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Correspondence and Communications

Re: The impact of delayed wound healing on patient-reported outcomes after breast cancer surgery

Dear Sir,

We read with interest the above article by Zehnpfennig et al.[1] While we admire the efforts by Zehnpfennig and colleagues in evaluating the impact of delayed wound healing in patients who underwent breast cancer surgery, we question whether BREAST-Q was the most appropriate tool in this situation. Although the validity and reliability of BREAST-Q have been repeatedly demonstrated, and it is undeniable that delayed wound healing can have an impact on patients' quality of life (QoL), perhaps it is worth to take a step back to contemplate the fundamental question being asked here - "*the impact of delayed wound healing on patient-reported outcomes after breast cancer surgery*".[1] Are we merely trying to ascertain patients' overall satisfaction with breast cancer surgery, albeit with some difficulties during recovery, or do we seek to investigate the specifics of how delayed wound healing could affect patients' QoL?

The conceptual framework for BREAST-Q, as originally described, included six areas: satisfaction with breasts, overall outcome, process of care, psychosocial, physical, and sexual well-being.[2] It was designed to assess patient overall perceptions about the results of surgery, with three modules to address different surgery types, namely augmentation, reduction and reconstruction, employing distinct pre- and postoperative questionnaires.[2] The reason that the BREAST-Q score is responsive to change after surgery and sensitive to patient perceptions is because each scale and items tailored to a particular surgery type have been carefully curated to address the concerns that matter most to women who have undergone that specific treatment.[2] Notwithstanding, if not handled wisely, this can turn out to be a double-edged sword, if BREAST-Q is utilised in a context not previously tested.[1]

As Weick et al. starkly noted in their recent systematic review, the overall certainty of evidence for any scoring tool giving meaning to PROMs for breast reconstruction is low.[3] There have been concerns about what scores indicate a meaningful clinical difference before and after reconstruction, or over time, and what level of score indicates a reasonable level of patient satisfaction and a good outcome.[3] To answer these questions, we need to find out what the patient considers important, or the 'minimal important differences' (MID), in the right context.

The lack of PROMs that are rigorously established and applicable to all types and locations of wounds has been cited as a barrier to outcome evaluation in wound care by Klassen, a member of the founding group for BREAST-Q.[4] To circumvent the issue, Klassen and colleagues reported the establishment of an international collaboration to create and validate the WOUND-Q, a new PROM for adults with chronic wounds.[4] WOUND-Q addresses important wound-specific issues such as odour and exudate and is not limited to a specific type of wound.[4] It also examines various items that measure a range of concepts that may affect QoL, including pain, wound discharge and sleep interference.[4] The fact that the WOUND-Q field-test had taken place in high-income countries also made it highly applicable to the cohort of patients examined by Zehnpfennig and associates.[4]

As alluded to by the authors themselves, time from surgery to follow-up in both the delayed wound healing (DWH) and the normal wound healing (NWH) groups are relatively long, at 29 and 33 months respectively.[1] We found it difficult to understand why the authors chose the aforementioned follow-up periods given that the mean wound healing time for the DWH group was 88 days, or little under 3 months, with the outliers healed within 6 months.[1] It is therefore not surprising when the authors have to contend that QoL tends to improve with time after surgery, in order to explain why there is no difference in patient-reported outcomes between the DWH and NWH groups. We suspect that the risks of recall bias would be substantial given that the BREAST-Q assessment was performed 2 to 3 years after the initial surgery. Lastly, any interim BREAST-Q assessment would have been beneficial to examine whether patients did indeed, develop coping mechanisms over time.[1]

In conclusion, even though the statistical analysis revealed that delayed wound healing did not significantly affect BREAST-Q scores amongst the authors' cohort of patients, it would be imprudent to draw the conclusion that delayed wound healing does not compromise patients' quality of life, as suggested by the authors. Other PROMs such as the WOUND-Q score appeared to be more clinically relevant to examine the effects on QoL after delayed wound healing and could have been used in conjunction with the BREAST-Q assessment. Despite this, we want to commend the authors' centre for the top-notch level of care it provides to breast cancer patients. We look forward to learning about

Abbreviations: QoL, quality of life; PROMs, patient reported outcome measures; MID, minimal important differences; DWH, delayed wound healing; NWH, normal wound healing.

further work from Zehnpfennig et al. in our common pursuit of achieving the highest standard of care for our patients.

Funding

None

Ethical approval

Not required

Declaration of Competing Interest

None

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Re: Preliminary reports of augmented-reality assisted craniofacial bone fracture reduction

Dear Sir,

I have read with great interest Lin and colleagues' article on the use of augmented reality (AR) in zygomaticomaxillary complex (ZMC) fractures fixation.[1] Augmented Reality (AR) is a rapidly advancing technology that is gaining acceptance and application in a variety of surgical fields. There have been numerous studies evaluating the precision and accuracy of AR-guided navigation. This study contributes to the body of evidence demonstrating the exciting potential of augmented reality in craniomaxillofacial surgery.

Zygomaticomaxillary complex fractures often refer to comminuted fractures, fractures with delayed surgery, and/or bone defects of the zygomaticomaxillary complex.[2] Due to a lack of available landmarks for anatomical reduction, fracture reduction of the ZMC is still highly dependent on the preference and experience of surgeons, making it challenging for novice and inexperienced surgeons to accomplish anatomical reductions. Even for seasoned surgeons, accurate reduction remains a formidable challenge, frequently leading to unsatisfactory over- or under-reduction results.[2]

In ZMC fracture fixation, the precise placement of mechanical elements such as screws, surgical guides, prosthetic components, and anchors to restore anatomy and function are of paramount importance in order to regain satisfactory facial contour. Improved accuracy often comes at the expense of increased radiation exposure for patients and operating room staff when using image-based intraoperative techniques such as three-dimensional (3D) fluoroscopy or CT-based navigation.[3] Mechanical drilling aids or CAD-designed and 3D-printed patient-specific instruments, while offering a promising intraoperative navigation option, are expensive and may require extensive preoperative planning and preparation.[3]

Full exposure of the fracture sites through a primary incision is difficult to achieve in ZMC fractures.[1] Augmented reality provides an elegant solution to this by overlaying a patient-specific 3D image onto the surgical field through the use of semi-transparent glasses that augment the virtual scene. The user's field of view is transformed into a display

Abbreviations: QoL, quality of life; PROMs, patient reported outcome measures; MID, minimal important differences; DWH, delayed wound healing; NWH, normal wound healingAR, augmented reality; ZMC, zygomaticomaxillary complex; 3D, three-dimensional; CAD, computed aided design.

that augments real-world objects with virtual data that is synchronised with previously obtained imaging. This means that information like drilling axes and cutting planes can be shown right on the patient's body in the surgical field.

Despite the statistical analysis showing a considerable increase in the fracture reduction accuracy without additional clinical risk, the sample size was still modest, as Lin and colleagues highlighted.[1] Therefore, it's crucial to be critical when assessing the true benefits of this novel technology. Not only should this revolutionary technology help the surgeon in his decision-making, it must also be comfortable enough to be worn for extended periods of time in order to ultimately benefit the patient. Fortunately, formerly cumbersome and cable-bound AR headsets have been turned into ergonomic gadgets that adhere to stringent ergonomic design guidelines thanks to advancements in information technology and hardware production.[4]

With regards to accuracy in craniomaxillofacial surgery, a systematic review performed by Vles et al. concluded that AR provides better accuracy than traditional techniques for performing intraoral mandible distraction and mandibular angle osteotomies.[5] In addition, the operative time was significantly shorter.[5] In a separate study, Chen and his colleagues looked at the use of augmented reality (AR) in unilateral orbitozygomatic maxillary fractures.[6] They found that AR technology could improve pre-operative communication between doctor and patient. This makes it easier to amend surgical plan as needed, shorten the operative time, and improve surgical accuracy.[6]

The limitations of these studies, in addition to the small sample size, are a lack of focus on clinical outcomes such as post-operative complications and cost-effectiveness. Although the operative time could be shorter, the longer pre-surgical preparation time means that the total procedure time of the AR group could be comparable to the free-hand method with traditional intra-operative imaging. This undoubtedly has an impact on the overall cost of implementing AR as a standard auxiliary navigation system for craniomaxillofacial surgery.

In conclusion, augmented reality (AR) is a rapidly developing technology with significant potential in craniomaxillofacial surgery. This study by Lin and colleagues confirms that the use of an AR-assisted surgical navigation system for the treatment of maxillofacial fractures can significantly increase reduction accuracy and cut down on operative time.[1] It provides a portable, inexpensive alternative to bulkier traditional navigation systems. Minor issues with image drift and depth perception associated with AR headset require further technical refinement. However, this will undoubtedly get better over time as technology develops.

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None

Ethical approval

Not required

Declaration of Competing Interest

None

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Letter to the Editor: Classification of superficial lymphatic pathways in the upper extremity and incidence of lymphatic obstruction according to the lymphatic pathways in patients with unilateral upper extremity lymphedema

Dear Sir

We read with extreme interest the recent publication entitled *"Classification of Superficial Lymphatic Pathways in*

Abbreviations: QoL, quality of life; PROMs, patient reported outcome measures; MID, minimal important differences; DWH, delayed wound healing; NWH, normal wound healingAR, augmented reality; ZMC, zygomaticomaxillary complex; 3D, three-dimensional; CAD, computed aided design.

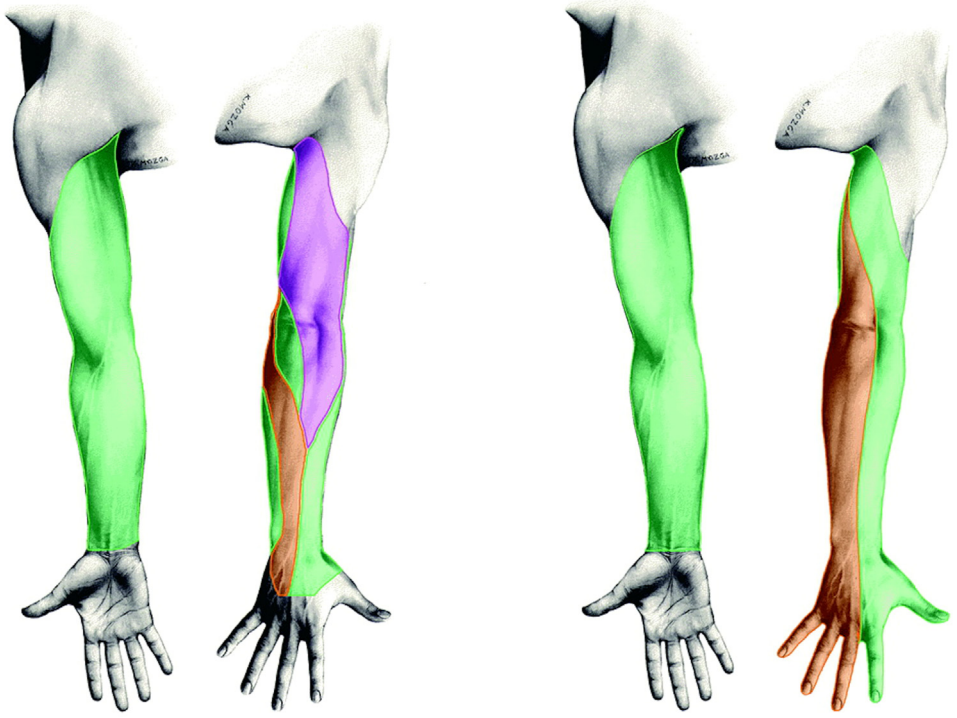

Fig. 1 Upper extremity lymphatic territories, including posterior radial and ulnar lymphosomes (adapted from Suami et al.[2] and reproduced with the permission of Plastic and Reconstructive Surgery).

the Upper Extremity and Incidence of Lymphatic Obstruction According to the Lymphatic Pathways in Patients with Unilateral Upper Extremity Lymphedema" by Woo et al.[1] in the Journal of Plastic, Reconstructive, & Aesthetic Surgery. We are in complete agreeance with many of their conclusions, especially their statement that a unified system for classifying and defining lymphatic anatomy is critical to the field of lymphatic surgery. We also find common ground in that clinically relevant lymphatic anatomy studies are imperative for advancing the field, and their area of study overlaps significantly with the work that our group is currently undertaking. There are a few points which we would like to further discuss.

In the methodology, the authors performed subcutaneous indocyanine green (ICG) injections into two sites at the second dorsal web space and ulnar to the palmaris longus tendon at the wrist crease. Based on previously delineated lymphosomes in the upper extremity,[2] we believe that the proposed injection protocol does not allow for comprehensive visualization of major superficial lymphatic channels; specifically, lymphatic channels in the anterior radial and posterior ulnar aspects are likely to be omitted without performing injections at the radial wrist crease and the 4th dorsal webspace, respectively.[3,4] The dorsum of the hand has two distinct lymphosomes[2] and therefore, the 4th dorsal website injection is essential for visualization of both lymphosomes (Figure 1). We regularly perform these injections in non-lymphedematous arms and we reliably visualize distinct posterior radial and ulnar channels, both of which do not consistently course anteriorly in the forearm and frequently remain in the posterior forearm[3]. The injection protocol utilized in this study may explain why posterior ulnar lymphatic channels were only described in 33% of normal extremities and we therefore postulate this prevalence may by an underestimation. Interestingly, in this study, channels that arose from the posterior webspace injection consistently traveled to the volar forearm. We have found that while the posterior pathways can travel to the volar forearm, there is notable variation and the pathways often travel via the dorsal foreram[3] (Figure 2).

Additionally, we acknowledge that terminology describing lymphatic pathways can be variable between institutions and generally remains undefined. In this study, the authors used reference lines to help characterize and delineate these pathways. Though this was a reasonable option, it can lead to some confusion and may be less translatable to other studies. We believe that if all injections represent a particular lymphosome (defined as a territory of skin reliably drained by lymph nodes) then the pathways can be more clearly defined and followed throughout the course of the arm (Figure 2).

We would like to draw attention to the authors' comparison between the anatomy of the contralateral arm and affected extremity. In our experience with ICG lymphography of bilateral upper extremities without lymphedema, we do not find concordance between the extremities and notable anatomical discrepancies between them are often present. The authors reference the work of Gentileschi et al. to support symmetry between the lymphatic channels of the limbs. In our review of Gentileschi et al., symmetry between the extremities was an assumption but not a finding, and their work relies on previous studies that determined symmetry in lymphatic drainage to lymph nodes but not necessarily symmetry of lymphatic channels. More-

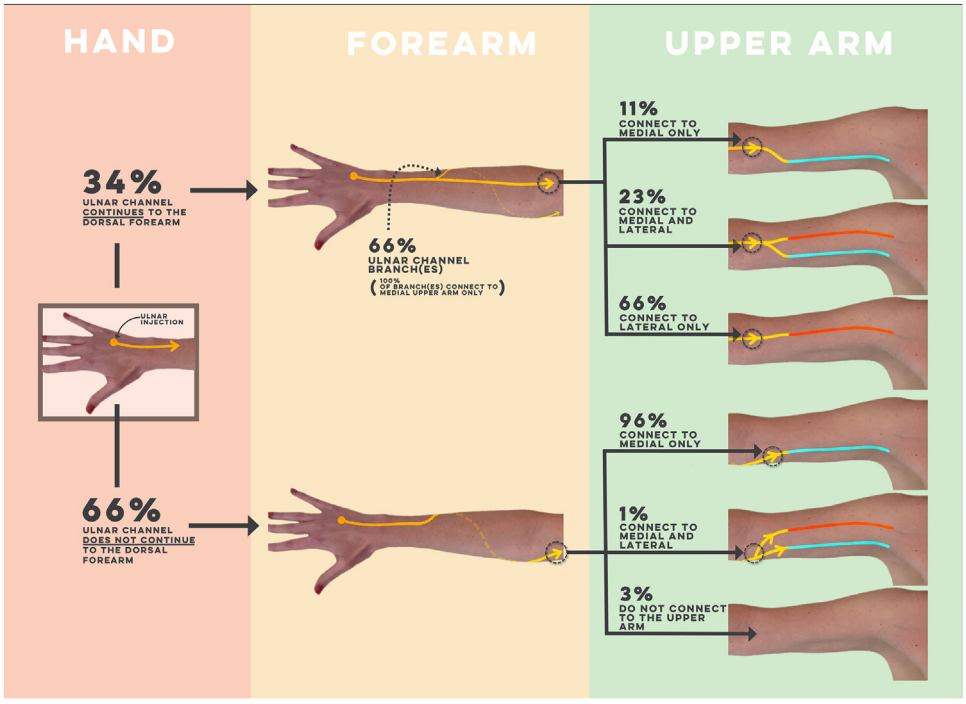

Fig. 2 Schematic of the anatomic course through the ulnar forearm (adapted from Granoff et al.[3] and reproduced with the permission of Plastic and Reconstructive Surgery).

over, if lymphatic drainage to lymph nodes is symmetric between the upper extremities of an individual, this would further argue for a classification system based on the lymphosome concept, which links lymphatic drainage of skin territories to nodal basins. Based on our experience, we do not support that the baseline lymphatic anatomy of one extremity can serve as a mirror image of the contralateral extremity.

A major conclusion drawn from this study is that lymphatic flow is preserved by the posterior ulnar lymphatic vessels and that these are least affected by lymphosclerosis. This finding differs from our observations, both clinically and radiologically. It is of particular interest as we have previously demonstrated that the distribution of breast cancer related lymphedema has a predictable pattern in which it is concentrated in the posterior upper arm and ulnar forearm.[5] We therefore hypothesize that the posterior ulnar lymphatics are especially vulnerable to lymphosclerosis, accounting for the swelling in the ulnar forearm. This discrepancy underscores the need for additional research on lymphatic anatomy.

We would like to commend the authors on this important work bringing attention to the superficial lymphatic anatomy of the upper extremities and how these pathways change following cancer treatment. Further study in this field will allow us to identify patients who are at the highest risk for the development of breast cancer related lymphedema prior to cancer treatment. We believe this preemptive approach could have a profound impact on preventing cancer related lymphedema in the future.

Ethical approval

Not required.

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Declaration of Competing Interest

None

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