazolin is preferred. Adding gentamycin for high energy injuries. Continue until soft tissue closure or 72 h. Contact microbiologist if unusual contaminations.	Within 1 hour of injury, preferably co-amoxiclav or cephalosporin. Add gentamicin at time of debridement and continue for 24 h. At time of definitive fixation and soft tissue coverage administer single dose of glycopeptide (teicoplanin).
Wound excision (Debridement)	Within 24 h, performed by senior plastic and orthopaedic surgeon.	Immediately for highly contaminated injuries. Within 12 h for high-energy injuries and within 24 h for other injuries. Performed jointly by consultant plastic and orthopaedic surgeons.	Immediately for highly contaminated injuries. As soon as possible, ideally within 12 h by consultant plastic surgeon and trauma/orthopaedic surgeon.	Immediately for highly contaminated injuries, within 12 h for high-energy injuries and within 24 h for other injuries. Performed jointly by consultant plastic and orthopaedic surgeons.

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Table 1 (*continued*)

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Temporary wound dressings	Negative pressure wound therapy (NPWT), not a substitute for definitive wound cover. Antibiotic impregnated beads pouch.	Consider NPWT after debridement if immediate definitive soft tissue coverage is not possible.	NPWT, not a substitute for definitive wound cover. Second choice are saline-soaked gauze dressings.	Use a simple non-adherent dressing (no benefit of negative pressure dressings over conventional dressings). NPWT not a substitute for definitive wound cover.
Skeletal stabilisation	Spanning external fixation if immediate definitive fixation and soft tissue cover is not possible.	Definitive skeletal stabilisation and soft tissue cover at the same time as wound excision, if possible. Within 72 h if soft tissue coverage not possible in first instance.	Spanning external fixation if immediate definitive fixation and soft tissue cover is not possible. Intramedullary nail is the preferred fixation method.	Spanning external fixation if immediate definitive fixation and soft tissue cover coverage is not possible. Definitive internal fixation only if there is minimal contamination and if definitive soft tissue cover can be achieved immediately. Otherwise ideally within 72 h. Use multiplanar circular fixator if there is significant contamination or bone loss.
Soft tissue reconstruction	As soon as possible, within 1 week. At same time as internal fixation.	Definitive skeletal stabilisation and soft tissue cover at the same time as wound excision (debridement) if possible. Otherwise within 72 h.	As soon as possible, within 1 week. Should be performed at same time as definitive fixation.	Definitive skeletal stabilisation and soft tissue cover at the same time as wound excision if possible. Otherwise definitive soft tissue coverage within 72 h. Use local flaps only for patients with limited zone of injury.
Early amputation	Perform emergency amputation if limb is source of incontrollable life-threatening bleeding or if limb unsalvageable. Decision should be taken by two consultant surgeons with patient and family involvement if possible. Preferred amputation level is transtibial, followed by transfemoral.	Perform emergency amputation if limb is source of incontrollable life-threatening bleeding or limb unsalvageable. Decision made jointly by orthoplastic and rehabilitation team, patient and relatives. When indicated, amputate within 72 h.	Preferred amputation level is transtibial, followed by through-knee. Involve rehabilitation specialist early.	Perform emergency amputation if limb is source of incontrollable life-threatening bleeding or limb unsalvageable. Decision should be taken by two consultant surgeons (orthopaedic and plastic) with patient and family involvement if possible. When indicated, ideally amputate within 72 h. Preferred amputation level is transtibial, followed by through-knee

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Table 1 (*continued*)

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Management of vascular injuries	Immediate surgical exploration and revascularisation within 4 h. Capillary refill can be misleading. Preoperative angiography can lead to wasting valuable time.	Use hard signs for assessment and diagnosis. Do not rely on Doppler signal or capillary refill. Perform immediate surgical exploration if hard signs persist after re-alignment of limb. Do not delay surgery to obtain imaging. Use a vascular shunt to restore circulation before skeletal stabilisation.	Perform immediate surgical exploration and revascularisation. Keep ischaemia time to a minimum. Only conduct CT-angiography if distal pulses are present.	Use hard signs for assessment and diagnosis. Do not rely on Doppler signal or capillary refill. Perform immediate surgical exploration if hard signs persist after re-alignment of limb. Do not delay surgery to obtain imaging. Use a vascular shunt to restore circulation within 4 h of injury and before skeletal stabilisation.
Compartment syndrome	Surgical emergency that must be diagnosed and treated promptly. In adults, the threshold is a perfusion pressure of $<$30 mmHg. Decompression of 4 compartments via 2 incision technique.	Maintain awareness in the first 48 h post injury or surgery. Regularly assess for symptoms. Teach patients to self-monitor. Consider continuous compartment pressure measurements.	Pay attention to the development of compartment syndrome.	Surgical emergency that must be diagnosed and treated promptly. Accurate diagnosis is facilitated by serial assessment and intra-compartmental pressure measurements. In adults, the threshold is a perfusion pressure of $<$30 mmHg for 2 consecutive hours. Decompression of 4 compartments via 2 incision technique.
Degloving injury	Degloving can occur superficial to the deep fascia, extent of injury difficult to estimate. Thrombosis of the subcutaneous veins usually indicates the need to excise the overlying skin. Circumferential degloving often indicates that involved skin is not viable. Serial wound excision may be necessary.	X	X	Degloving can occur superficial to the deep fascia, extent of injury difficult to estimate. Thrombosis of the subcutaneous veins usually indicates the need to excise the overlying skin. Circumferential degloving often indicates that involved skin is not viable. Serial wound excision may be necessary. Large volume ($>$50 ml) Morel-Lavalle lesions may be better treated surgically instead of drainage.

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Table 1 (*continued*)

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Management and avoidance of complications: flap failure, bone loss, deep infection.	Necrosis, deep infection, or suspected circulatory compromise requires early exploration and revision surgery. Antibiotics should be started for suspected deep infection. Limited flap congestion can respond to leech therapy. Perform free flap anastomoses out of zone of injury. Common causes of complications include inadequate wound excision, haematoma formation, inappropriate or delayed soft tissue cover, and unstable fixation.	X	X	Reconstructive options for bone loss include autologous bone graft, distraction osteogenesis, or free vascularised bone. Infection should be managed by multidisciplinary team. Diagnosis is based on radiological appearances and bone and deep tissue sampling after stopping antibiotics. Treatment includes removal of internal fixation, aggressive wound excision, and culture-specific anti-microbial therapy. Retention of internal fixation may be considered in early infection with low virulence organisms supressed with targeted antibiotics, and closely monitored.
Open fractures in children and older patients	Wound excision and principles of soft tissue reconstruction in children are same as for adults. The use of medullary devices limited by the presence of growth plates. It is likely that patients under the age of 12 will have a shorter union time.	Use clinical judgement to limit CT to the body areas where assessment is needed. Elaborate a definitive management plan involving a paediatric orthopaedic trauma specialist within 24 h of diagnosis. Allocate a dedicated member of the staff if a child is unaccompanied. Consider the age, developmental stage, and cognitive function, and include siblings when offering support to family and carers.	X	Initial management of children is same as for adults. Fracture fixation needs to consider the presence of growth plates. Small areas of bone loss in under 6 years of age can be managed expectantly. Skeletal injuries in those aged 12 or older behave like adults. Management for older patients should include falls prevention, rehabilitation and mental health support. Coordination with primary care and social services is important. Regional anaesthesia and angle-stable skeletal fixation devices should be considered. In frail patients unsuitable for lengthy surgical procedures alternative surgical techniques may be used, incl. skeletal shortening, secondary healing and pre-conditioning of local flaps.

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Table 1 (*continued*)

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Blast injuries and mass casualties	X	X	X	The tissue damage is often greater than suggested by the size of the wound, that evolves over time. Initial surgery should be performed as soon as possible, and wound excision often needs to be repeated. Blast and complex ballistic injuries should not be closed directly, and early complex reconstruction should be undertaken cautiously. For mass casualties standard orthoplastic care pathways may need to be modified to provide a population-based approach. It may be necessary to preserve evidence for future forensic examination.
Patient centred approach and rehabilitation	X	Manage expectations and answer questions honestly, do not speculate. Provide a point of contact and ask the patient if they want someone with them. Provide information about what is happening, injuries, investigations, treatment, and time-schedules. Offer people the opportunity to see images of their injury. Give verbal and written information on the management plan.	Discuss the definitive treatment plan with the patient and relatives. Point out the possible treatment options, risks, and expected results. Start exercise therapy as quickly as possible post-operatively. Set treatment targets in consultation with patient and surgeon. Adapt exercise therapy targets over time to the requirements of the patient.	Offer psychological support to express emotions, manage pain, adjust to wounds and to mobility changes. Cognitive Behavioural Therapy can be used and referral to mental health clinicians considered. Rehabilitation should be led by a consultant in rehabilitation medicine. A rehabilitation prescription should be provided within 2 days. Weight bearing status should be documented immediately after skeletal and soft tissue reconstruction. Screen for PTSD and refer to the specialist pain team if patients develop chronic pain. Make a peri-operative pain plan before undergoing a delayed amputation. Poorly functioning patients should be referred for dynamic orthotics. Patients with high transfemoral amputations should be referred for consideration of osseointegration if not tolerating standard prosthetics.

(*continued on next page*)

Table 1 (*continued*)

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Documentation	X	Follow a structured process when handing over care and make sure this is documented. Ensure all documentation goes with the patient when transferring. The written summery contains diagnosis, management plan, and expected outcome. Send it within 24 h to the GP, write it in plain English for the patient and family, and make sure it is readily available in the patients' record.	X	Keep photographic documentation of the wound in the key stages of management in the patients' record. Document neurovascular status for both limbs: nerve function, sensibility, and motor function (MRC grading system). Presence of pulses, or how circulation has been assessed when pulses are not accessible.
Classification of open fractures	The Gustilo and Anderson grading is widely used and is relatively simple but has poor interobserver reliability and is best applied after wound excision.	Gustilo-Anderson open fracture classification is used for clarity. High-energy injuries = Gustilo IIIA and IIIB.	Classify the injury in accordance with the Gustilo and Andersen open fracture classification.	The Gustilo–Anderson classification: High-energy lower limb fractures are likely Gustilo–Anderson Type IIIA and IIIB.

(*continued on next page*)

Table 1 (*continued*)

	BAPRAS/BOA 2009	NICE 2016	Dutch 2017	BAPRAS/BOA 2020
Organisation of the ortho-plastic service	Essential components include orthopaedic trauma surgery, plastic, and microvascular surgery, with facilities for simultaneous debridement for these teams. Provide dedicated theatre sessions for the combined ortho-plastic management during the normal working day. Have access to microbiology, radiology, artificial limb fitting, rehabilitation, physical, and psychosocial rehabilitation services. Include audit of outcome as part of the care pathway. Aim to reach 30 cases per annum. Possess intensive care and other trauma facilities for the multiply injured patient.	Essential components include combined service for orthopaedic and plastic surgery in which consultants from both specialities work simultaneously to treat open fractures as part of regular, scheduled, combined orthopaedic and plastic surgery operating lists. Consultants are supported by combined review clinics and specialist nursing teams. Ensure that healthcare professionals have up-to-date training and the right skills for interventions they required to give.	The multidisciplinary team should see the patient preoperatively and make a treatment plan. Assign a primary treating physician. Make local or regional arrangements regarding the organisation of care for patients with a grade III open fracture of the lower limb and register this in a protocol.	Essential components include a joint service provided by orthopaedic and plastic surgery consultants, with sufficient combined operating theatre lists to meet timely treatment as per this guideline. There should be combined review clinics and specialist nurses to care for both fractures and flaps. There should be regular audit meetings and case data submitted to the Trauma Audit Research Network.
Measuring outcomes in clinical practice	Patient health status questionnaires such as the Sickness Impact Profile and Medical Outcomes Study Short Form-36 provide a valuable overall assessment of the patient. Other recommended outcome measures are union time of diaphyseal, complication rates and limb function scores (i.e. Enneking Score).	X	For quantification of physical functioning, six-weekly WOMAC and Short Form-36 are recommended. Return to work and quality of life are determined by personal and environmental factors.	The core outcomes are quality of life, return to life roles, walking, gait and mobility, pain and discomfort. They also should include EQ-5D-5 L and the Lower Extremity Functional Scale.

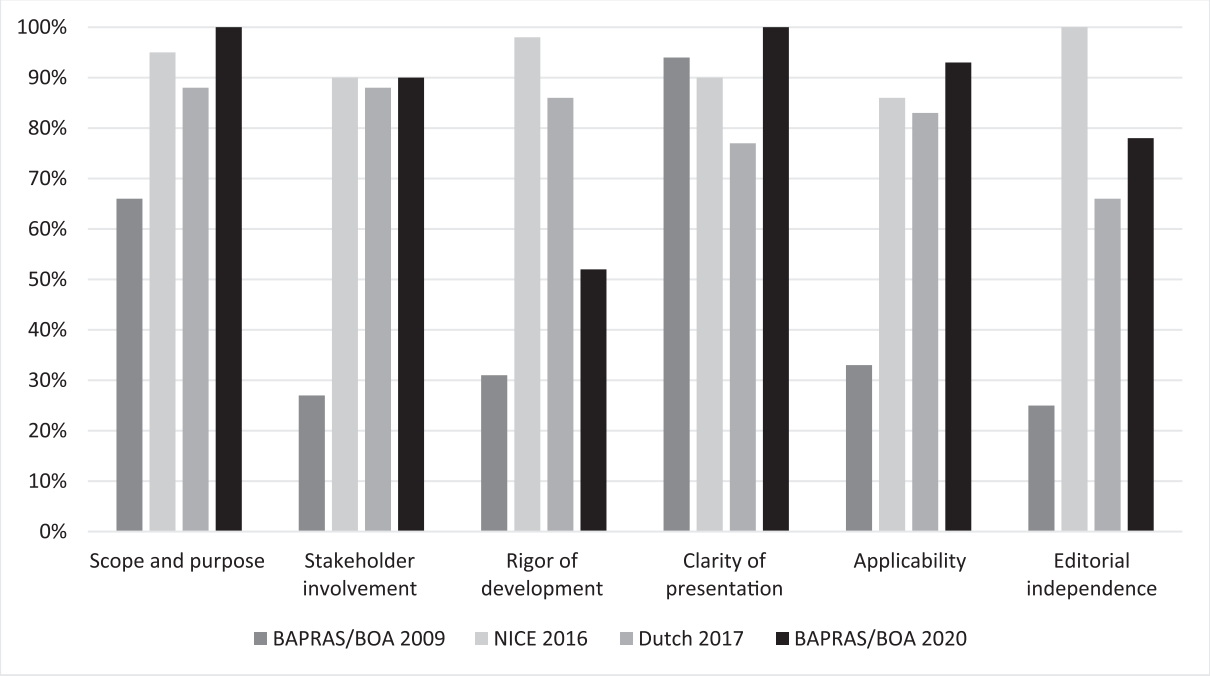

Figure 1 AGREE II scores for the open fracture guidelines. This grading tool involves 7 different domains, including scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. These are divided into 23 items rated on a 7-points Likert scale. Supplemental documents about the development were requested from the authors. Each domain was assessed in parallel by two authors in a blinded fashion (EV, KO). Consensus was reached by means of discussion with a third author (JEB). An overall score for each heading was calculated by summing individual items and converting these to percentages according to the AGREE II methodology. The grading tool can be achieved from 'www.agreetrust.org'.

guidance that could be applied across national borders once transparent methodology and aims are agreed, whilst taking into account differences in healthcare systems and structures. If available, robust previous guidelines could be used as a starting point to further reduce the time and effort associated with development of a completely new document. Different healthcare systems and availability of recourses have to be factored in but considerable costs can be saved though international collaboration, adapting existing guidelines, whilst remaining cognisant of local needs and limitations. The examples we provide from Italy and Spain illustrate the hurdles if each country tries to proceed in isolation. We should build on examples of successful collaboration such as those provided by the AO Foundation to improve for the benefit of patients with severe open fractures.

Ethical approval

N/A

Declaration of Competing Interest

Jagdeep Nanchahal participated in the development of the BAPRAS/BOA 2009 and 2020, and NICE guidelines for the management of open limb fractures. Hinne Rakhorst was part of the working committee for the Dutch guideline for open lower limb fractures. The remaining authors do not have any conflicts of interest to declare.

Funding

None.

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Reconstruction of fingertip defects with the anterograde homodigital neuroarterial island flap under local anesthesia

Dear sir,

Fingertip injuries constitute the most common injuries of the upper extremities.

Fingertip appearance and sensorimotor function are both important, disfigurement can impact mental health. Better reconstruction of a fingertip defect without replantation can be achieved by simplifying the surgical procedure and reducing the rate of unnecessary procedures. In this study, we describe our clinical experience with reconstructing fingertip defects using the anterograde homodigital neuroarterial island flap (AHNIF) under local anesthesia.

Five male patients with fingertip defects were enrolled between January 2018 and September 2019 (Table 1). Digital nerve root block anesthesia was used in all procedures. In total, 5 ml of 1% lidocaine (1.5 ml into each side of the finger root, 1 ml across the dorsal side, and 1 ml infiltrated around the flap incisions) was injected as the ring root block. The plunger of the syringe was withdrawn gently to ensure that the needle had not entered the digital artery. The flap operation began after thorough debridement. The first step was to assess the wound, including its surface area and location. The flap was designed based on the surface projection of the digital neurovascular bundle. A 3 cm zigzag midlateral incision was made proximal to the flap, to dissect the surrounding tissue that tethered the neurovascular bundle. Once the pedicle had been completely released, we confirmed that it ran into the flap and finalized the dimensions of the skin island. We readjusted the boundaries of the flap before it was incised, according to the course of the neurovascular bundle. The flap was elevated totally on the deep fascia layer or underlying flexor tendon sheath in a distal to proximal fashion. We recommend the use of microsurgical instruments to isolate the neurovascular bundle and flap, to decrease the risk of injury to the pedicle. Finally, the flap was transferred to the defect by advancing and directly suturing the donor area (Figure 1). The greatest danger during this step is excessive tension on the flap pedicle. Therefore, we relieved the tension by releasing the distal pedicle. The subcutaneous fat tissue was resected appropriately, and the finger joint was flexed to close the wound with silk sutures. The tourniquet was loosened before closing the wound to stop the bleeding and observe the blood flow to the flap.

The fingertip should be kept warm and cast splinting should be used to immobilize the flexed finger for 7 days immediately after the operation. Skin temperature and color, flap tension, and capillary refill were monitored. The dressing was changed every other day. The dressing was changed immediately if excessive blood was oozing from the fingertip. Petroleum jelly should be placed on the wound edge to prevent adhesion of the scab and pressure on the flap.

We used the approach to cover the fingertip defects for these advantages: Local anesthesia could shorten and optimize the surgical procedure, as well as produce an analgesic effect that lasts for at least 5 h if lidocaine is used.[1] which greatly improves patient comfort and safety compared with brachial plexus block. Homodigital flaps do not impair the circulation or function of the other fingers, and an AHNIF around the defect is in close proximity with the defective tissue and has an acceptable glabrous appearance that conceals invasive scars.[2] Moreover, Pedicle flap increases vascular stability, particularly in patients with a crush injury, for which the incidence of vascular problems is high.[2] Use of an AHNIF with palmar digital nerves achieves better sensory recovery in the fingertip than compared with other types of reconstruction.[3] Lastly, the AHNIF is a single-stage flap that does not require microvascular anastomosis or a long learning curve, and thus can be performed in primary hospitals by junior surgeons.

The AHNIF also has the following potential limitations. The transfer distance dependent on the flexed interphalangeal joint, and joint flexion contracture is a potential complication. The literature indicates that the longest ad-

Table 1 Patient information.

Case	Sex/Age,y	Etiology	Defect site	Defect size,cm	Flap size,cm	Combined injury	Duration of Opera-tive(including anesthesia),min	Advanced length,mm	Complication	follow-up,mon
1	Male/44	crush injury	Right middle finger	1.5 × 1.8	2.0 × 2.0	None	45	8	None	8
2	Male/60	crush injury	Left ring finger	0.8 × 1.0	1.0 × 1.0	Loss of distal phalangeal mass	38	14	None	14
3	Male/20	crush injury	Right index finger	1.0 × 1.5	1.5 × 1.5	None	44	10	None	10
4	Male/46	crush injury	Right thumb	1.0 × 1.5	1.5 × 1.5	Loss of distal phalangeal mass	42	12	None	8
5	Male/21	crush injury	Right index finger	1.0 × 2.0	1.5 × 2.0	Loss of distal phalangeal mass	52	14	None	10

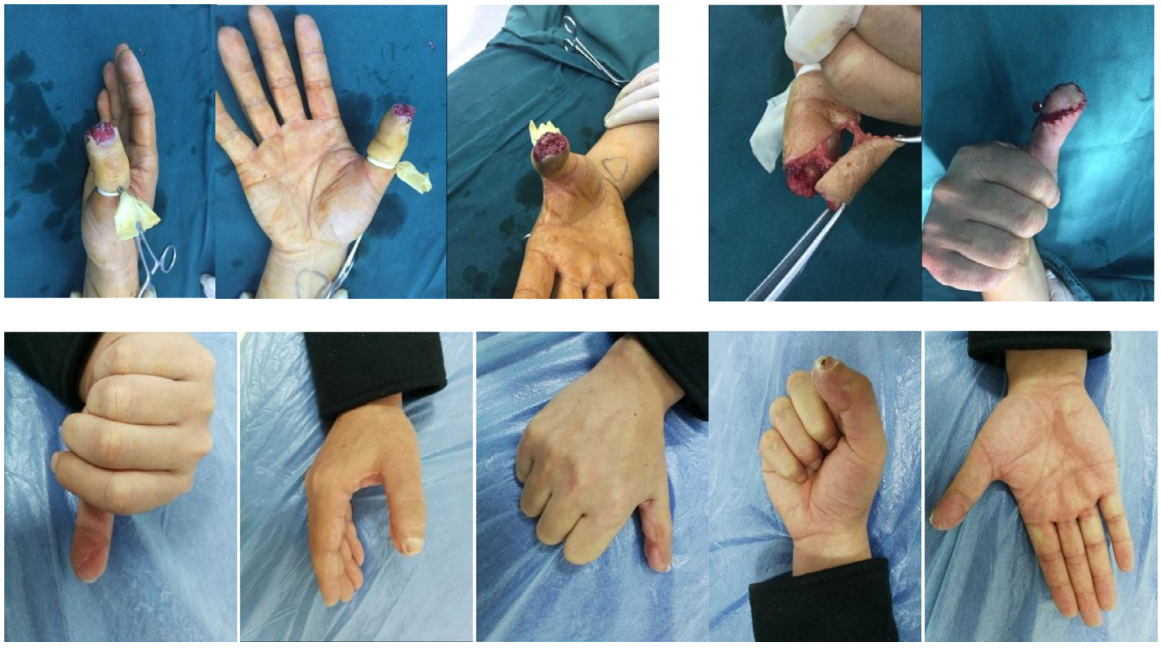

Figure 1 Preoperative defect appearance. Intraoperative flap elevation and transfer. Appearance and function 8 months after operation.

vancement flap is 30 mm, which requires extensive tissue stripping, although a 10-mm-long flap is acceptable.[4] Moreover, the AHNIF is much more suitable for transverse and lateral oblique defects if the pedicle is not over-rotated in cases of avulsion and digital dorsal injury.[5] The following precautions were taken during the operations in this study: the donor site skin was pinched to determine whether it could be closed directly, which reduced the rate of donor site complications, and the pedicle was located near the wound to reduce the risk of flap necrosis.

In conclusion, Reconstruction of fingertip defects with the AHNIF under local anesthesia is an easy-to-apply, safe and feasible first-line approach to achieve satisfactory shape and function outcomes for injured fingertips.

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Ethical approval

Not required.

Declaration of Competing Interest

None declared.

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Mohs micrographic surgery for cutaneous malignancy of the hand & upper limb – Raising awareness of its applications and advantages

Dear Sir,

Mohs Micrographic Surgery (MMS) permits margin-controlled excision of skin lesions using a staged process to ensure complete tumour resection. It has become the standard of care for management of cutaneous malignancies, with the most common being Basal Cell Carcinoma (BCC) and Squamous Cell Carcinoma (SCC). Given its ability to achieve tumour clearance and avoid unnecessary excision of uninvolved tissues, MMS is often used to manage facial skin cancers. Whilst these constitute the majority MMS practice, we wish to raise awareness of its application to other anatomical areas, specifically the upper limb and hand. Here, MMS can preserve essential tendons and nerves, but also aid in the decision-making process toward more destructive surgery, such as amputations, if necessary.

Frederic Mohs described his method of margin-controlled tumour excision in the 1930s, and his 1971 paper details numerous applications, including resection of tumours of the hand.[1] Despite this early acknowledgement of its use in the upper limb, there are comparatively few reports in the available literature for this purpose. One study describes a 10-year ($n = 57$) experience with Mohs excisions of SCC of the nail unit,[2] and another details their 5-year ($n = 27$) experience with melanoma and NMSC of the digits.[3]

Case examples

Whilst our unit has treated upper limb and hand tumours with MMS since 2012, the addition of a Plastic Mohs surgeon with a specialist interest in upper limb and hand surgery allowed for an MMS hand service to be established in 2020. Upper limb and hand tumours represent approximately 1% of our Mohs throughput, and examples of its application are shown:

Meetings/presentations: This work has not been presented wholly or in part at any meetings to date.

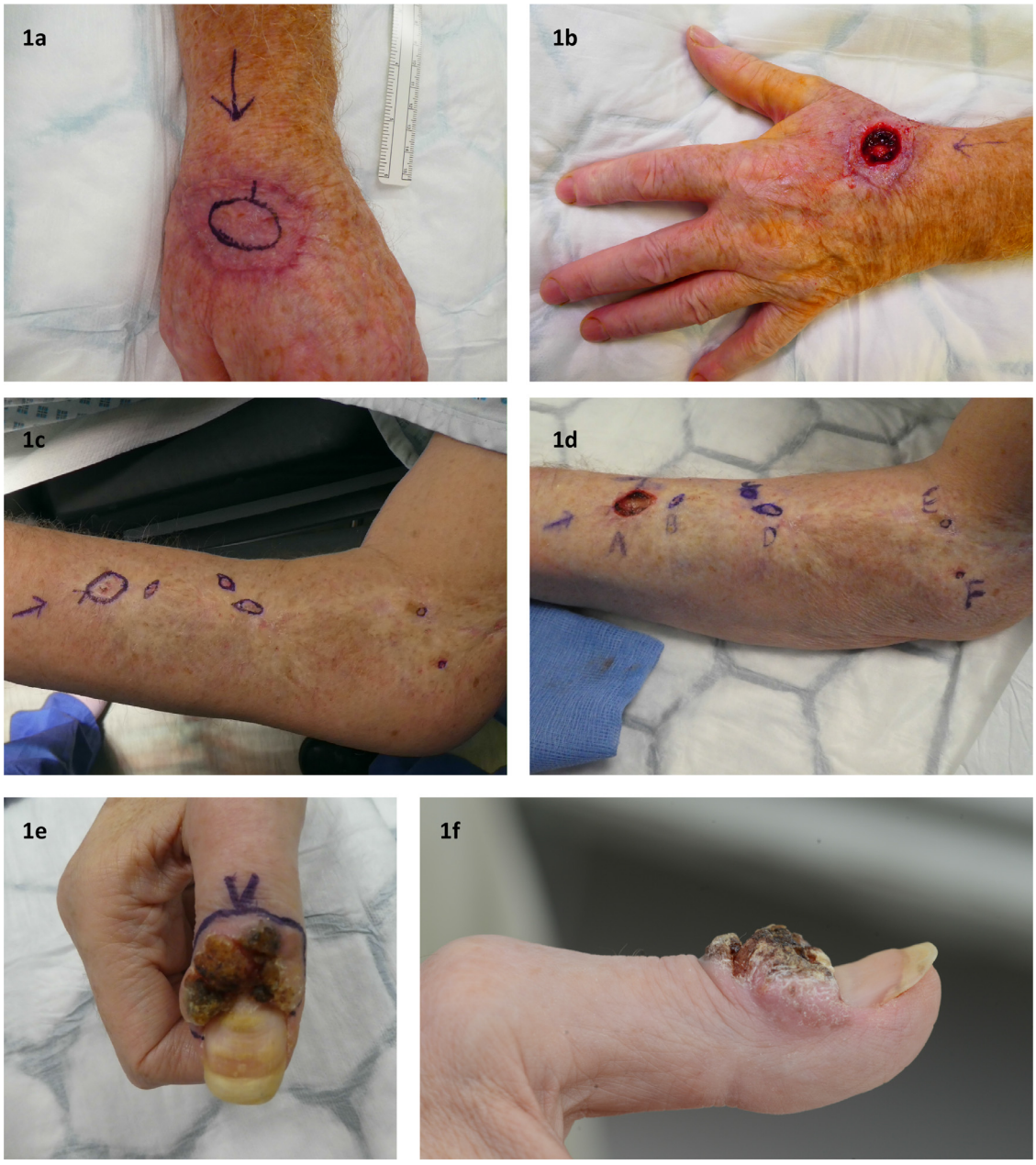

Figure 1 This figure illustrates clinical images of patients treated by the MMS hand service. Figure 1a and 1b demonstrates Case 1, showing the pre and post Mohs surgery appearance of the full-thickness skin graft overlying an incompletely excised SCC; Figure 1c and 1d demonstrates Case 2, illustrating the difficulty in identifying the BCC in irradiated skin and the post Mohs defect; Figure 1e and f shows two views of the thumb of Case 3, whose SCC invasion of deep structures mandated amputation at the interphalangeal joint.

Case 1

A 65 year-old had conventional excision of a dorsal hand SCC and full-thickness skin graft resurfacing (Figure 1a). Unfortunately, excision was incomplete centrally at the deep margin and further treatment recommended by the Skin Cancer MDT. Radiotherapy is not ideal here and conventional surgery would likely involve resection of paratenon or extensor tendon, along with the entire skin graft. He underwent MMS whereby a only a portion of his previous skin graft was excised and the wound base resected and analysed. Tumour clearance was achieved and extensor tendons preserved (Figure 1b). A second full-thickness skin graft was applied and his wound healed well. He has full range of movement of his hand with no clinical evidence of tendon adhesions, or tumour recurrence, at 12 months post-op. This case is a typical example of the margin-controlled, tissue-preserving advantages of MMS in the hand.

Case 2

A 77 year-old presented with a biopsy-proven BCC on the dorsal forearm within a large area of radiotherapy scarring. Clinical examination with light and magnification could not distinguish tumour margins from the surrounding abnormal skin (Figure 1c). Conventional excision would have required a large resection and split skin graft on the background of radiotherapy-affected tissue. MMS was performed on the area of concern permitting clearance in a single-stage (Figure 1d) and direct closure of the wound. Not only are the tissue-preserving advantages of MMS further highlighted by this case, but also more extensive resection and reconstruction, and their sequelae in an irradiated field, are avoided.

Case 3

A 62 year-old guitarist presented with biopsy proven SCC to his dorsal right dominant thumb, distal to the IPJ (Figure 1e & 1f). Amputation at the IPJ-level was recommended by the Skin Cancer MDT. The patient was understandably concerned about the influence this would have on his ability to play guitar, and his overall function. He therefore sought MMS in an attempt to salvage the distal digit. He underwent Mohs resection which demonstrated widespread tumour at the deep margin involving extensor tendon and periosteum. After further discussion, and in view of the histological findings, the patient agreed to proceed with amputation at the IPJ, permitting oncological clearance. Whilst this was not the outcome the patient was hoping for, MMS enabled him to fully appreciate and accept the extent of tumour involvement and therefore the necessity of more extensive surgery. This case illustrates the use of MMS in aiding decision-making to proceed with digital amputation, in a patient initially reluctant to accept the need for such surgery.

Summary

Whilst MMS is primarily recognised for use in facial tumours, it should also be considered to aid excision of tumours of the hand, where preservation of tissue and maintenance of function are key factors. Mohs surgery can also serve to facilitate decision making both by the patient and surgeon. This can be particularly helpful when proposing more extensive surgery, or prior to complex reconstruction where confirmation of tumour clearance is paramount.

The establishment of an MMS hand service, delivered by a surgeon with specialist upper limb resection and reconstructive expertise, has allowed our unit to provide optimal treatment, governance, and outcomes for this group of patients.

Ethical statement

No ethical approval was required for this manuscript. All patients have provided written informed consent for their images and cases to be published in medical literature.

Informed consent - All patients have provided written informed consent for their images and cases to be published

Declaration of Competing Interest

All authors declare no conflicts of interest.

Funding statement

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Recycling the keystone flap

Dear Sir,

The concept of recycling or reusing a flap is probably as old as the history of flaps itself, eg. the elegant “crane principle” of Millard[1] for transporting subcutaneous tissues. Segments of muscle flaps have been re-advanced into nearby secondary defects or become the source of a second free flap.[2] Any perforator flap can be later split with preservation of the pertinent perforator to be a pedicle for a second local or even free perforator flap.[2] In general then, any inset flap if tissue redundancy is sufficient, might benefit

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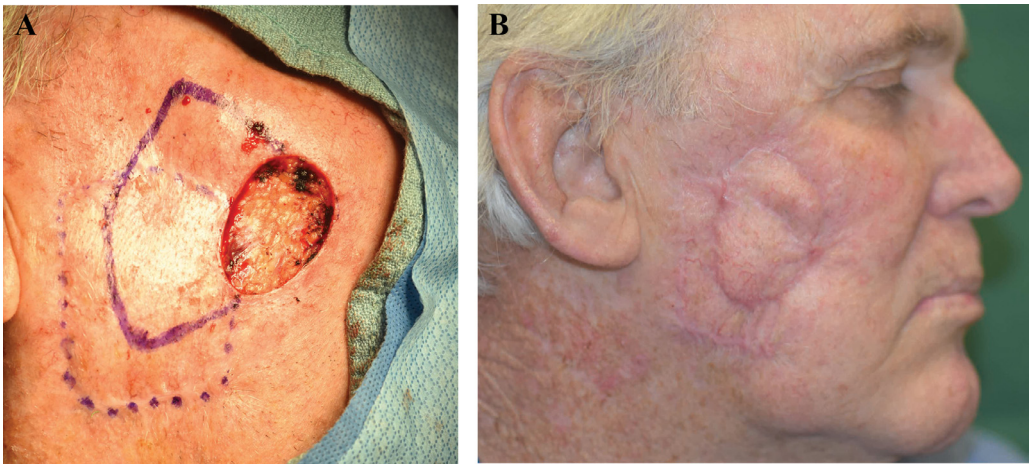

Fig. 1 (A) Scars of an original keystone flap used to cover melanoma excision site overlying right parotid gland, as accentuated by dotted line. Medial and superior to this, second Keystone flap designed to include [and thereby recycle] the upper medial portion of the first, to allow closure of defect of excision of another melanoma. (B) Result 3 months later, with no right lower eyelid ectropion nor deviation of the right oral commissure, while satisfactorily avoiding the need for a skin graft.

not only by its recontouring, but also with the simultaneous use of that excess excised tissue as a recycled flap.[3] Such a maneuver also reduces overall donor site morbidity since the need to violate any other body region for that flap is eliminated, and is the basis of the "green approach" of Sadigh, et al.[2,3] for secondary reconstructions. Sadigh, et al.[3] have even classified recycled perforator flaps into 3 types depending on the presence of a perforator, degree of its dissection, and means of flap transfer .

The Keystone advancement flap has become a popular perforator flap subtype, but no prior comments have been made on any capability specifically for its recycling. If regional donor tissues have sustained flexibility, an entire Keystone flap could then be re-harvested and moved to fill another adjacent defect, with viability sustained as the source of flap circulation would not have been disrupted. However, a secondary defect still amenable to closure with a Keystone flap may better require inclusion of only a small portion of an initial Keystone flap. This experience over the past decade with the use of 146 Keystone flaps required that option on only 2 occasions Certain provisos must be obeyed to ensure not jeopardizing viability of the partially recycled Keystone flap, emphasizing retention of sufficient circulation. Adequate donor site size and flexibility must be available. The intent should be not to undermine the deep fascia so as to preserve all available fascial perforators; but if attempted insetting is found to be restricted, minimal subfascial dissection may be necessary to release fibrous attachments as long as any perforators are carefully protected. Note that if the original keystone flap had significant subfascial dissection, the retained portion with the recycled flap may have to survive via neovascularization across any scars. In rats, new deep fascia perforators to skin flaps did not occur; but such neovascularization across scars was possible after only a week, although in humans that more likely will be months, if at all[4]. This variation of the recycled Keystone flap in its entirety would then have to depend on perforators entering via its virgin territory.

The recycled Keystone flap, since perforators are usually never isolated nor dissected, would be classified as a type II recycled skin flap per the schema of Sadigh, et al.[2] The adequacy of circulation can usually be ascertained using available smartphone thermography technology.[5] Nevertheless, recycling of a Keystone flap in any form will always require an alternative back-up option in the event final flap circulation were to prove to be compromised (Fig. 1).

Declaration of Competing Interest

None declared.

Funding

None.

Ethical approval

Not required.

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A comparison between abdominal based and inner thigh based free flaps in breast reconstruction: A single surgeon's experience

Dear Sir,

While abdominal based free flaps (ABFF) are the workhorse for autologous breast reconstruction, the challenge remains for thinner, athletic patients who desire autologous reconstruction but lack sufficient abdominal tissue, or for patients with prior major abdominal surgeries.[1-2] For this subset of patients, inner thigh based free flaps (ITBFF) offer a possible donor site to improve breast aesthetics. While previous studies have compared donor site morbidity of these two techniques, there is limited literature comparing patient population and outcomes.[3-4] The purpose of this study was to evaluate demographics, outcomes, and complications for patients who underwent breast reconstruction using either ABFF or ITBFF.

A retrospective chart review of the electronic medical record was conducted of ABFF and ITBFF for breast reconstruction performed by a single surgeon, senior author M.L., between February 2016 and May 2018. Patients were divided into three groups: ABFF, ITBFF, or bilateral reconstructions (i.e., one breast reconstructed with ITBFF and the other with ABFF). ABFF included TRAM, msTRAM, DIEP, and SIEA flaps. ITBFF included VUG, TUG, and PAP flaps. Bilateral reconstructions consisted of one of each flap type.

The specific outcomes tested included but were not limited to flap survival rates, post-operative vascular thrombosis, donor site complications, and body mass index (BMI). Patients were seen for follow-up on routine at 1 week, 3 week, 7 weeks, 3 months, 6 months, and then annually. All patients included in this study were at least 6 months post-op at the time of data collection. The dataset was analyzed via an unpaired *t*-test to determine statistical significance of difference in mean, and a chi-squared analysis for statistical significance of proportions between groups.

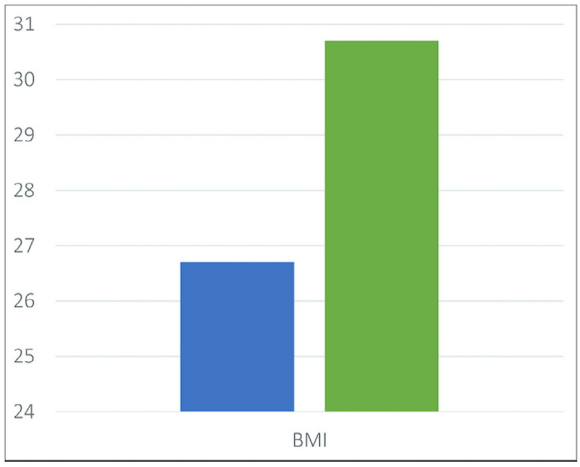

Figure 1 There was a statistically significant difference in patients' BMI (TTBFF 26.7 vs. ABFF 30.8, $p = 0.02$).

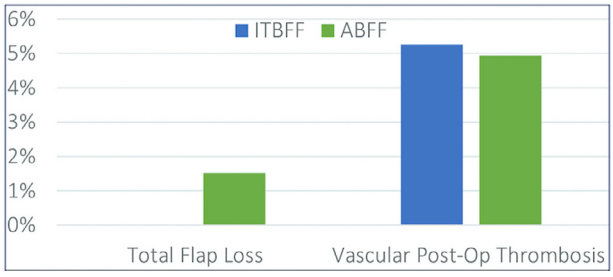

Figure 2 There was no statistically significant difference between the ITBFF and ABFF groups in flap total flap loss (0% vs 1.5%, p 0.63) and vascular post op thrombosis (4.9% vs 5.3%, p 0.95).

In total, 100 free flaps were performed in 66 patients. Nineteen ITBFF- consisting of 16 TUG flaps, 2 VUG flaps, and 1 PAP flap- were performed in 13 patients. Eighty-one ABFF consisting of 46 msTRAM flaps, 34 DIEP flaps, and 1 SIEA flap were performed in 53 patients. Two patients had a bilateral reconstruction consisting of one of each flap type.

There were no differences between the two groups with regards to age, smoking status, diabetes mellitus, or radiation history. Of note, there was a statistically significant difference in patients' BMI (ITBFF 26.7 vs. ABFF 30.7, $p = 0.02$, Figure 1).

There were no differences between groups with respect to vascular post-operative thrombosis (ITBFF = 5.3% vs. 4.9%; $p = 0.98$, Figure 2). Of those in the ABFF group, one patient experienced complete flap loss and one patient experienced partial flap loss. No patients in the ITBFF group experienced flap loss. There were no statistically significant differences between ABFF and ITBFF with regards to total flap loss (ITBFF = 0% vs. ABFF = 1.5%; $p = 0.63$, Figure 2).

There were no differences in rates of post-operative complications such as infection, seroma, hematoma, partial necrosis, hernia, pulmonary embolism, and deep vein thrombosis. There was, however, a higher incidence of donor site delayed healing among the ITBFF group (ITBFF 42.1% vs. ABFF = 13.6%, $p = 0.004$).

This study demonstrates both ABFF and ITBFF are safe surgical options with minimal donor site morbidity for patients undergoing autologous breast reconstruction. Although ABFF remain the "workhorse" flap for breast reconstruction by providing a reliable donor site and an abundance of vascularized soft tissue for medium to large sized breasts, this may not be a viable reconstructive option for all patients. ITBFF provide well-vascularized tissue for breast reconstruction particularly for patients who are thinner and prefer smaller breasts, as reflected by the significantly lower BMI seen in our study.

Donor site delayed healing was found to be higher in ITBFF likely due to an attempt to harvest larger flap volumes and aggressive beveling with wider skin paddles. These complications can be minimized, however, with smaller volume harvest, less aggressive posterior beveling, and thigh compression with strict post-operative precautions (especially in sitting position). Other technical consideration to mitigate donor site complications include diagonal skin flap design, using double flaps for a breast when larger volume is required, and avoiding major lymphatic collectors.[5] Preoperative evaluation for peripheral vascular disease, severe venous insufficiency, history of deep vein thrombosis, or any suspicion for lymphedema is also important in determining patient candidacy for ITBFF.

Complication rates may vary from surgeon to surgeon depending on one's level of expertise and the frequency with which they perform the procedure. More ABFF (81) were performed compared to ITBFF (19), which is consistent with our institution's flap selection protocol, where abdominal donor sites remain the default and preferred choice for flap harvest in the majority of patients. For women who do not have adequate abdominal tissue or who have had previous abdominal surgery, an inner thigh based free flap should be considered.

Declaration of Competing Interest

None.

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Ethical Approval

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Split skin-subcutaneous resurfacing technique for Apert hand reconstruction

Dear Sir,

During finger reconstruction in Apert hand, inadequate skin and soft tissue coverage at bone and joint area might happen due to severe bony fusion, abnormal anatomy, tight skin and less soft tissue pliability. In this study, we propose the "Split Skin-Subcutaneous Resurfacing (SSSR) technique" to increase the area of soft tissue coverage in Apert syndactyly separation. Details of this technique are explained as follows:

1. Preoperative marking with zigzag incision on both sides of the syndactylous digits to share the skin for each finger.
2. The mirror image zigzag incision (shown as "dot-line") is planned for the second layer of dissection for subcutaneous fat layer (Figure 1).
3. Superficial layer (skin) is dissected under sub-dermal plane along the zigzag incision (shown as "dense line").
4. Deep layer dissection is performed under subcutaneous fat plane along zigzag "dot-line" incision to create a second-layer soft tissue flap from the opposite finger.
5. Bi-layer soft tissue flap prepared by SSSR technique is ready for coverage of both fingers, especially in areas of vital structures such as bone, joint and tendon (Figure 2).
6. Full-thickness skin graft is then used to cover the top of the subcutaneous fat flap.

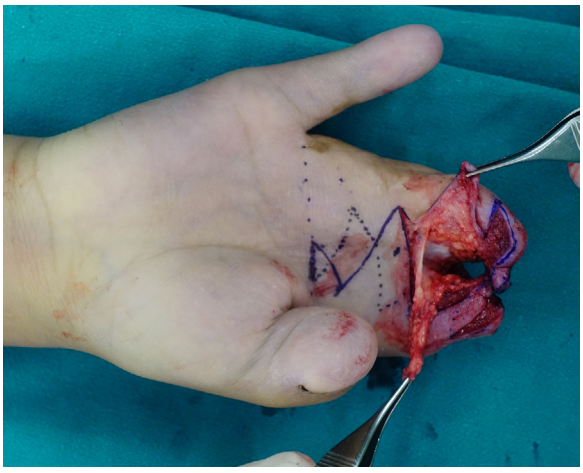

Figure 1 Preoperative marking with mirror image zigzag incision. Superficial layer (skin) is dissected under sub-dermal plane along "Dense line". Deep layer dissection is performed deep to subcutaneous fat along "Dot-line".

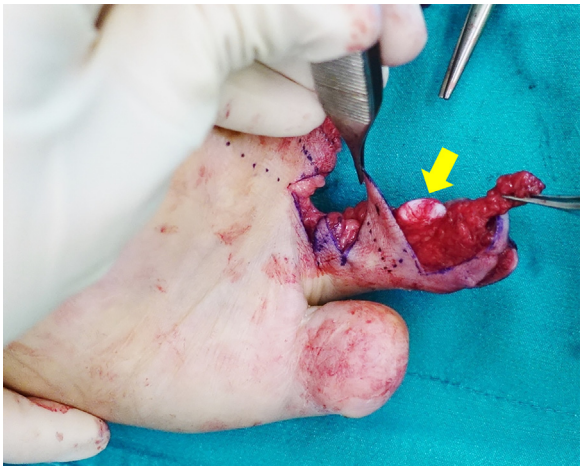

Figure 2 Bi-layer soft tissue flap prepared by split skin-subcutaneous resurfacing technique is used for coverage of vital structures such as bone, joint and tendon. The "Arrow sign" shows exposed cartilage area in Apert syndactyly separation.

A total of 5 Apert patients (9 hands) were included in this study. Four patients were operated on in both hands and 1 patient was operated on in the right hand. In this series, there were type 1 Apert hand (described by Upton) in 3 patients (5 hands), type 2 in 1 patient (2 hands) and type 3 in 1 patient (2 hands). Typically, the first web is reconstructed by dorsal rotational flap from dorsal skin. Finger web (2nd- 4th web space) were reconstructed by dorsal rectangular flap design to create adequate web space. Soft tissue coverage of index to small fingers were resurfaced with the SSSR technique. Result of this technique from retrospective medical charts were reviewed. Quality of the surgical scar was rated by the Vancouver scar scale in terms of vascularity, pigmentation, pliability and height of the scar. Web creep was also graded as described by Withey.[1]

A total of 40 fingers from 20 finger web releases (5 patient, 9 hands) were reconstructed by the SSSR technique. With this technique, no vital structures were exposed. All skin flap areas were healed without areas of skin necrosis. A total of 36/40 fingers (90%) that were covered by split subcutaneous flap and skin graft were healed at 3 weeks without complications. There were 4/40 fingers (10%) that had partial skin graft loss. However, these areas were healed within 6 weeks by local wound care and oral antibiotics without the need for re-operation or re-grafting.

For long-term results, the mean follow up period was 4.40 years (range from 29 years). According to the Vancouver scar scale, the scar appearance of these 40-finger areas that were resurfaced by SSSR technique showed normal vascularity, mixed hypo- and hyper-pigmentation, yielding pliability and scar height of less than 2 mm (average score 0 for vascularity, 2.08 for pigmentation, 2.04 for pliability and 1.04 for scar height, respectively). From 20 finger webs, all finger webs had some degree of creeping (grade 1: 15/20, grade 2: 2/20, grade 3: 3/20, no grade 4 web creep). All patients were able to use their reconstructed hand for holding large objects, picking up small objects, holding pencils for writing or drawing and could perform bi-manual functions such as holding a book or playing with a smartphone. There were no children who complained about pain (average faces pain rating scale = 0/10) and all parents and family were satisfied with the overall result of the surgical treatments (average VAS satisfactory score = 9/10).

Split skin-subcutaneous resurfacing (SSSR) technique can increase the area of soft tissue coverage for syndactyly separation by separating between the skin and subcutaneous layers. A well-planned incision and meticulous dissection to prepare the bi-layer flap are required prior to proceeding to bone separation. Blood supply of these bi-layer flaps can be explained by the concepts of adipofascial flap dissection previously proposed by many authors.[2-4] Blood supply of the skin layer in this flap comes from sub-dermal plexus. While blood supply for adipofascial layer comes from the branches of the digital artery and subcutaneous vein.[5] Since adipofascial tissue has high mobility and is flexible enough to cover the defect, this technique should be adapted for use in Apert syndactyly reconstruction. Moreover, another benefit of split skin and subcutaneous layer is the ability to redistribute subcutaneous fat during resurfacing of the finger and finger contouring for a more balanced shape. In conclusion, SSSR technique can increase the area of soft tissue coverage and reduce the risk of vital structure exposure in Apert syndactyly separation. This technique is a less complex procedure with low morbidity and yields acceptable short and long-term outcomes.

Conflicts of interest and source of funding

For all authors in this manuscript none were declared.

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Ethical approval

The Institutional Review Board (IRB) of the Faculty of Medicine, Chulalongkorn University approved this study (certificate of approval No.1304/2019, IRB No.654/62).

Declaration of Competing Interest

None.

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The microtia questionnaire study should include Chinese patients with microtia

Dear Sir,

Congenital microtia has a great impact on the physical and psychological development of patients.[1] At present, the main treatment for severe microtia is auricle reconstruction.[2] Recently, we read the published study by Angelo A Leto Barone and Thomas G W Harris on influential factors when considering reconstruction and post-operative outcomes: a survey of microtia patients and parents.[3] The authors followed up 98 volunteers. Among them, 28 underwent auricle reconstruction and 70 did not. And autologous reconstruction (AR) was performed in 17, porous polyethylene (PPE) in 10 and osseointegrated implants (OI) in 1. After analysis, the authors concluded that PPE was more effective in auricle reconstruction and that patients with microtia were more likely to choose PPE for auricle reconstruction. However, based on our experience in treating patients with microtia, we do not agree with the authors' findings.

Figure 1 The auricle framework made of autologous costal cartilage.

Firstly, the social media platform on which the researchers conducted the survey was Facebook™. It is well known that few people use Facebook™ to communicate in China. However, in China, a large number of patients with microtia undergo auricle reconstruction surgery every year.[4] The microtia questionnaire study, which excluded Chinese patients with microtia, had significant patient selection bias.

Secondly, only 28 of the 98 patients surveyed had undergone auricle reconstruction. Moreover, patients undergoing auricle reconstruction surgery used three kinds of auricle framework materials: autologous cartilage, PPE and OI. The sample size in the study was small and uneven. In Table 1 presented by the authors, only the comparison of patient satisfaction rate showed statistically significant, while the comparison of post-operative complications and the comparison of negative feelings and behaviors showed no statistical difference. It is notrigorous to judge PPE to be better based solely on the results of the satisfaction rate comparison.

Finally, in non-reconstructed patients, the authors should first find out whether they have a comprehensive understanding the advantages and disadvantages of AR, PPE and OI. In disregard of this premise, the conclusion obtained in the study that non-reconstructed patients are more likely to choose PPE for auricle reconstruction is misleading to readers.

In contrast to the conclusions of the authors, in China, most patients choose to use autologous costal cartilage for auricle reconstruction.[5] The main reason is that patients using autologous costal cartilage do not experience material rejection. The plastic surgeon can perfectly present the subunits of the reconstructed ear with the auricle framework made of autologous costal cartilage, and the ear reconstructed with the auricle framework made of autologous costal cartilage is basically the same as the contralateral ear (Figure 1). In addition, the plastic surgeon will use skin dila-

tors to expand the skin of the mastoid area before placing the auricle framework, thus increasing the skin area covering the auricle framework and reducing the incidence of complications such as auricle framework exposure. Therefore, we hope that the authors can include Chinese patients with microtia in their study, so as to obtain more scientific and rigorous research conclusions.

Funding

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Ethical approval

Not applicable.

Declaration of Competing Interest

None.

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Comparison of non-surgical correction of a neonatal ear anomaly using two different commercial ear molding devices

Dear Sir,

With the introduction of commercial auricular molding devices, non-surgical ear correction for neonatal auricular deformities have become popular and commercialized ear molding products are becoming more diverse. However, because there are no studies comparing different types of commercial ear molding devices, the knowledge of the characteristics of each product may be necessary for patient consultation and for the selection of the product. This study aimed to compare the impact of two different types of commercial ear molding devices.

In this prospective study, 76 ears from 51 patients (less than 12 weeks of age) diagnosed with a congenital auricular anomaly were randomly assigned to two groups: one undergoing correction with EarWell® (Becon Medical Ltd, Naperville, IL, USA) and the other with BabyEar®(Linktech Korea Ltd, Seoul, South Korea)(Figure 1). This study was approved by the local institutional ethics review board of Pusan National University Hospital, Busan, South Korea (Ethics Committee Decision no: 2007-024-093). At the first visit, the auricular anomaly was classified into one of the following five types before splinting: cryptotia, prominent ear, lop ear, constricted ear, and Stahl's ear. Splinting was initiated at the first visit (see Video 1, 2. Supplemental Digital Content 1, 2 that demonstrates the technique of auricle correction using EarWell® and BabyEar®) to our clinic under the decision of the caregivers, and our planned follow-up schedule was 2, 4, 6, 8 weeks, 3 months, and 6 months after the initiation of splinting. From 4 weeks after initiation, the doctor and caregivers discussed whether or not to continue splinting, until the auricle reached the desired shape. If skin problems such as skin irritation or ulceration were observed, the splinting was stopped. If 8 continuous weeks of splinting failed to achieve the desired shape, splinting was discontinued to prevent skin problems. The two groups were compared for aesthetic outcomes, caregiver satisfaction, complications and time required for device application. The mean age at the initiation of correction was 19.1 $\pm$ 13.7 days. Classification included 20 prominent ears, 19 constricted ears, 18 lop ears, 12 ears with cryptotia, and seven Stahl's ears. This investigation was completed for 72 ears from 48 patients with the exception of three patients (four ears) because of follow-up loss. Splinting was conducted in 36 ears using the EarWell® system and in 36 ears using the BabyEar® system. The age at the initiation of auricular splinting was not significantly different between the groups (18.8 $\pm$ 13.4 days in the EarWell® group and 19.3 $\pm$ 14.2 days in the BabyEar® group; $p = 0.889$). Aesthetic results showed no statistically

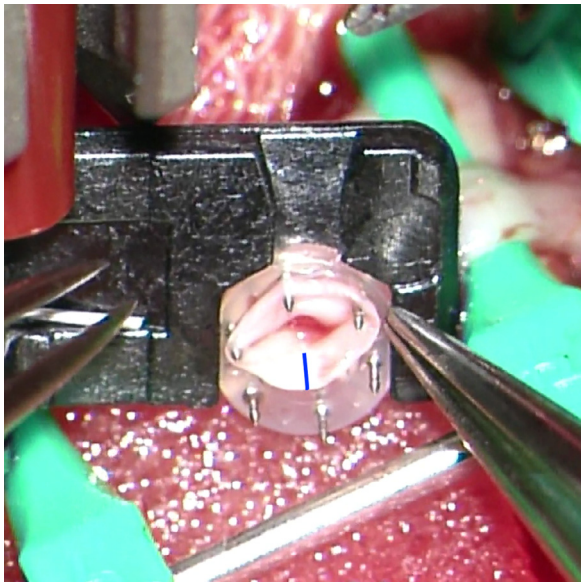

Figure 1 Two different ear molding systems. A) The EarWell® infant ear correction system. B) The BabyEar® system.

significant differences between the two groups for all types of deformities.(Supplementary material 1,2) The mean time required to place the device onto the patient was 366 (± 47.3) seconds for the EarWell® and 262 (± 36.3) seconds for BabyEar®, which was statistically significant ($p = 0.03$). Minor complications such as skin problems were found in two ears treated using EarWell® and in one ear treated using BabyEar®. The recurrence rate, indicating a change in the rate of good outcomes between immediately after the procedure and 6 months after the procedure, was 11.1% in the EarWell® group and 11.2% in the BabyEar® group, and this difference was not statistically significant.

When the ear molding technique was initially introduced, a flexible, rounded splint was placed in the scaphal hollow to define the antihelix and to act as supporting struts.[1] Similarly, Earbuddies™ (EarBuddies Ltd, London, UK), which is similar in material and shape to the BabyEar® in this study, commonly follow this classic technique.[2] Besides these correction methods, since Byrd developed the EarWell® system, many studies have used it, with a success rate of over 90%.[3,4] Therefore, it would be meaningful to compare the traditional ear correction system (BabyEar®) with one of the most popular current correction systems (EarWell®). These two systems are different in shape but have the same purpose to transform the deformed auricular cartilage into the desired shape. The overall correction results between the EarWell® and BabyEar® systems were comparable. However, the two systems differed in several aspects. While BabyEar® generally does not need hair shaving, EarWell® needs cutting of the hair to attach the adhesive surface. This is why it took a longer time to apply the EarWell® device. In terms of price, BabyEar® was cheaper than EarWell®; BabyEar® was less than half the price of EarWell® in South Korea. Cost is one of the important factors when choosing an ear correction device. Although it was not the subject of this study, the EarWell® device was advantageous for correcting conchal cartilage deformity using the conchal former of EarWell®, whereas it is not easily corrected by the BabyEar®. Technical difference also exists: The technique of Earwell® is relatively easy. In other words, you can place the retractor and conchal foamer according to the manual. However, Babyear® has a simple shape, which means that you have to customize it according to the shape of the deformity, and this requires more skill and experiences. The structural simplicity of Babyear® and the absence of its own stickers, unlike Earwell®, provide the advantage of longer application without the purchase of additional device, even if corrections are required for more than 4–6 weeks.

In conclusion, through this study, patients and doctors may make choices based on the characteristics of each device.

Ethical approval

This study was approved by the local institutional ethics review board of Pusan National University Hospital, Busan, South Korea (Ethics Committee Decision no: 2007-024-093).

Declaration of Competing Interest

None.

Source of funding

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2021.08.032.

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Analysis of various distortions in selfies due to differences in smartphone models

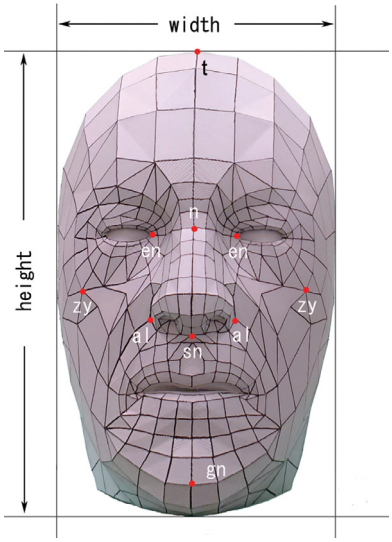

Fig. 1 Anatomical landmark of cross point. nasion (n), gonion (gn), midcolumellar point (sn), alar points (al), lateral zygoma point (zy). The maximum width and maximum length of the contour were set to the facial width and facial height, respectively, and the top edge point was set as top (t).

Dir sir,

'Selfies', which are photographs taken by and of oneself using a smartphone or other similar mobile devices, have become widely popular along with social media networking services [1]. According to a previous study, a selfie is a distorted self-portrait [2,3], and inner conflict between the selfie image and the real self motivates individuals to undergo aesthetic surgery [4]. With such a large number and variety of smartphone models with various features currently available in the market, it is hard to specify either the type of distortions in the selfie images or where they are noticeable.

In this study, we examined where the distortion is particularly noticeable and whether the differences in features between these smartphones affect the degree of distortion.

Using the free data, a life-size 3D polygonised head model was created by a 3D printer (Creator3, APPLE TREE Co. Ltd., Osaka, Japan). Next, primary surface processing was performed, and the boundary of the polygon was painted with a marker to complete the object (Fig. 1).

Two photographs of the object were captured using front-facing and rear-facing cameras of two different smartphones from a distance of 70 cm, which is the average arm length. A photograph taken using a single-lens reflex digital camera, with a 35 mm focal-length lens, from a distance of 2 m was used as the control image. These photographs were taken by ten plastic surgeons.

Landmarks were marked at each intersection, as shown in Fig. 1. Assuming the zy-zy widths are the same, various distances were measured using ImageJ [5], and each index was evaluated and compared.

The significance of differences was assessed using multiple comparisons after a Kruskal–Wallis test. All analyses were performed using SPSS version 27 for Windows (SPSS Inc., Chicago, IL), and *P* values less than 0.05 were considered to indicate statistical significance.

Fig. 2 shows superimposed images in which the polygon edges have been extracted with the assumption that the zy-zy values were the same. In addition, the actual representative photographs are shown in Supplemental Figure 3. As seen from these figures, the photos of the single-lens reflex camera and the rear-facing camera overlap without much deviation; whereas, in the case of those of the front-facing camera, the width reduced, the lower part was stretched in the vertical direction, the upper part contracted, and the shooting range had narrowed.

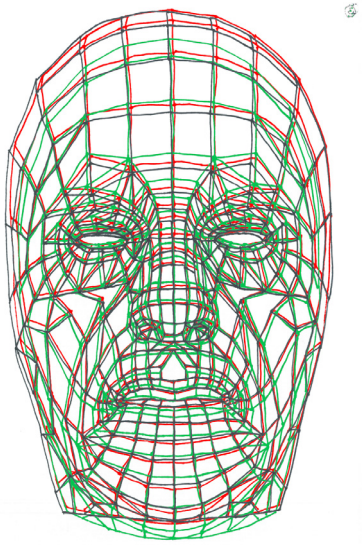

Fig. 2 Superimposed images with assuming zy-zy were same. single-reflex lens (black line), rear-facing camera (red line), and front-facing camera (green line).

The results of comparison of each index value are shown in supplemental Figs. 4–10.

There were no significant differences between the height/width index of the control photograph and that of the two photographs taken with the rear-facing cameras of the two smartphones. In contrast, significant differences were observed between the height/width index of the control photograph and that of the two photographs taken with the front-facing cameras of the two smartphones (supplemental Fig. 4).

Similar to the height/width index, the other indices, such as the n-gn/zy-zy, n-t/n-gn, zy-zy/al-al, zy-zy/en-en, and al-al/en-en, also showed the same results. The n-sn/al-al index was the only exception, which exhibited different results, and significant differences were observed when the results of the control and phone #1 rear-facing camera were compared to those of phone #2 rear-facing camera. No significant differences were found in the comparison of other groups.

Pictures taken with a camera have two types of distortions: perspective distortion and distortion aberration.

Perspective distortion is related to the distance between the camera lens and each point. In a portrait image, the part of the nose closest to the camera was extended, and the part of the face farther away from the camera was compressed. According to mathematical model, selfies increase nasal size by approximately 30% compared to an orthographic projection [2].

The distortion aberration is related to the camera lens. In a smartphone, a comparatively wider-angle lens, is used in the front-facing camera than in the rear-facing camera, thus enabling the user to shoot a wide angle view at a short distance. The feature of wide-angle lens used for front-facing camera is that the image magnification decreases with increasing distance from the optical axis.

This is called barrel distortion, and the distortion appears in the middle of the focal length range of the lens and is worst at the wide-angle end of the range. Our results suggested these distortions.

In conclusion, selfies are a distorted self-portrait in which the forehead gets shortened, the midface and lower part get stretched and appear to be long. Plastic surgeons involved in aesthetic surgery must be aware of these distortions and be cautious while dealing with patients who wish to look better in selfies.

Declaration of Competing Interest

None.

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Ethical Approval

N/A

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjps.2021.09.064.

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Challenges in mid-nasal vault management: Spreader graft or spreader flap?

Dear Sir,

The internal nasal valve (INV) is typically the narrowest portion of the nasal airway and is formed by the junction of the upper lateral cartilage and the nasal septum.[1] Collapse of the nasal valve is often responsible for significant nasal obstruction and is associated with deficiencies in the lateral nasal wall structural support. Congenital, trauma or iatrogenic etiologies can constrict the INV area.[1,2] Dorsal hump reduction and medialization of the lateral nasal wall for addressing the open roof and over-resection of the lower lateral cartilage in reduction rhinoplasty can compromise the INV angle. [2,3] Several rhinoplasty techniques have been described for midvault reconstruction with the aim to achieve the best possible aesthetic and functional outcomes. [1-5]

Spreader grafts (SGs) have long been constituting the standard technique for reconstructing the INV after reduction rhinoplasty and were first described by Sheen in 1984.[1,3] These grafts are positioned between the upper lateral cartilage and the dorsal septum, strengthening the lateral nasal wall and enlarging the INV angle. However, this technique is not without its disadvantages as it is considered time consuming, it requires cartilage harvesting and entails the risk of nasal dorsum widening.[1,2] A new procedure called spreader flap (SF) or autospreader technique has been introduced in the last years gaining attention among rhinoplasty surgeons, although SFs history roots back to 1950s. The main principle of the SF technique is the folding of the upper lateral cartilages over themselves and securing with sutures to the dorsal septum. However, several modifications have been described until now.[1,4] Upper lateral cartilage acts as a substitute for the SG, thereby having the advantage of avoiding cartilage harvesting.[1,4]

The functional outcome of a rhinoplasty can be assessed using objective methods, such as rhinomanometry, acoustic rhinometry, endoscopic images of nasal valve. Additionally, subjective methods, such as the Nasal Obstruction Symptom Evaluation (NOSE) questionnaire and the Visual Analog Scale (VAS) score, can evaluate the improvement or not of nasal obstruction symptoms after surgery. Furthermore, aesthetic postoperative improvement or patient's satisfaction can be assessed by means of subjective evaluation methods, such as the VAS score, the Rhinoplasty Outcome Evaluation (ROE) questionnaire or another satisfaction questionnaire regarding the aesthetic outcome.

Until July 2020, there have been 5 studies comparing the effectiveness of SFs vs SGs (Table 1).[1-5] In both SG and SF groups was shown improvement in rhinomanometry[1,3,5] and NOSE[2,4] score, respectively. All studies compared the effectiveness of the two techniques regarding the functional outcome. No significant difference in functional outcomes between SF and SG technique was proven in four[1-3,5] of the five studies. Moreover, Eldeeb et al. did not report differences between the two techniques concerning the functional outcome.[4]

As for aesthetic patient's satisfaction after the rhinoplasty, two[2,4] out of five[1-5] studies compared SF and SG techniques. All studies showed that more than 68% of the patients were satisfied with the postoperative appearance of their noses. Hassanpour et al. reported similar satisfactory results between the two groups.[2] However, Eldeeb et al. showed that the SG technique had a better aesthetic outcome compared with the aesthetic outcome of the SF.[4]

Both SG and SF techniques seem to be effective either after dorsal hump removal or not, by improving objective or/and subjective measures to a clinically significant level in both patient groups.[1-5] As for aesthetic outcomes, level of dissatisfaction seems to be low in both groups.[2,4] Although, SF have been proposed as an alternative to SG technique with the aim to minimize limitations such as dropping of the graft in the mucoperichondrial pocket or future graft displacement, this novel technique is not without its issues. Specifically, surgeons find difficulty in achieving optimal dorsal width and trouble with addressing the lower third of the dorsum as folding of the ULC fails reach and cover the anterior septal angle as compared to the SG.[2]

To conclude with, both SG and SF play a valuable role in the preservation and reconstruction of the mid-nasal vault offering satisfactory functional and aesthetic results. Further randomized-controlled studies with larger sample sizes and long-term follow-up are needed to assess the outcomes of SF technique in rhinoplasty with both subjective and objective methods and establish its long-term reliability.

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Table 1 Characteristics of studies addressing the use of spreader flaps and spreader grafts.

Study	Country	Design	Patients (no.)			Assesment tool	Outcome	Last vist (m)
			Total	SF	SG			
Hassanpour et al. [2]	Tehran, Iran	clinical trial	50	25	25	Rhinomanometry, Aesthetic satisfaction questionnaire	Sig. improvement in each group & no sig. differences between groups in functional outcome about 60% complete or partially satisfied with aesthetic outcome in each group	1
Sowder et al. [1]	Salt Lake City, USA	retrospective study	26	13	13	NOSE	Sig. improvement in each group & no sig. differences between groups in functional outcome	6
Rezaei et al. [5]	Mashhad, Iran	randomized clinical trial	30	15	15	Rhinomanometry	No sig. improvement in each group & no sig. differences between groups in functional outcome	3
Zeid et al. [3]	Cairo, Egypt	RCT	40	20	20	Rhinomanometry	Sig. improvement in each group & no sig. differences between groups in functional outcome	6
Eldeeb et al. [4]	Saudi Arabia	RCT	32	16	16	NOSE, Aesthetic satisfaction questionnaire	No sig. improvement in each group in functional outcome SF group: 68,8% complete or partially satisfied SG group: 93,8% complete or partially satisfied Sig. difference in SG group	6

SF: Spreader Flap, SG: Spreader Graft, *m*: months.

Ethics

No ethical approval was required.

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Bridging the gap for aesthetic training amidst the Covid-19 pandemic

Dear Sir,

Aesthetic surgery is a key component of the plastic surgery syllabus in the United Kingdom which covers a vast array of aesthetic procedures which are examined on both components of the intercollegiate Fellowship of the Royal College of Surgeons (FRCS) Plastic Surgery examination. Many techniques used in aesthetic surgery overlap with reconstructive techniques used in the National Health Service (NHS) and it is therefore vital that trainees have opportunities to enhance and develop skills in this area.[1,2]

Both the Plastic surgery trainee association (PLASTA) and the British Association of Aesthetic Plastic Surgeons (BAAPS) play an active role in education and ensuring aesthetic training opportunities are provided at a national level. BAAPS have held regional aesthetic training days (RATDs) since 2014 to cover modules on the aesthetic syllabus, with some deaneries making it compulsory for trainees to attend.[2] On a more local level, some UK deaneries incorporate an aesthetic rotation as part of their training programme.[3] These deaneries should be commended on taking a proactive role in ensuring high quality aesthetic training is delivered and this should be a goal for all UK deaneries.

Unfortunately, the Covid-19 pandemic hit the aesthetic industry particularly hard. Both the American Society of Plastic Surgery (ASPS) and the International Society of Aesthetic Plastic Surgery (ISAPS) called a halt to all aesthetic procedures during the first wave of the pandemic.[4] This had a direct knock-on effect for aesthetic training. This issue was exacerbated further when the UK government introduced the concept of "social distancing" and "lockdown" which led to the cancellation of RATDs and face-to-face educational courses.

"Out of adversity comes opportunity"
Benjamin Franklin

This lack of aesthetics training fuelled the enhancement of virtual learning platforms to meet the needs of plastic surgery trainees. Although virtual teaching sessions were already being delivered prior to the Covid-19 pandemic, the use of this platform rapidly accelerated on a global basis. PLASTA were successfully delivering educational webinars via Zoom® the previous year and plans were in place to collaborate with BAAPS to expand and incorporate aesthetic topics.[5] When the WHO declared a global pandemic in March 2020, followed by the cessation of all aesthetic operations and cancellation of aesthetic training courses, the time was right to take aesthetic training to a new 'virtual' level, with greater reach than ever before and at no cost to the learners.

The collaboration between PLASTA and BAAPS led to the production of a virtual training series which took the place of the RATDs. The first series covered breast surgery and body contouring and was delivered in 3 parts in June 2020. Following the success of the first series and ongoing government restrictions a second 4-part series was delivered in October 2020. This covered Head and neck aesthetics, including; otoplasty, rhinoplasty, brow lift, upper and lower blepharoplasty. The third instalment was a 2-part series in February 2021 to complete head and neck aesthetic topics from the FRCS syllabus, including; face and neck lifts, facial lipomodelling and lip lift.

This virtual aesthetic training series was successfully received by all levels of plastic surgeons and trainees throughout the world with an average of 451 people attending each part of the first series. Only a third of learners were based in the UK and Ireland. This global reach is testament to the quality of speakers, the content, the method of delivery and a clear need for such high-quality teaching in aesthetic surgery across the world. This virtual platform also opened up these teaching opportunities to a wider range of training levels. Just over a third of attendees were plastic surgery registrars who are usually the *only* attendees at the RATDs. Surprisingly, there was a high rate of consultants (24%), junior doctors (24%) and medical students (5%) attending.

Feedback was significantly positive with an average score of 4.8/5 for the academic content across the first series. Relevance of the subject averaged 4.7 and organisation achieved scored 4.8. Written feedback was very supportive and positive with encouraging comments commending BAAPS and PLASTA for providing "very interesting and insightful educational seminars". The enthusiasm from attendees led to the development of the subsequent series which was also highly attended.

Although these collaborative virtual aesthetic teaching sessions have been relevant and an effective means of learning in preparation for the FRCS Plast, they are not a substitute for hands on aesthetic experience and operating. They are merely a means of 'bridging the gap' until the aesthetic industry normalises in the wake of this pandemic. The Joint Committee for Surgical Training (JCST) and the Speciality Advisory Committee (SAC) need to ensure UK trainees are advocated for and highlight the need for the incorporation of aesthetic training into the recovery plans for the aesthetic industry to protect the future of our speciality.

Declaration of Competing Interest

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Focused solutions for medical student engagement in plastic surgery

Dear Sir,

Over the past 25 years, representation of plastic surgery in the undergraduate curriculum has declined steeply from 78% in 1986 to 13% in 2017[1].

In 2020, PLASTA (Plastic Surgery Trainees Association) organised a national medical student plastic surgery essay competition which encouraged the UK undergraduate body to identify solutions that could achieve greater medical student engagement in plastic surgery. We collate and summarise these solutions here, providing a strategy to tackle the decline in plastic surgery undergraduate education (Table 1).

Teach

Integration in medical schools

A UK-based study suggests that opportunities to interact with plastic surgeons in educational settings has the most influence on students choosing this career[2]. Lectures delivered by plastic surgeons on undergraduate topics, such as skin cancer, breast cancer, trauma care, burns and congenital paediatric conditions, could provide excellent opportunities for medical student interaction. These lectures could fit within existing multi-disciplinary teaching models. For example, skin cancer lectures may be delivered by plastic surgeons, dermatologists and pathologists; trauma care lectures may be delivered by A&E doctors, orthopaedic surgeons and plastic surgeons. Improved integration between medical schools and plastic surgery departments would demonstrate the value of our speciality to undergraduate students.

Plastic surgery undergraduate days

The BAPRAS Undergraduate Day (UPRAS) is consistently popular with undergraduates, often attracting those who already have interest in the speciality. To improve wider engagement, it could be run virtually in parallel with local undergraduate departments, with each unit breaking off for practical workshops with local surgical teams. One-day events such as these have previously shown to positively impact student interests in plastic surgery[3].

Early clinical exposure

Early clinical exposure for medical students is an opportunity to learn core skills such as wound management and instrument handling. Not only are these skills essential for all doctors working in general surgery, emergency departments, primary care and beyond, they would also aid appropriate and efficient referrals to plastic surgery in the future. This has the potential to benefit not only students with an interest in plastic surgery, but also the wider medical community[4].

Shadowing schemes

Since 2016, University College London (UCL) Surgical Society's Shadowing Scheme has provided approximately 220 students with theatre time in a speciality of their choice[5]. Plastic surgery is the third most popular speciality and provides an excellent way for pre-clinical students to explore theatres in a preferred speciality with 91.5% of participants in pre-clinical years[5].

Electives

Students can gain greater exposure to plastic surgery during a more focused placement without distracting from competing learning requirements. This allows more time for students to hone their surgical skills, increase surgical knowledge, and further develop their career interests.

Mentor

Mentorships and positive role models play a vital role in attracting medical students to a career in surgery[6]. Medical schools could introduce formalised mentoring schemes to complement mentoring events run by trainee-led surgical societies, such as PLASTA. Conferences could provide novel face-to-face speed-mentoring activities for students.

Empower

Student surgical societies

Organising simulation events may seem challenging and daunting to students without guidance. The British Orthopaedic Association provides guidance on how to run a medical student conference. PLASTA could provide a similar advice page and expand upon this further by including event ideas, support and a contact email for the local PLASTA representative. Advice could include: the top 10 tips for organising a successful event, how to simulate plastic surgery techniques on different tissues, and instructional videos and printouts of basic plastic surgical skills such as tendon repair, Z-plasty and local flaps.

Collaborate

Plastic surgery quality improvement collaborative

A quality improvement collaborative can benefit departments and provide a stepping-stone for students who want to get involved in research. The PLASTA Junior Sub-Committee could pick a topic each year for a national quality improvement collaborative for students. Interested university societies could sign up to the collaborative and aid recruitment of medical students for data collection in local units. Informative webinars could help prepare medical students for this, for instance: "What is an Audit?"; "Collecting Data"; "How to Make a Poster" and "Top Tips for Oral Presentations and Common Questions".

Research

The long summers in the early years of medical school provide opportunity for laboratory research. Students may contact local research leads, or obtain research experience in a structured way through intercalated degrees. Many intercalated degrees provide modules related to the speciality, as well as projects that fall within its wide scope.

The Reconstructive Surgery Trials Network (RSTN) is the national trainee research collaborative for plastic surgery. It focuses on conducting large-scale, multi-centre, collaborative projects that can inform high-quality research and ultimately improve the evidence base for plastic surgery. Many RSTN projects are suitable for undergraduates to get involved in, and will result in on-the-ground clinical research experience, presentations, and publications.

Represent

A plasta medical student sub-committee

Each year, PLASTA could elect one student representative from each university to advertise PLASTA and national plastic surgery events, engage with local university surgical societies to incorporate plastic surgery in their events, and act as a link with the local plastic surgery unit and the PLASTA regional representative. The "Surgical Skills Conference" organised by Queen's University Belfast Surgical Society in February 2020 involved practical workshops across multiple surgical specialties, including; Plastic Surgery, Orthopaedics, General Surgery and Neurosurgery.

Incorporating plastic surgery into this event provided students with exposure to this speciality at an early stage. Excellent feedback was received by attendees, commenting particularly on the opportunity to learn more about various sub-specialties that they otherwise would not routinely experience as part of the undergraduate curriculum.

Declaration of Competing Interest

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An analysis of publication trajectory in plastic surgery across the decades

Dear Sir,

Between the 1970s and 2000s, the publishing rate in plastic surgery journals more than doubled.[1] In recent years, this rapid increase has continued to surge, mostly due to an exponential increase in the proportion of contributions by authors from the United States.[2-4] With the rapid evolution of the field of plastic surgery and the accompanying increased contributions to research comes the challenge of documenting changes in both research trends and significance of academic productivity. One of the methods used to evaluate academic and research productivity is the publication trajectory of an individual or group of academicians. Since the 1950s, the typical, or canonical, academic trajectory has been described by a rapid increase followed by a slower decrease in research productivity, leading to a plateau later in one's career.[5]

While it is clear that research and innovation are important facets of a career in academic plastic surgery, the overall publication trajectory has not yet been described. Additionally, it is unclear whether the trajectory remains stable across decades. As such, we sought to visualize the publication trajectory per decade for surgeons certified from 1980 to 2010, and characterize and quantify the changes in publishing trends across different generations of surgeons.

Using a list of plastic surgeons board-certified between 1980 and 2010 obtained from the American Board of Plastic Surgery (ABPS), we identified all surgeons who had a minimum of 10 publications on PubMed. We recorded number of publications per year for each surgeon, starting 10 years prior to board certification (to include medical school and residency) and ending in 2020.

The overall publication trajectory, represented by median number of cumulative publications per year, was graphed for each decade (Figure 1). The most complete career is that of surgeons from the 1980s, for whom the trajectory demonstrates a steep publication trajectory with a gradual slowing of publishing rate with eventual plateau near the end of career (year 47). This is consistent with the previously described canonical trajectory in academia, and appears to persist in the 1990s. Starting with the 2000s, the overall trajectory and rate of publication becomes accelerated at the 15th year of career. This phenomenon is further accentuated in 2010, with an earlier onset of acceleration near year 8.

We observed a notable evolution of the publication trajectory amongst surgeons from successive generations. Most

The present work has not been presented at any meeting, wholly or in part.

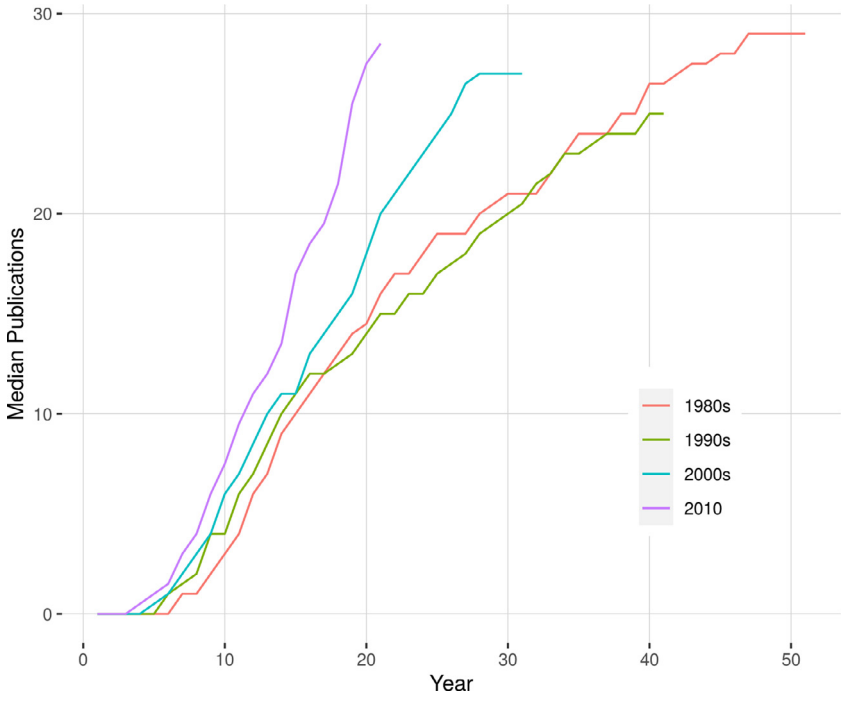

Figure 1 Overall publication trajectory for each generation of plastic surgeons, depicted by median number of cumulative publications per year. Year 10 represents year of board certification.

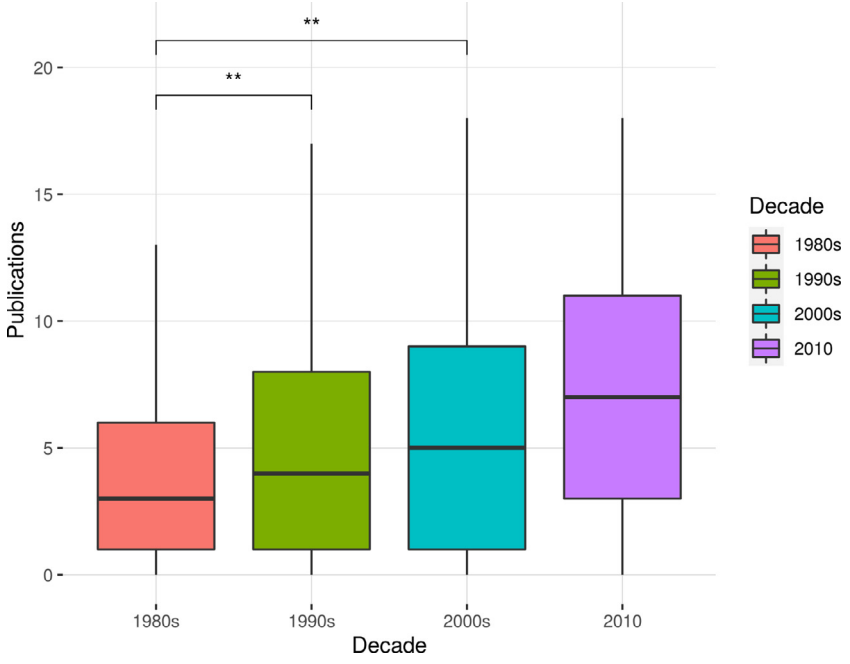

Figure 2 Number of cumulative publications achieved at year of board certification (10th year of career) for surgeons from 1980 to 2010. **= $p < 0.01$, significant at the 95% confidence level.

strikingly, as decades progressed, the publication arc began earlier in a surgeon's career and was steeper (reflecting greater rates of publication), and surgeons became more productive overall. This transformation may be due to several factors, including (1) the movement towards integrated plastic surgery residency programs in the 2000s; (2) an increase in the volume of open access journals; and (3) the proliferation of subspecialty training and innovations, all of which have been associated with increased publication rates.

The trend for early-career publication is further elucidated in Figure 2, which depicts generational changes in the average number articles published in a surgeon's first 10 years of career. Kruskal–Wallis with Post-Hoc analysis identified a significant difference in the mean number of publications across each decade ($p < 0.01$), with the greatest

differences between the 1990s and 2000s vs. 1980s (7 and 8 vs. 5, respectively, $p < 0.01$). While the average number of publications was similar between the 1990s and 2000s ($p = 0.44$), it is clear that there is a notable trend for increasing number of publications by the time a surgeon becomes board certified. This tendency appears to continue into the 2010s.

As evidenced by these findings, there is clearly a trend for increasing number of publications achieved at an earlier stage in career. This notable increase in early publication achievement is likely driven by the requirements of matching into an integrated plastic surgery residency. Plastic surgery continues to be one of the most competitive specialties within medicine, and research productivity is consistently cited as an important factor in candidate selection and successful matching.

The present findings raise several questions, including whether there are multiple trajectories that make up the overall arc within each decade and whether these are consistent across decades. While our research sheds light on the ever-increasing demands of matching into plastic and reconstructive surgery residency, it begs the question of whether this is sustainable for future generations of medical students, especially with the United States Medical Licensing Examination's recent decision to transition Step 1 score reporting to a pass/fail outcome. Indeed, there is growing concern that this change will result in programs placing even greater emphasis on research productivity as a means to assess candidates. This would result in an inherent disadvantage for students who are unable to complete a research fellowship, and for those who attend a medical school not associated with a plastic surgery residency program or which has limited research funding and opportunity.

Ethical approval

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Declaration of Competing Interest

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Technology will never replace hands on surgical training in plastic surgery

Dear Sir,

In plastic surgery, technology has vastly evolved and has been a useful adjunct allowing the new era clinicians to perform operations that were not possible before. In addition, technology now allows greater and more efficient delivery of medical education; from online lectures, webinars and books to three-dimensional anatomy applications and virtual reality platforms.

The previous traditional thought of "see one, do one, teach one" is now going out of fashion and considered unsafe. In the current climate of reduced working hours, demand for accountability and medico-legal issues, there is an increase in demand for simulation training. Furthermore, with the new surge of COVID 19, technology has consolidated its significant role in our lives. Being unable to attend face to face teaching sessions, limitation to access and staff in theatre has led to a clear shift in simulation and online teaching.

Virtual and augmented reality surge in surgical training could be a new future for the junior surgeon. Studies in laparoscopic skills show that trainees that have been exposed to virtual reality laparoscopic training were faster and were more careful at preserving tissue than their counterparts who received no training.[1] Similarly, robotics in plastic surgery is gaining traction as they help with mastering complex anatomy. Tanaka et al. has created a VR Web-based 3D cleft lip educational tool to review incisions and reconstructive steps.[2] A Cochrane review of randomised controlled trials concluded that students who had access to

virtual reality applications in robotic suturing were more efficient and demonstrated better performance than students who didn't.[3]

Technology, however, emulates parts of the patients' journey but does not teach the whole story. Classroom teaching does not always translate into the day-to-day life of a doctor and competence does not always translate into confidence. Studies comparing traditional cadaveric teaching to simulation-based teaching do not take into account the students' understanding of anatomy or their exam grades in the subject. Their main outcome focus is the students' preference which is not an objective measure of the effectiveness of the teaching methods.[4]

Operation-based virtual reality training could be a good adjunct of learning steps involved in a procedure, however, cannot emulate human factors in the operating theatre. Operating theatres are high-stress environments with a unique set of team dynamics. Professionals from a multitude of specialities with different goals and training, working in a closely coordinated fashion, provide a number of opportunities for suboptimal communication and errors arising from cognitive biases, poor interpersonal skills and substandard environmental factors. These environmental factors such as clutter, congestion, poor lighting, noise and temperature while performing an intricate procedure where maximal focus is required, have shown to have a negative impact on surgical performance. Furthermore, the operating surgeon must take into account the skill set and of their staff. Lack of knowledge of the procedure and fatigue of the assisting personnel can shift the team dynamics, lengthen a procedure and lead to adverse events. Technology creates a safe learning bubble were all emulations follow a predictable course.

Plastic surgery remains one of the most demanding surgical specialities. The combination of advanced anatomical knowledge and creative dynamic thinking in the operating theatre requires a surgeon who can work well under stress, adapt learned techniques and at times convert non-functional normal anatomy to functional abnormal anatomy. Furthermore, a plastic surgeon is required to think in "four dimensions" because they need to envision the tissue changes with healing in time. This is a unique skill acquired by hands-on plastic surgical training, which cannot be replicated by technology.

Current technology in the National Health Service (NHS) has been proven to not be used efficiently and causes delays. Simple functions such as waiting for the computer to load in order to access patient data can cost millions every year. It is estimated that if all doctors waited 10 min every day for their computer to load, it costs the NHS £143,285,208. This is equivalent to 0.11% of the total NHS budget.[5] This is a cost that we unconsciously consume on a daily basis and could potentially be used to improve current technology before employing new ones.

The patient journey begins from their first symptoms and incorporates their visit to the hospital, assessment by clinicians, investigations and treatment. These events are key learning opportunities for junior doctors, introducing them to compassion and critical thinking which form the basis of our decision making. It is difficult to teach or emulate this process without real patient contact.

The advances in technology have developed the speciality of plastic surgery, making us safer clinicians and streamlining our daily practice. Technology can serve as a good adjunct in clinical care, however, it would cannot replace the hands-on experience that is needed to be a skilled operator, communicator and leader.

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COP26 and the climate crisis: How can plastic surgeons do their bit?

Dear Sir,

The 26th United Nations Climate Change Conference (COP26) has cast a harsh light on the role of governments in curbing global warming. As plastic surgeons, this is a good time to reflect on our role in climate change. There are opportunities to make carbon savings at every point in the patient journey; preoperative, perioperative and postoperative. We write with our own strategies for reducing CO_2 emissions in plastic surgery in the hope that this will stimulate reflection, debate and change amongst the readership.

Patient travel accounts for 5% of NHS carbon emissions and is thus a rich area for potential carbon savings. Increased use of telemedicine during the COVID-19 pandemic has revealed that it can be deployed effectively to list patients for skin cancer operations whilst avoiding preoperative patient journeys.[1] Locally, we have reduced patient journeys by developing a same-day local anaesthetic 'see and treat' service for simple trauma. We estimate that this saved 1.9 tonnes of CO_2 in its first year (data presented at The British Society for Surgery of the Hand Annual Conference 2021).

Wide-awake local anaesthetic no tourniquet (WALANT) operating has flourished during the pandemic as a way to streamline hand trauma services.[2] WALANT can significantly reduce the environmental impact of hand surgery compared to general anaesthetic lists. Anaesthetic gas consumption accounts for 42% of all surgical carbon emissions in the NHS.[3] In addition, a reduction in anaesthetic consumables (endotracheal tube, oxygen tubing, bougie etc.) significantly reduces plastic waste.

When anaesthetic gases are excluded, energy consumption accounts for 58% of carbon emissions in theatre.[3] This includes temperature regulation, laminar flow and lighting. Other sources of avoidable waste in the operating room are single-use items and excess packaging: just one example of this in plastic & hand surgery is the concerning increase in individually wrapped screws. The 40% of our trauma workload managed through our see and treat service are operated on under field sterility in a dedicated procedure room which is less energy-intensive than a dedicated theatre and produces less waste.[4]

Three minutes of hand washing uses approximately 20 litres of water. The use of alcohol-based water-free scrub can reduce water waste and the energy needed to provide hot water. These preparations can be impregnated with emollients to reduce the risk of dermatitis from repeated hand washing.

Some post-operative care can also be delivered remotely. Although our hand therapy service has remained largely face to face, there is evidence predating the pandemic that remote hand therapy may be appropriate after a range of procedures.[5] Certainly, remote follow-up after skin cancer excision is now widespread for many types of lesion. Dressings are a great source of expense and waste in plastic surgery. Most dressings come individually wrapped in non-recyclable packaging and are non-biodegradable. Opting for products that require less frequent changes, for example by employing dressing materials that incorporate silver and / or have greater absorptive capacity, would potentially reduce the resource impact of dressing materials as well as patient travel frequency.

To conclude, we have suggested a range of interventions at preoperative, perioperative and postoperative phases of the patient journey designed to reduce carbon emissions. Shared innovation can help all of us become more sustainable surgeons.

Abbreviations: COP26, The 26th UN Climate Change Conference; WALANT, Wide-awake local anaesthetic no tourniquet.

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Reusable surgical drapes in Plastic surgery: What is the sticking point?

Dear Sir,

As a response to the ongoing climate crisis the NHS has committed to net zero carbon emissions by 2040. Switching to reusable products will be key both in this endeavour and in reducing single-use plastic waste, while also alleviating pressure on supply chains during a pandemic. There are several papers demonstrating reusable gowns to be of higher quality, more cost-effective and less energy intensive than single-use gowns.[1,2] It follows that reusable surgical drapes could yield similar benefits with some evidence for their cost-effectiveness.

A sticking point for drapes and gowns is that surgeons may prefer single-use over reusable under the assumption that they offer greater sterility and reduce the risk of surgical site infection. However, given the climate emergency we must apply rigorous scrutiny to our practice and examine the evidence base. In plastic surgery, sterility is perhaps most paramount in breast implant cases, where much effort has been invested in reducing sources of contamination, such as Adams et al's 14-point plan.[3] Notably there is no recommendation in this for disposable drapes. A recent systematic review found no difference in post-operative infection rates when using reusable or disposable drapes in orthopaedic and spinal surgery.[4]

A review of the literature finds that while Showalter et al. recommended single-use drapes and gowns for implant-based breast reconstruction after purportedly finding higher postoperative infection rates with reusables, the paper has several limitations.[5] Firstly it was a small, single-blinded study from one institution. Secondly, although a randomised prospective trial, all of the implant infections identified were within a group that underwent inpatient surgery with significantly greater operative duration and estimated blood loss compared to the outpatient day case surgery group. It is likely that the potentially greater implant exposure time, and less tight haemostatic control, are significant confounders.

We would advocate that reusable drapes be available in all theatres; institutions and departments should harness the behaviour changing power of nudge theory and have reusable drapes and gowns readily available such that they become the default option for theatre staff. As surgeons we should be leaders in shaping the future procurement of so-called 'consumables' within our practice, many of which should be easily reusable and need not be consumable. Reusable drapes are potentially a safer and more environmentally-friendly option, and every change we make counts in the climate emergency.

Abbreviations: COP26, The 26th UN Climate Change Conference; WALANT, Wide-awake local anaesthetic no tourniquet.

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Promoting applicant engagement via website development for transgender fellowship training programs in plastic surgery

Dear Sir,

Gender dysphoria describes the distress felt due to an incongruence between gender identity and birth-assigned sex. The prevalence of gender dysphoria has increased in the past several decades, leading to increased demand for providers trained in gender affirmation surgery and the subsequent creation of fellowships teaching these procedures.[1] While treatments for gender affirmation are generally taught in plastic surgery residency, surveys of residents and program directors suggest that fellowship can be an ideal setting for training in gender affirmation surgery.[2]

Transgender fellowship training programs are relatively new and compose only a small subset of plastic surgery fellowships. Therefore, improving the content quality of information available to prospective applicants is of high importance. Program websites in particular represent a low-cost method for transgender fellowships to engage with prospective applicants, provide important information, and increase program visibility. Our objective was to evaluate the website content of all U.S. plastic surgery transgender fellowship training programs to identify potential areas of improvement.

The World Professional Association for Transgender Health (WPATH) and American Society of Plastic Surgeons (ASPS) websites were queried using the search terms "gender reassignment" and "transgender surgery" to identify transgender fellowship training programs. Corresponding program websites were assessed for the presence of information on geographic location, number of fellows accepted each year, number of faculty members, medical school or departmental affiliation, and fellow responsibilities (including didactics, conference schedules, journal club, rotations, expected publication output, and operative cases).[3]

Table 1 Breakdown of Program Information and Fellowship Duties in Transgender Fellowship Websites.

Table 1. Website Information Regarding Transgender Fellowship Program Information	Number of Programs
Location	
Northeast	1 (33.3%)
Midwest	1 (33.3%)
West	1 (33.3%)
South	0
Number of Fellowship Positions	
1	3 (100%)
Number of Faculty	
0-7	1 (33.3%)
7+	1 (33.3%)
Department Affiliation	3 (100%
Medical School Affiliation	3 (100%)
Liason Available on Website	3 (100%)
Fellowship-Specific Responsibilities	
Didactics	1 (33.3%)
Conference Schedule	2 (66.7%)
Journal Club	2 (66.7%)
Rotation Schedule	1 (33.3%)
Expected Publication Output	1 (33.3%)
Operative Cases	3 (100%)

Of the nine identified transgender fellowship training programs, one was excluded due to inclusion within a microsurgery and breast fellowship and another was excluded due to its location outside of the United States. Two of the remaining seven fellowships did not have a website and two additional fellowships had no online information altogether. Therefore, three (33%) fellowships with program websites were included for final analysis. Available website content is described in Table 1.

Our analysis demonstrates a paucity of online information regarding transgender fellowship training programs. In contrast, hand surgery, a historically more established plastic surgery fellowship, has a high proportion of programs utilizing websites (91%).[3] Applicant usage of websites for exploring programs has also been demonstrated, with 88% of applicants for orthopedic fellowship stating that the website was the primary source.[4] This suggests that creating websites or even improving upon the information content quality of preexisting program websites may help to increase program visibility. Additionally, heterogeneity of information regarding fellowship duties may complicate applicant decision-making. Therefore, transgender fellowship training program websites should aim to be as comprehensive as possible to highlight their unique offerings, and may

Abbreviations: COP26, The 26th UN Climate Change Conference; WALANT, Wide-awake local anaesthetic no tourniquet.

consider additional avenues like social media to perform additional outreach to potential applicants.[5] These and related interventions may help to optimize applicant-program fit.

Study limitations include small sample size, limiting comparison between websites. Future directions of this work may include assessing whether improved content quality on these websites increases application numbers or affects applicant attitudes toward a given program. Our findings suggest that increased usage of program websites with comprehensive information may benefit both transgender fellowship training programs by increasing their visibility, as well as prospective applicants by informing their decision-making.

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Comments on: "Immediate vaginal and perineal reconstruction after abdominoperineal excision using the Inferior Gluteal Artery Perforator Flap (V-IGAP)"

Dear Sir,

We read with interest the study by Johal et al., reporting a case series of 22 patients who underwent to Abdominoperineal Excision (APE) and immediate reconstruction using the Inferior Gluteal Artery Perforator (IGAP) flap for perineal and vaginal reconstruction[1]. We agree that this study is very interesting and may be useful in the plastic surgeon's therapeutic arsenal.

There are many flap choices for perineal and vaginal reconstruction after APE, each one having advantages and drawbacks. According to vast literature, one of the most used and studied fasciocutaneous flaps for this purpose is the Internal Pudendal Artery Perforator (IPAP) flap (also called "lotus petal" or "gluteal fold" flaps), with hundreds of patients reported in cohorts and case series[2–4].

We would like to highlight some advantages related to the IPAP flap for the perineal and vaginal reconstruction, compared to others such as the IGAP flap. The cutaneous sensibility of IPAP flap is preserved in perineal reconstruction after APE, according to what we previously published in 2015. This is because its source of innervation (given by branches from the pudendal nerve and the posterior femoral cutaneous nerve) can be preserved during the harvesting of the flap[5]. Maintenance of the flap sensation is important in these cases because the flap will be located in an area of support during the act of sitting, and it has other benefits for the simultaneous reconstruction of vulva and vagina. These and other advantages associated with IPAP flap reinforce the idea that it is reliable and versatile. Besides, the scar from its donor area can be hidden on the gluteal fold, and the flap can be harvested in the prone or supine positions.

In 2017, we published the biggest consecutive series of patients (to our knowledge) using IPAP flap only for perineal reconstruction after APE, presenting the outcomes with 122 immediate IPAP flap reconstructions for 73 irradiated APE defects[4]. Based on its reliability and versatility, we have proposed that IPAP flap can be considered as the first choice for perineal and vulvovaginal reconstruction in patients with moderate and some large defects after APE[4]. We agree that the IGAP flap (as proposed by Johal et al.) is another option for plastic surgeons and should be adopted mainly regarding larger perineal defects, situations in which the IPAP flap may not offer enough tissue volume for reconstructive surgery.

Abbreviations: COP26, The 26th UN Climate Change Conference; WALANT, Wide-awake local anaesthetic no tourniquet.

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