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Correspondence and Communications

No flow pattern on indocyanine green lymphography in breast cancer patients undergoing taxane-based chemotherapy



Dear Sir,

Breast cancer-related lymphedema (BCRL) is a common complication of breast cancer.¹ Indocyanine green (ICG) lymphography² can assess lymphatic functionality. However, some patients undergoing taxane-based chemotherapy experience a period of interstitial edema during which no flow is observed on ICG lymphography, because when the dye is injected near the first web space over the dorsum of the hand, it does not flow beyond the wrist.³ Over time, this resolves and either returns to normal or results in dermal backflow (DBF). The present study aimed to investigate the association between lymphatic functionality and the risk factors for BCRL using ICG lymphography, while particularly focusing on the no-flow pattern.

This study retrospectively reviewed 422 breast cancer cases involving axillary lymph node dissection (ALND). BCRL was diagnosed based on ICG lymphography patterns or, for patients with edema unable to undergo ICG lymphography, by comparing volume differences. The patients were divided into two groups based on the presence/absence of BCRL: BCRL(+) and BCRL(–). The following characteristics were compared between the groups: age, body mass index, laterality, type of surgery (breast-conserving or mastectomy), disease staging, regional lymph node irradiation, hormone therapy, and type of chemotherapy (taxane, non-taxane, or no chemotherapy).

Patients exhibiting the no-flow pattern underwent ICG lymphography every 3 months. DBF patterns typically do not change within such a short period, but because the no-flow pattern was the result of temporary interstitial edema, changes were observed from one lymphography to the next (Figure 1). Patients with prolonged edema who could not be diagnosed by ICG lymphography alone were assessed by lymphoscintigraphy.⁴

Of the 422 patients who underwent ALND, 100 (23.7%) were diagnosed with BCRL. Compared with the BCRL(–) group, the BCRL(+) group had significantly higher rates of lymph node irradiation (45% vs. 32%; $P = 0.020$) and taxane-based chemotherapy (94% vs. 63%; $P < 0.001$). Postsurgical disease staging was significantly more severe in the BCRL(+)

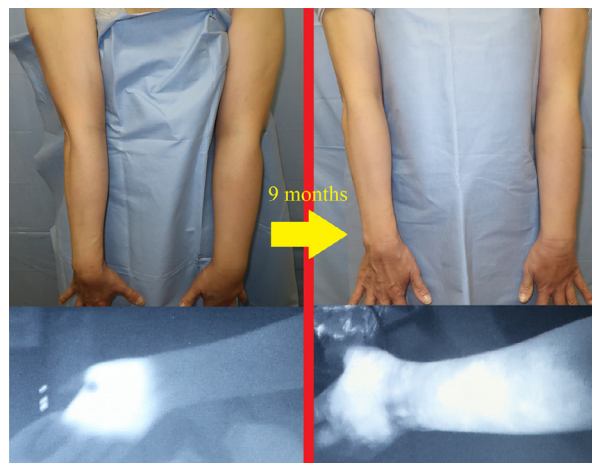


Figure 1 No flow pattern

This patient complained of edema 2 months after the initial chemotherapy. After 9 months from initial ICG lymphography, she was diagnosed with BCRL.

group ($P = 0.040$). No significant differences were observed for the other characteristics.

Of the 422 patients, 120 (28.4%) exhibited edema. Of these, eight were unable to undergo ICG lymphography, and six were diagnosed with BCRL without an assessment of lymphatic functionality. The patterns observed on the initial ICG lymphography for the other 112 patients included DBF in 55, a linear pattern in 14, and the no-flow pattern in 43.

Of the patients with the no-flow pattern, 36 changed to the DBF pattern, 4 improved to the linear pattern, and 3 could not be diagnosed by ICG lymphography alone and thus underwent lymphoscintigraphy; all three were diagnosed with type V lymphedema (tracer did not flow beyond the wrist.⁴ More than 90% of the patients with the no-flow pattern were ultimately diagnosed with BCRL (Figure 2); thus, when the no-flow pattern was visualized, complex physical therapy was initiated for these patients. The volume of the extremity changed within a short period, and patients initially using a simple tubular bandage subsequently changed to a compression sleeve after the diagnosis of BCRL. The cases wherein the no-flow pattern improved to the linear pattern exhibited slight volume differences.

For all 43 patients with the no-flow pattern, the pattern was confirmed after initiating adjuvant taxane-based chemotherapy, prior to the radiation therapy. The mean interval between the initial chemotherapy and the onset of edema in these patients was 2.6 ± 2.0 months; the in-

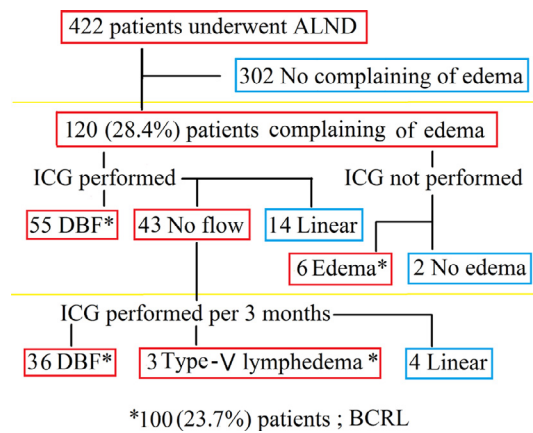


Figure 2 Postoperative changes in the patients who underwent axillary lymph node dissection (ALND)
Over 90% patients with the no flow pattern were diagnosed with BCRL.

interval was <6 months in all cases. Among the other 57 patients in the BCRL (+) group, the rate of adjuvant taxane-based chemotherapy was 87.7%. Both the rates were high. However, the rate was significantly higher for the patients with the no-flow pattern ($P = 0.019$), suggesting that the no-flow pattern was a result of the taxane-based chemotherapy rather than the radiation therapy. The mean interval between the onset of edema and observation of the DBF or linear pattern (i.e., the period of the no-flow pattern) was 7.8 ± 4.3 months; in 95% of the patients, the interval was <1 year. This period was equivalent to the duration of transient edema. We therefore performed lymphoscintigraphy only for patients exhibiting the no-flow pattern for >1 year.

The mechanism underlying the no-flow pattern may be as follows. Taxanes cause an increase in the extracellular fluid volume, leading to compression of the lymphatic duct. The change in thickness of the soft tissue then reduces the accuracy of the ICG lymphography. This condition improves as the influence of the chemotherapy gradually weakens. Because the short-term congestion of lymph fluid results in the DBF pattern, most patients are diagnosed with BCRL. Johnson et al. reported that patients with taxane-induced neuropathy demonstrated considerably lower lymphatic duct contractility than those who were asymptomatic or who did not undergo chemotherapy⁵; this was associated with the pathology of BCRL.

The patients who underwent taxane-based chemotherapy and irradiation had more severe disease staging. As a result, postsurgical disease staging was found to be associated with these therapies rather than with breast cancer severity.

Ethical approval

Not required.

Declaration of Competing Interest

None declared.

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COVID-19 The Great Disruptor



Dear Sir,

Before the pandemic the idea of any dramatic change in our plastic surgery service would be unthinkable. In the National Health Service (NHS) it is rare to see services change overnight; if you want to set up a new service we go through departmental approval, ethical approval and often red tape from management. The process is almost not worth the Herculean effort. It is the truth of the world that it takes a great disruption in society for things to change dramatically out of necessity. Disruption is similar to innovation in surgery - it literally can uproot and change how we think and practice. We have had disruptors in our field of Hand surgery - an example is Harold Kleinert seen as an outsider by his own surgical community as a young surgeon so much so that a delegation from the American Society of Hand Surgeons had to be sent to witness that primary repair of flexor tendon injuries was feasible.¹ COVID-19 is now probably the biggest disruptive force in the last century; more so than any single person or idea. It has made us redesign health services across the world.

Surgery and war

In the 1980s I grew up as a child during the Iran-Iraq war. The horrors of that war where my father served as a doctor, advanced surgical techniques in trauma in Iran, and more than 1 million people lost their lives, and many had life changing wounds. War has always disrupted the course of surgery and given birth to new branches such as Plastic and Reconstructive Surgery. The legacy of war is present in historic centres such as Queen Victoria Hospital, East Grinstead where many surgeries were first pioneered.² It is in such extreme times that great advances in surgery and in medicine have been made, with parallels made with the current pandemic.

Redesigning services

I cannot believe how we have redesigned services for millions of patients in the space of months across the United Kingdom^{3,4} and indeed the World; many of our challenges are common worldwide and sharing knowledge through virtual platforms has been remarkable. It is sad to think we have lost so many people during this pandemic, patients, and dear friends and colleagues. Some of us have come to the frontline and many of my colleagues have worked in the intensive care department providing nursing care or proning ventilated patients. Many have shown the best of what it means to be a doctor.

Only cancer surgery and trauma continue during the pandemic and excellent guidelines on the management of our services were provided by the British Association of Plastic Reconstructive and Aesthetic Surgeons (BAPRAS) and our

hand society (BSSH). As our anaesthetists were sent out to care for ventilated patients we as a speciality have managed many cases under local anaesthetic. One example I have seen worldwide is the rise in popularity of Wide Awake Local Anesthesia No Tourniquet (WALANT) which has taken over as the primary method of anaesthesia for tendon and fracture fixation in many trauma centres. However, the tourniquet which is so intertwined with traditional hand surgery is hard to abandon by many surgeons. The truth of the matter is we were putting too many patients to sleep under general anaesthetic and the pandemic made us rethink our strategy to deal with complex hand trauma safely. However, when great strides like this are made we must compare these alternative approaches to traditional techniques through evidence. Many including myself suggest that repairing flexor tendons under local anaesthetic and adrenaline is the way forward, however not one comparative paper in the last decade has been written on the lower tenolysis rate, rupture rate and superior outcomes with this technique compared with regional or general anaesthesia. Until this is written some surgeons will continue to go about their usual practice unchanged.

Social media

I have always been an advocate of social media and digital technology if used for education of patients and surgeons.⁵ Social media whether through Twitter, Instagram or Facebook has brought different branches of our community together. Never before have I seen so many educational forums or webinars posted on these platforms. Some surgeons have been shameful and charged for information that in my opinion should be free for all; particularly in a crisis. However historic centres such as the Pulvertaft hand unit and UK trainee organisations such as Plasta have made excellent free for all practical webinars that have been watched by surgeons globally.

Virtual platforms

For meetings with colleagues, many of us used to gather in person and now we use virtual platforms like Zoom. We will I am sure be doing Journal clubs and multidisciplinary team (MDT) meetings differently. In my service our regional breast and skin cancer MDT is done remotely using virtual platforms. Our national and regional teaching for our trainees is delivered with Zoom with speakers from across the world. In 2019 we were using some of these emerging technologies but with the advent of the pandemic and social distancing they have become the new normal in 2020. From now on when my registrars want a meeting about an article or teaching I will encourage the use of a virtual platform.

Digital revolution

I check the majority of my patient letters, patient radiographs and notes remotely from my home. This I predict will

be standard practice in all NHS trusts in the next few years. I have also been trialing video consultations in my practice, which I feel will become more routine particularly in hospitals that follow a hub and spoke model for plastic surgery. The same appears true now for the private cosmetic sector with a number of virtual consult programmes competing for a share of the market.

I am certain that for an organisation to be successful it will need to be digital and to embrace this change. Those that aren't will struggle and be forgotten.

Conflict of Interest

None.

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COVID-19 lockdown learning: The uprising of virtual teaching



Dear Sir,

The global health pandemic with COVID-19 has hugely impacted the international health community causing sig-

nificant disruption to routine clinical practices as well as teaching and training. The speed and scale of viral spread have overwhelmed health services across the globe and has required diversion of all clinical resources to save lives and protect health care workers. Redeployment of trainees into medical specialities has virtually halted their training within chosen subspecialties.

Within a few weeks, COVID-19 has forced the surgical community to rapidly adapt to a completely new way of delivering care. Guidelines for the treatment of acute conditions and oncology patients are being re-evaluated. Moreover, each procedure that takes place is being evaluated with regards to potential for both patients and practitioners. COVID-19 has truly changed the way that surgeons of all specialties think, practice and operate.

In these unprecedented times, it is a challenge to facilitate standard teaching and training modules. As it became imperative to maintain social distancing in order to achieve victory over this pandemic, the use of webinars has gained massive popularity within multiple healthcare domains. The General Medical Council (GMC) in setting out the principles for good medical practice, recognises the importance of continuous professional development in order to maintain and develop performance and skills.¹ Within this pandemic, it has become imperative that trainees and healthcare professionals are kept engaged within their specialities. From basic telehealth platforms to more complex augmented reality solutions, technology is increasingly being deployed to foster connectivity between surgical teams in order to disseminate best practice and share expertise on a global scale.

Webinars and virtual collaboration platforms, allow the advantage of face to face learning with an interactive exchange in real-time. In addition to this, sufficient learning tools can be provided for a large number of learners, multiple chat functions like live quiz and polls offer helpful learning modalities. Current literature demonstrates that webinars are a reliable tool to deliver a near-normal interaction between the audience and the lecturer.^{2,3} Under normal circumstances, virtual learning is often underutilised since humans are sociable and enjoy a person to person interaction more. However, these virtual environments allow for synchronous sessions which enable the trainer and trainee to share ideas and questions in real-time, located anywhere in the world. The wide variety of webinars available online have provided a new level of convenience in medical education, where learners can engage in gaining education on a platform where online availability can be incorporated easily even within the time constraints of regular working days. Over the past five weeks, we have observed an influx of online teaching modules. The benefits of these sessions are clear; they provide a platform wherein the comfort of the trainee's home; they have access to world-class surgeons providing teaching in real-time. This traditionally was only available if one were to attend a meeting, which in itself is associated with an expense.

We have converted our regular inhouse teaching by utilising video communication through platforms, Zoom, and virtual collaboration and augmented reality platforms, Proximie. The teaching schedule is designed to complement the curriculum for plastic surgery training and address

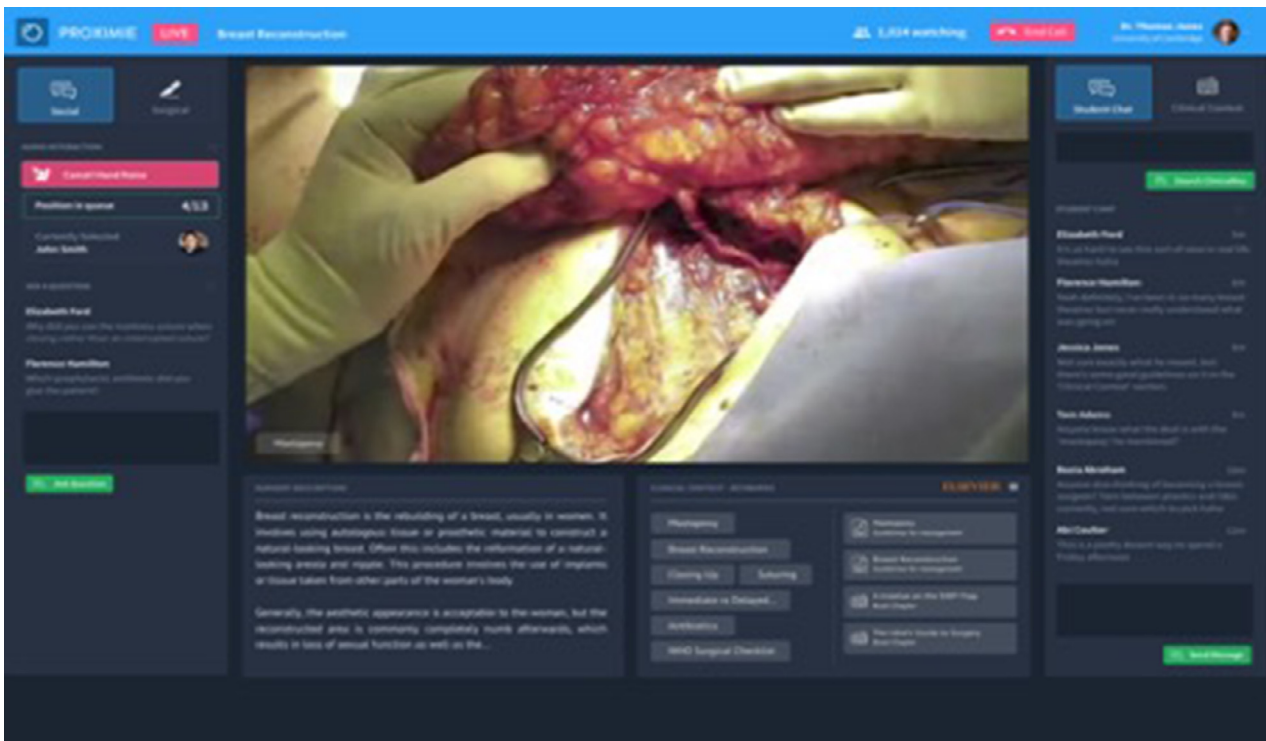


Figure 1 Use of video communication for live dial in to the operating room, free tissue transfer surgery in this case.

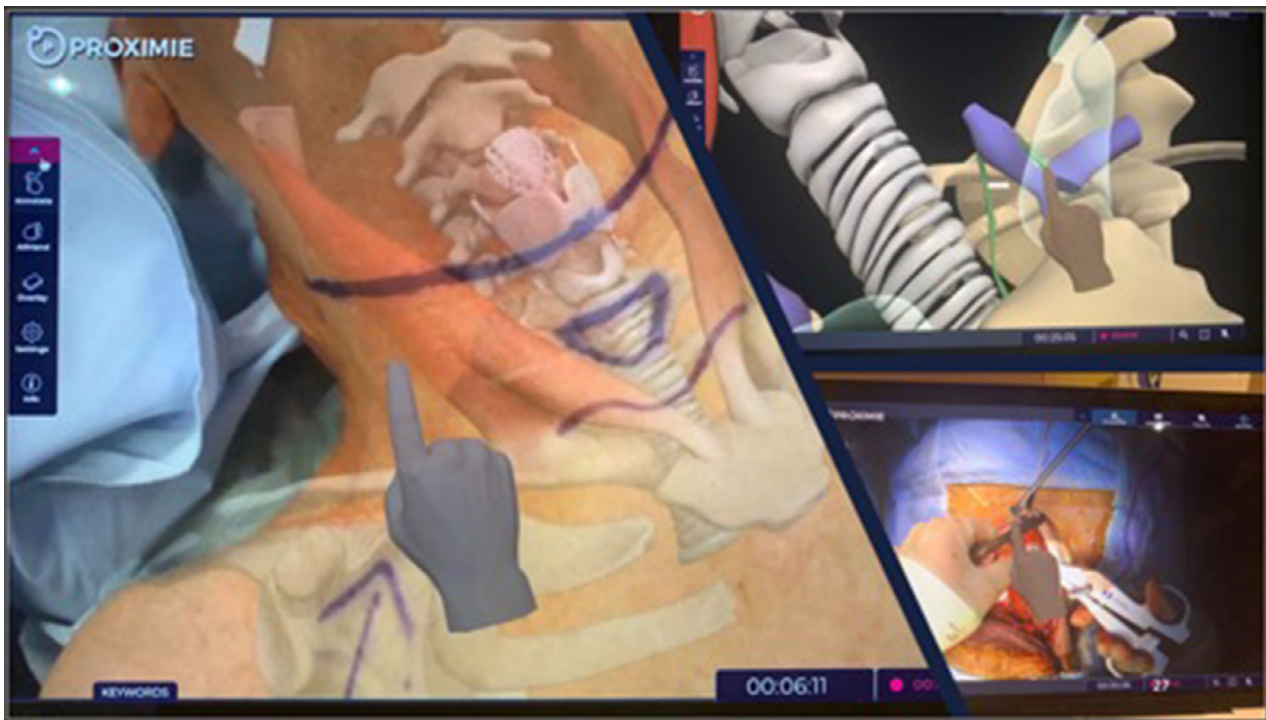


Figure 2 Cadaveric Masterclass demonstrating use of virtual platforms in practical learning, display of practical tracheostomy teaching.

the hot topics caused by the Covid-19 pandemic. Initial feedback from trainees has been extremely positive and judging through the attendance rates at webinars throughout the country we believe this trend of online learning is here to stay.

In our experience, online teaching has provided an easily accessible resource of teaching that is available to use when convenient. This is especially true for many surgeons that adapted to a new work schedule and were redeployed to help in other clinical areas such as intensive care setting resulted in an unpredictable timetable. Furthermore, this form of teaching has provided a break in the physical barriers to training and encouraged interaction in a way that seems more favourable to participants.⁴ Feedback surveys show a high satisfaction rate from participants. Also, trainees were able to comment on improvement in morale as redeployment to other specialities caused certain anxiety regarding training. Keeping trainees engaged with the speciality is also vital in this time of uncertainty.

Historically, the most common challenges faced during the utilisation of electronic platforms to deliver virtual learning were the technical challenges.⁵ However, owing to advances in technology and internet connection. High-quality video and sound have been maintained throughout the sessions. Security concerns were raised with platforms like Zoom even with password protection. Though some of the concerns have been addressed it is important to bear this in mind and not share confidential information on these platforms and ensure that your software is frequently updated.

In summary, virtual learning utilising webinars has enabled continuous professional development in our unit and others across the world. In our experience, webinars are highly efficient, flexible and allow surgeons in training to access learning material from a wide geographic area ensuring at the same time, compliance with the social distancing guidance. Online teaching has globalised teaching in pure form and in the future, may replace face-to-face lectures (Figures 1 and 2).

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Emerging role of online virtual teaching resources for medical student education in plastic surgery: COVID-19 pandemic and beyond



Dear Sir,

On March 17th, 2020, the Association of American Medical Colleges released a communication recommending that medical students be withdrawn from all clinical rotations.¹ While the duration for which this pause will persist remains elusive, the acute need for social distancing and shortages in personal protective equipment are likely to keep medical students at a distance from clinical learning environments for some time.² As the pandemic continues to unfold, online and virtual teaching resources are set to play a larger role in the continuity of medical education,³ particularly for medical students who remain interested in pursuing postgraduate training in plastic and reconstructive surgery.

To address this educational disparity, the American Society of Plastic Surgeons (ASPS) announced on April 13th that all medical students with an interest in plastic surgery may now obtain free access to its online Education Network (Ed-Net). This program offers over 90 learning modules spanning eight curriculum branches, each with didactic lectures, case discussions, suggested readings, as well as pre- and post-module tests. Medical students interested in this resource may register by contacting their local plastic surgery program coordinator, or may do so directly by filling out this communicated [link](#).

In light of this ongoing need, the authors sought to survey and report on all presently available learning resources for medical students seeking to maintain or advance their education in plastic surgery, during time away from formal clinical rotations and beyond. A search was performed

Table 1 Medical Student Educational Resources for Plastic Surgery.

Category	Subject Area	Resource / Provider	Cost	Description	Sample Topics Covered	Available Videos / Recorded
Online Education Network	All Plastic Surgery	American Society of Plastic Surgeons Education Network (EdNet)	Free	Learning modules and interactive case reports across eight broad curriculum sections. Each module includes a pre-test, journal article readings, audio slide lecture, typical oral board case, additional resources, and a post-test. Available free of charge until October 16th for medical students.	<ul style="list-style-type: none"> • Fundamentals of Surgery • Head and Neck Plastic Surgery • Plastic Surgery of the Upper and Lower Extremity, Breast, and Trunk 	Yes
Virtual Grand Rounds	All Plastic Surgery	American Society of Plastic Surgeons Virtual Grand Rounds	Free	Grand rounds hosted by expert faculty sharing knowledge and experience on topics covering the breadth and depth of the plastic surgery specialty.	<ul style="list-style-type: none"> • Contemporary Management of Lower Extremity Amputation • Nerve Transfers for Upper Extremity Reconstruction • Facial Paralysis • Postoperative Pain Management in Plastic Surgery 	Yes
Virtual Grand Rounds	All Plastic Surgery	Yale University Virtual Grand Rounds	Free	Weekly virtual grand rounds for plastic surgery teaching.	<ul style="list-style-type: none"> • Postoperative Pain Management in Plastic Surgery 	n.s.
Virtual Grand Rounds	All Plastic Surgery	UC San Diego Virtual Grand Rounds	Free	Weekly virtual grand rounds for plastic surgery teaching.	<ul style="list-style-type: none"> • Becoming Consistent in Rhinoplasty • International Humanitarianism and Microsurgery 	Yes
Online Clinical Resource	All Plastic Surgery	Continuing Medical Education (CME) Articles	Free; Institutional Subscriptions	Monthly Continuing Medical Education articles published in the <i>Journal Plastic and Reconstructive Surgery</i>	<ul style="list-style-type: none"> • Masculinizing and Feminizing Gender Surgery • Advancements in Implant-Based Breast Reconstruction • Flap Reconstruction of the Hand 	n/a

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Table 1 (continued)

Online Clinical Resource	Upper Extremity	Ortho Bullets	Free	Free and personalized adaptive learning system, resource, and virtual curriculum; 92 upper extremity learning topics.	<ul style="list-style-type: none"> • Flexor Tendon Injuries • Extremity Flap Reconstruction • Amputations and Replantations • Various Hand and Wrist Fractures 	Yes
Journal Clubs	All Plastic Surgery	Plastic and Reconstructive Surgery	Free	Monthly journal clubs discussing 3 selected articles.	<ul style="list-style-type: none"> • Direct-To-Implant Prepectoral Breast Reconstruction • Pediatric Hemifacial Atrophy 	Yes
Journal Clubs	Aesthetic Surgery	Aesthetic Surgery Journal	Free	Aesthetic Surgery Journal Articles discussed	<ul style="list-style-type: none"> • Blepharoplasty Anatomy, Techniques and Safety Considerations • Use of Scaffolds in Revision Breast Surgery 	Yes
Online Webinars	All Plastic Surgery	University of California Los Angeles MDChat Webinars	Free	UCLA MDChat Webinars discuss recent advances and current management strategies by expert surgeons from UCLA on diverse plastic surgery topics.	<ul style="list-style-type: none"> • Craniosynostosis Management • Scar and Keloid Management • Congenital Ear Anomalies 	Yes
Online Webinars	Upper Extremity	American Association for Hand Surgery Webinars	Free	Free weekly educational webinar program healthcare professionals around the world.	<ul style="list-style-type: none"> • Pediatric Hand, Wrist and Forearm Trauma • Congenital Upper Extremity Conditions • Pediatric Elbow Fractures 	Yes
Online Webinars	Upper Extremity	American Society for Surgery of the Hand Webinars	Free	Webinars featuring ASSH members discussing a variety of topics pertaining to upper extremity surgery.	<ul style="list-style-type: none"> • Atypical Nerve Compression • Complications of Hand Fractures 	Yes
Online Webinars	Craniofacial Surgery	AO CMF Webinars	Free	AO CMF is a multi-specialty community consisting of clinicians from all around the world, offering webinars on a wide range of topics such as oral and maxillofacial surgery, plastic surgery, ENT, head and neck surgery, ophthalmology, and neurosurgery.	<ul style="list-style-type: none"> • Microsurgery in Craniomaxillofacial Reconstruction • Temporalis Flaps for Midfacial Reconstruction 	n.s.

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Table 1 (continued)

Online Webinars	Craniofacial Surgery	Baltic Sea Community of Orthognathic Surgery and Orthodontics Webinars	Free	BSCOSO provides a series of webinars that unite a number of national and international speakers around the world, focusing on topics pertinent maxillofacial and craniofacial surgery.	<ul style="list-style-type: none"> • Zygoma Implants: Indications, Technique and Long-Term Results • Surgical Treatment of Maxillary Hyperplasia • Evolution of Structured Rhinoplasty 	No
Online Webinars	Aesthetic Plastic Surgery	IMCAS Online Educational Webinars	Free Month Trial	E-learning plastic surgery and dermatology platform; thousands of available lectures and ongoing webinars	<ul style="list-style-type: none"> • BIA-ALCL and Breast Augmentation • Botulinum Toxin Combinations and Complications 	Yes
Instructional Videos	Surgical Anatomy	Dr. Sanjoy Sanyal Cadaveric Anatomy; YouTube Videos	Free	Didactic Video Tutorials on Surgical and Cadaveric Anatomy	<ul style="list-style-type: none"> • Forearm Flexor and Extensor Dissections • Brachial Plexus Surgical Anatomy • Upper Extremity Neurovascular Distribution 	Yes
Instructional Videos	Surgical Anatomy	Dr. Shakti Chandra Cadaveric Anatomy; YouTube Videos	Free	Didactic Video Tutorials on Cadaveric Anatomy	<ul style="list-style-type: none"> • Craniofacial, Head and Neck, and Abdominal Wall Anatomy • Upper and Lower Extremity Muscular, Bone, and Neurovascular Dissections • Head and Neck, Genitourinary and Abdominal Wall Dissections 	Yes
Smartphone / Tablet Applications	Surgical Anatomy	Complete Anatomy - 3D Medical	\$0-\$30; Institutional Subscriptions	3-Dimensional Interactive Anatomy Models	<ul style="list-style-type: none"> • 17,000 Interactive Anatomical Structures • 3D Muscle Movement; Origins, Insertions, Neurovascular Supply, and Bony Anatomy 	n/a
Smartphone / Tablet Applications	Surgical Anatomy	Human Anatomy Atlas 2021	\$0-\$35; Institutional Subscriptions	3-Dimensional, Interactive Anatomy Models	<ul style="list-style-type: none"> • 10,000 Interactive Anatomical Models • 3D Muscle Movement; Origins, Insertions, Neurovascular Supply, and Bony Anatomy 	n/a

using a variety of databases and sources, including the google search engine, social media platforms, international plastic surgery society websites and recently released communications. Available resources were evaluated for their utility and accessibility to medical students, and a total of 18 resources, spanning 7 major categories, were identified. These included online educational networks (n=1), virtual grand rounds (n=3), webinars (n=6), journal clubs (n=2), anatomy instructional video channels (n=2), smartphone and tablet applications (n=2), as well as online clinical resources (n=2). A detailed summary is presented in [Table 1](#), complete with links to each of the resources identified, resource descriptions, sample topics covered, as well as pricing information; all resources were free of charge either directly or through institutional subscriptions available to medical students.

Advantages of the virtual learning tools identified were significant and wide-ranging. Barriers previously posed by the geographic dispersion of content experts or by monetary costs are now seen negated giving learners of all levels, including medical students, front-row access to specialized teaching by plastic surgery experts worldwide. Both educators and learners are provided with unprecedented flexibility; didactic lectures are frequently recorded accommodating those unable to attend, and learning objectives are often clearly defined. Online education networks such as the ASPS EdNet provide structured, in-depth teaching on essential plastic surgery topics, complete with assessment methods for medical students to track and identify gaps in their knowledge acquisition process. Didactic cadaveric video tutorials, supplemented with 3-dimensional interactive virtual reality applications, provide an anatomy learning experience unmatched by any of the traditional approaches. Finally, and by means of virtual grand rounds and journal clubs recently made accessible to learners from all institutions, medical students can remain abreast of the latest developments in plastic surgery from the perspective of top training programs worldwide.

With the advent of social media and growing online presence of many academic plastic surgeons, medical students can tune in to live streaming services such as *Instagram Live* for daily discussions on current hot-topics, and remain in contact with colleagues and mentors through online forums.⁴ With accepted presentations of some of the cancelled plastic surgery conferences going virtual, medical student participation is both facilitated and encouraged. Despite the significant reform medical education has witnessed over the past decade,^{3,5} it remains without a doubt that the COVID-19 pandemic has kindled change in plastic surgery education at both the undergraduate and postgraduate levels that will persist for generations to come. For medical students interested in a career in plastic surgery, this unique, evolving situation should be embraced, and identified resources leveraged. Albeit through a computer or smartphone screen, much remains to be learned, for, as Stephen Hawking once wrote, “intelligence is the ability to adapt to change.”

Conflicts of interest

None.

Funding

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Future directions in digital anatomical simulation and visualisation



Dear Sir,

We thank the authors for their interest in our work on digital models for anatomical education. As described, this was a student based subjective assessment of our 3D Anterolateral thigh model as a learning modality.¹ Objective learning outcomes will be assessed in future studies with our newer Augmented Reality (AR) models and teaching packages which are in development. The current 3D ALT model together with our recently completed, highly anatomically accurate 3D model - the Definitive Human - are now being integrated into the undergraduate curriculum in Glasgow.² These digital models take spatial anatomy and user immersion to new levels, and are currently the subject of an international validation study. The 3D ALT model was not developed as a teaching course for Plastic surgeons, but was targeted at the level of an anatomy student. As



Figure 1 A: Smartphone looking at patient leaflet on table, 3D model with ALT flap comes out of page. B: Model is fully interactive and can zoom in and move the ALT flap, sarcoma resection, implant prosthesis and thigh muscles. Labels with further information are available on pressing an on screen button.

such, the subtleties of microvascular reconstruction are not relevant, with its purpose being to introduce concepts of spatial anatomical relationships to plastic surgery naïve students. These concepts are put into context for students with a follow-on dissection session on the ALT flap. In this regard it excels, with the digital teaching component regularly receiving some of the highest feedback on the BSc Anatomy course.

Our current work focuses on the development of Augmented Reality (AR) 3D models, available on accessible, ubiquitous technology such as mobile phones. This obviates the need for capital expenditure, infrastructure and technology obsolescence related to use of AR/VR head mounted displays. We recently described the development of AR enhanced patient leaflets.³ Our research group is currently completing an updated version of this, with transformative, interactive 3D models that come "out of the page" (Figure 1). This is the currently subject of an ongoing randomized controlled trial.

Lastly, the investment of time, labour and finance into such projects should not be underestimated. The development of the Definitive Human was a multimillion pound project over several years, and our AR patient leaflets have been in development since 2018. In Glasgow, to allow responsiveness to change and new technologies, we have incepted a new role for Digital Simulation in NHS Greater Glasgow and Clyde and the Undergraduate medical school. Specifically, this will be to integrate our newer digital models, and to develop and validate specific virtual teaching packages (eg cardiology) into medical student teaching. However, we must never lose sight of the fact that virtual technologies should serve to augment rather than replace teachers and face-to-face interaction. To quote Bill Gates:

"Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important".⁴

Conflicts of Interest

None

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PLASTA National Webinar Series: A developing model for remote surgical education



Dear Sir,

The increasing popularity of web-based learning in plastic surgery over the last 5 years has been driven by convenience, cost, use of portable devices, and the rise of remote communication platforms^{1, 2}. The delivery of regional plastic surgery teaching programmes in the UK is variable³, and the centralisation of services makes gaining experience in the entirety of the broad curriculum challenging⁴. The Plastic Surgery Trainees Association (PLASTA) recognised the need for additional educational resources to supplement trainees' preparation for the FRCS(Plast) examination. To this end, we designed a national webinar series based on the current 2016 Plastic Surgery curriculum.

Commencing in March 2019, we have hosted monthly webinars - web-based presentations or lectures delivered in real time via the internet⁵ - using the Zoom™ platform. This allows for video and audio conferencing, screen-sharing, live text chat and submission of questions. Participants are invited by e-mail (mean open rate 65%) through the PLASTA mailing list which currently has 732 subscribers. Participant demographics are collected via an automated registration process, and they are sent a unique link to log into the webinar. The webinars are advertised on social media, on WhatsApp™ via our network of regional representatives, and through the BAPRAS membership e-mail bulletin. Reminders are e-mailed to all registered attendees at one week, two days and one hour prior to the webinar.

Table 1 Summary of Webinar Topics with Number of Attendees

Webinar Topic	Number of Attendees
Craniofacial Plastic Surgery for FRCS (Plast)	73
Brachial Plexus Surgery for FRCS(Plast)	63
Breast Reconstruction for FRCS(Plast)	41
Facelift for FRCS(Plast)	61
Neck Dissection for FRCS(Plast)	67
Hypospadias for FRCS(Plast)	51
Facial Palsy for FRCS(Plast)	64
Mandibular Reconstruction for FRCS(Plast)	52
Congenital Hand Surgery for FRCS(Plast)	63
Oncoplastic Breast Reconstruction for FRCS(Plast)	70
Flap Reconstruction of the Hand for FRCS(Plast)	162
Aesthetic Breast Surgery for FRCS(Plast)	174
Free Flap Breast Reconstruction for FRCS(Plast)	373

Each webinar is structured around a Consultant-led presentation lasting 45 minutes, with an FRCS(Plast) exam focus, followed by a facilitated question and answer session lasting 15 minutes. At the conclusion of each session, participants are automatically redirected to a SurveyMonkey™ feedback form. Speakers, whom are all Consultant Plastic Surgeons and experts in their webinar topic, are provided with a certificate and a summary of feedback for use in appraisals and revalidation. All webinars are recorded, edited, and uploaded onto the PLASTA website for members only to access on-demand following speaker review.

We appointed a webinar co-ordination team in January 2020 to manage and develop the webinar series. We have found that the presence of a facilitator is essential to introduce the speaker, lead the Q&A session by eliciting questions and encouraging interaction, and ensure time-keeping.

Thirteen webinars have been held to date (Table 1). The mean number of registrants per webinar is 175 (range:58-469), with 101 (range:41-373) attending live. These attendance rates were initially consistent between 41-73 attendees, with a significant recent increase to between 162-373 per webinar over the last 2 months. Participants are of all training grades ranging from medical students to Consultants, with ST5-6 representing the largest group, potentially as an adjunct to their concurrent exam preparation. Participants represent every training region in the UK (Fig. 1), in addition to increasing numbers of international trainees.

The webinar series has received positive feedback for quality of content, educational value, and relevance with a mean overall rating of 93/100. Trainees have consistently highlighted the utility of the Q&A session. When asked about webinar logistics, 90% opt for email as their preferred method of contact, 54% favour webinars on Tuesday evenings and 64% favour a start time of 7pm. 73% of participants suggest an ideal webinar duration of 45-60 minutes

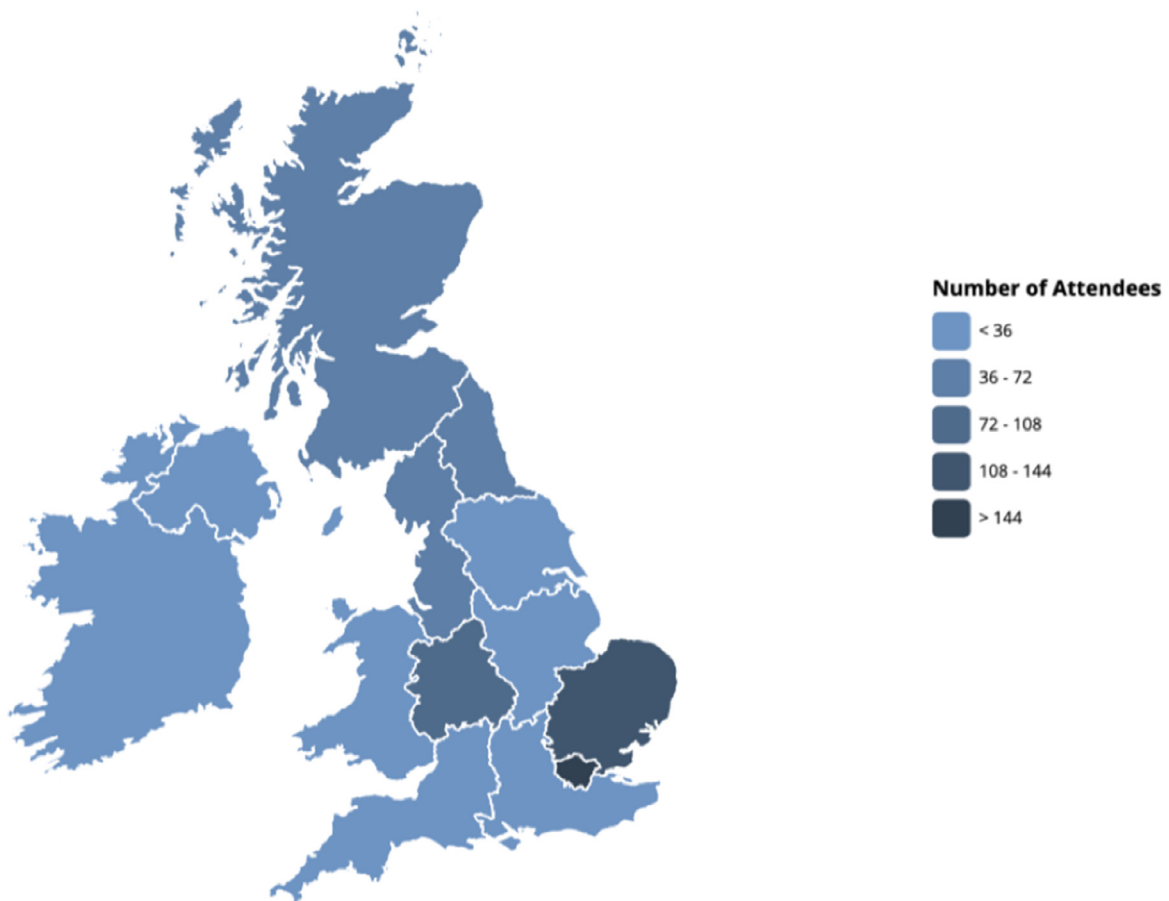


Fig. 1 Distribution of Attendees by Region

whilst 16% prefer 60-90 mins. Over 98% of attendees state they benefit from access to recordings.

The webinar format provides unparalleled accessibility for participants, unrestricted by location, venue requirements or cost. The webinars cost the association less than £1/trainee/webinar to facilitate, which is advantageous in the current era of growing training costs and diminishing study leave budgets. In addition, trainees have access to specific teaching in areas of the FRCS(Plast) syllabus that might not be experienced in their region, for example Craniofacial and Hypospadias.

We are currently building working collaborations with the International Confederation of Plastic Surgery Societies (ICOPLAST) and the Pulvertaft Hand Centre, to expand the webinar series further. We also work closely with the BAPRAS Education Committee to theme our webinars around the BAPRAS Advanced Educational Course Series, and are developing our repertoire of webinars to support junior trainees in 'preparation for ST3' and managing plastic surgery cases whilst on call.

The unprecedented situation of the COVID-19 pandemic, with inevitable loss of plastic surgery training opportunities, has resulted in an increasing demand for remote training. This is supported by the significantly increased attendance at our most recent webinars, which we have responded to by increasing the frequency of webinars to weekly, to provide

trainees with ongoing learning opportunities in the absence of normal clinical practice throughout the pandemic.

The PLASTA Webinar series is proving a reliable, cost-efficient and convenient learning tool that can enhance surgical training by engaging trainees through remote, yet collaborative, learning. We recommend use of this model to other surgical training programmes to supplement, but not replace, clinical training and face-to-face learning opportunities.

Declaration of Competing Interest

None

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Should WALANT surgery be included in the training curriculum?



Dear Sir,

Currently the COVID-19 pandemic is putting significant strain on the healthcare systems across the globe. Our anaesthetic colleagues are under immense pressure and in some instances have been redeployed to other settings, limiting our ability to operate under general or regional anaesthesia. We propose that training in both wide awake local anaesthesia no tourniquet (WALANT) as well as ultrasound guided blocks should be incorporated into plastic surgery training or at the very least in to the hand surgery subspecialty curriculum to help overcome such a problem in the future.

As a limb salvage team, we have a duty to continue our service during these dire times. To facilitate continued surgical treatment with limited anaesthetic cover, other options should be explored. This view also been supported by the BAPRAS/BSSH Coronavirus pandemic management recommendations for hand injuries.¹ One of the suggestions is to use the WALANT approach.² This technique has widely documented safety³ and utilises tumescent infiltration of 1% lignocaine with 1:200000 adrenaline. Interestingly, most UK trainees use a variation of this technique during open carpal tunnel decompression surgery, yet are not comfortable repairing flexor tendons using such an approach. This is for the most part due to the unfamiliarity of the technique as well as the dogma of not using adrenaline in the fingers which has been refuted.⁴ In the coming weeks, this skill set might make a huge difference in the amount of resources required to maintain a safe and efficient upper limb trauma service, allowing for more injuries to be treated in minor ops theatres provided the right equipment is available.

We therefore propose that WALANT should be incorporated into plastic surgery training curriculum. We recognise that it might not be an approach favoured by all once the pandemic is over however, increasing the variety of skills taught to future plastic surgeons should be encouraged. Furthermore, the Hand Diploma or subspecialty interest in hand surgery curriculum could include training on regional ultrasound guided blocks. This should mainly be as an adjunct for smaller cases with regional anaesthesia remaining under the domain of our anaesthetic colleagues.

Declaration of Competing Interest

None

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Patterns of Adult and Paediatric Hand Trauma During the COVID-19 Lockdown



Dear Sir,

The first reported cases of the novel Coronavirus SARS-CoV-2 (COVID-19) emerged from Wuhan, the capital of Hubei province (China) in December 2019.¹ At the time of writing, there have been 201,101 laboratory confirmed cases in the United Kingdom (UK), with 30,076 associated deaths.² The UK response on the 23rd March 2020 was to impose a nationwide lockdown to prevent the transmission and spread of the virus. This involved the closure of all non-essential businesses, schools and nurseries, strict limitations on non-essential travel, one-hour limit on outdoor exercise, and the concept of social distancing.

We performed a single tertiary trauma centre comparative cohort study to examine referral patterns of hand injuries, and whether enforced changes would result in a change in the aetiology of presenting hand trauma.

Two cohorts of patients were identified; a *prospective* cohort (Cohort-P) during the COVID-19 lockdown period from 23rd March 2020 to 26th April 2020, and a *retrospective* cohort (Cohort-R) as a comparison from 18th March 2019 to 21st April 2019 (this time last year). All patients (adults and paediatric) with upper limb injuries referred for surgery were identified. Patients that were subsequently managed non-operatively on the day of surgery were still included. We collected demographic data for each patient, the mechanism and aetiology of their injury, and where the injury occurred. We grouped the injury aetiologies in to 15 different broad categories and location was grouped into either 'domestic' or 'workplace'.

A total of 109 adult patients were referred and scheduled for surgery during the COVID-19 lockdown period (Cohort-P), 248 patients in Cohort-R; an overall reduction of 56.0% ($p < 0.0001$) (Fig. 1). There were no differences in the distribution of age and sex between cohorts. The aetiology of injuries is shown in Table 1. There was a significant increase in injuries sustained from using tools at home from 2.0% in Cohort-R to 11.9% in Cohort-P ($p = 0.002$). There was no change in the proportion of injuries sustained at work with tools [6.0% and 5.5%, $p = 1.00$]. There was a reduction in injuries to the hand at the workplace from 5.2% to 1.8% although this did not quite reach statistical significance ($p = 0.16$).

There was a total of 31 paediatric injuries in Cohort-R and 6 in Cohort-P; a reduction of 80.6%. There was no significant change in any of the grouped aetiologies of injury between the two cohorts, see Table 2.

The results show that our overall adult and paediatric caseload has decreased during the lockdown, but there has been a significant increase in the proportion of injuries associated with using tools at home ($p = 0.002$). These were related to the use of circular saws, angle grinders, lawnmowers, chainsaws, hammers, electric planers, and hand saws. We also noted an increase in deliberate self-harm (DSH) injuries from 2.8% to 5.5%. Although this was not statistically significant ($p = 0.23$), this is in keeping with evidence that social isolation can lead to an increase in depression, suicidal ideation, and low self-esteem.³ This vulnerable group may require additional support from primary care and mental health services during and after the lockdown period to reduce their risk of self-harm. The overall reduction of cases may also be explained by less referrals made by A&E, that may have dealt with cases that previously would have been referred.

As the UK government seeks to relax the COVID-19 lockdown incrementally, we can anticipate an upsurge in trauma cases, but also secondary spikes in COVID-19 cases, putting further pressure on NHS resources. Our study shows that there is a change in the aetiology of presenting hand trauma cases and also the need for more resources to prevent the spike in DSH cases. This can provide a framework for how units can manage resources and organise services when similar situations arise. We urge the public to be aware of the potential dangers associated with using tools at home, and emphasise the importance of receiving safety training, use of protective equipment, taking adequate breaks, and



Fig. 1 Total number of new cases listed for surgery each week since COVID-19 lockdown commenced on the 23rd March 2020 (Cohort-P) compared to the same period in 2019 (Cohort-R)

Table 1 Grouped aetiologies of injuries sustained by all patients during the COVID-19 lockdown period (Cohort-P) and the same time last year (Cohort-R).

Injury Aetiology	Cohort-R (n)	(%)	Cohort-P (n)	(%)	p-value
Animal Bite	16	6.5	8	7.3	0.82
Domestic hand injuries	65	26.2	29	26.6	1.00
Deliberate self-harm	7	2.8	6	5.5	0.23
Falls	29	11.7	14	12.8	0.73
Infections	22	8.9	7	6.4	0.53
Injury from tools at home	5	2.0	13	11.9	0.002
Injury from tools at work	15	6.0	6	5.5	1.00
Interpersonal violence	16	6.5	5	4.6	0.63
Other	2	0.8	3	2.8	0.17
Paronychia	10	4.0	1	0.9	0.18
Punch injuries	13	5.2	6	5.5	1.00
Road traffic accidents	7	2.8	2	1.8	0.73
Surgical complications	7	2.8	2	1.8	0.73
Sports injuries	21	8.5	5	4.6	0.27
Workplace hand injuries	13	5.2	2	1.8	0.16
Total Count	248		109		

Table 2 Grouped aetiologies of injuries sustained by paediatric patients during the COVID-19 lockdown period (Cohort-P) and the same time last year (Cohort-R).

Injury Aetiology	Cohort-R (n)	(%)	Cohort-P (n)	(%)	p-value
Domestic hand injuries	18	58.0	3	50.0	0.26
Infections	2	6.5	0	0.0	1.00
Interpersonal violence	1	3.2	0	0.0	1.00
Paronychia	2	6.5	0	0.0	1.00
Punch injuries	1	3.2	1	16.7	0.30
Sports injuries	7	22.6	1	16.7	1.00
Surgical complications	0	0.0	1	16.7	0.16
Total Count	31		6		

limiting working hours in order to prevent avoidable severe injuries.

Declarations

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Response letter on the comments on: Body mass index and Abdominal wall thickness correlate with perforator caliber in free abdominal tissue transfer for Breast Reconstruction



Dear Sir,

we acknowledge the comment of Capitelli-McMahon et al. related to our article on correlation of Body Mass index (BMI) as well as the abdominal wall thickness (AWT) to the deep inferior epigastric perforator (DIEP) and superfi-

cial epigastric artery (SIEA) - diameter in autologous breast reconstruction¹.

In our cohort, the correlation of the largest DIEP caliber and BMI was highly significant ($p < 0.01$, $r = 0.353$), as well as the correlation of the largest DIEP caliber with the abdominal wall thickness at multiple points. Furthermore, the mean diameter of the dominant perforator was steadily increasing from one BMI group to another which underlines the above-mentioned results. These results are coherent and also reflect our clinical experience. As outlined by Capitelli-McMahon et al., the correlation is significant but of moderate strength and we agree that BMI and AWT are only two out of many, yet unknown, confounding factors influencing vessel diameter.

Capitelli-McMahon et al. compared our results to a previous study by Scott et al.² in which no relationship between BMI and ultrasound estimated perforator size could be found in 66 patients undergoing DIEP-breast reconstruction. Given that we measured vessel diameter in the routinely performed CTA, which represents the gold standard in preoperative perforator selection with a higher intra- and interobserver reliability than ultrasound, this may be the underlying reason for the different findings³.

As outlined in our article, we agree with Capitelli-McMahon et al. that flap survival depends on multiple factors and not just perforator size with many studies showing increased flap related and donor site complications in overweight and obese patients^{4,5}.

As such, obese patients had a statistically higher early revision rate and a trend towards a higher rate of partial flap losses than normal weight patients despite larger perforator diameter in our study.

In conclusion, we agree with Capitelli-McMahon et al. that each preoperatively performed CTA for perforator mapping has to be analyzed individually since perforator size and location vary greatly between patients even within the same BMI-group.

Declaration of Competing Interest

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