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## Correspondence and Communications

## Acute upper limb infections in a regional Scottish plastic surgery unit during COVID-19: Lessons learned



Dear Sir,

### Introduction

The COVID-19 pandemic has inflicted innumerable pressures on healthcare systems worldwide, including substantial impacts on resource availability. Certainly, for the United Kingdom's National Health Service, this has necessitated reprioritisation of services and redeployment of staff to acute medical departments. As such, surgical services have been particularly affected, where large portions of elective surgery have been cancelled.<sup>1</sup>

At our unit, hospital-wide pressures resulting in reduced theatre capacity and amalgamation of surgical specialties into a single ward influenced changes in the delivery of our plastic surgery services. Similar to other centres,<sup>2</sup> we introduced a triage clinic (OPD4) and dedicated local anaesthetic (LA) theatre for acute trauma, including acute upper extremity infections which represent a significant proportion of on-call work in plastic surgery.<sup>3</sup> Delay in the treatment of these infections could have devastating impacts on functional outcomes<sup>4</sup> and may even be limb-threatening. We hoped this shift in management would allow us to assess patients as safely and efficiently as possible, without the potential risks of hospital admission or the need to burden limited emergency theatre (CEPOD) resources. In this work, we sought to analyse this change in care delivery and consider how it may alter patient care even after the pandemic.

### Methods

Using electronic hospital records, data from patients presenting with acute upper limb infections was collected retrospectively from 1st January to 30th March 2020 (pre-OPD4), then prospectively from 30th March until 30th June 2020, after our service changes were implemented (post-OPD4).

CHI squared and unpaired t-tests were utilised in statistical calculations. Significance level was taken as  $<0.05$ .

### Results

Seventy-two patients were identified prior to our changes and 49 patients after (Table 1). There was no statistical difference between the presenting age of patients between the two groups or in the time from injury/symptom onset to presentation to healthcare services. In both groups, most infections affected the hand ( $n = 54$ , 75.0% and  $n = 42$ , 85.7%, respectively) and resulted from animal bites.

Prior to the changes in our care delivery, most patients underwent surgery ( $n = 58$ , 80.6%), almost always under general anaesthetic (GA) ( $n = 56$ , 96.6%), and performed in CEPOD theatre. The majority of pre-OPD4 patients were admitted to hospital ( $n = 64$ , 88.9%). After our service changes, however, despite a similar percentage receiving operative treatment ( $n = 41$ , 83.7%), these were largely under LA ( $n = 37$ , 90.2%). Of those requiring LA, 81.1% ( $n = 30$ ) underwent surgery in our new dedicated LA theatre, thus significantly reducing the use of CEPOD resources. Patients in this cohort were more commonly managed in the outpatient setting ( $n = 25$ , 51.0%).

For both groups, mainly *Staphylococcus* and *Streptococcus* spp. organisms were grown. Eight cases of Group A *Streptococcus* were noted in the pre-OPD4 patient cohort, but none post-OPD4. For patients requiring antibiotics pre-OPD4, the majority received intravenous therapy as inpatients and were then discharged with oral antibiotics ( $n = 44$ , 61.1%). However, after our changes, there was a shift in management and instead most patients received oral antibiotics only ( $n = 26$ , 56.5%). The duration of antibiotic therapy was not statistically significant ( $p = 0.505$ ) between the two groups. Co-amoxiclav antibiotic was most commonly prescribed.

Readmission rates were not affected by our service changes (Table 2). Beyond readmission, several significant post-management complications were assessed, which were fewer in the post-OPD4 cohort.

### Discussion

The results of this study suggest that in many instances, acute upper limb infections can be adequately managed in the outpatient setting with LA procedures, without the need to admit and provide treatment under GA for all patients. Our data has proposed that post-operative outcomes were no different comparing the two groups.

We note the lack of homogeneity between our pre- and post-intervention groups, explained in part by our small patient cohorts, but also the unpredictable nature of trauma.

**Table 1** Patient demographics and referral information.

	Pre-OPD4	Post-OPD4
Average Age (Range)	46.5	47.8
$p = 0.708$	(18-91 years)	(18-92 years)
Patient Sex		
Male	43	24
Female	29	25
Referring Source		
On-site emergency department	41	19
Emergency department in different hospital within the same trust	19	9
Minor injuries unit in different hospital within the same trust	3	5
General practice	5	15
Other	4	1
Time Between Injury (or Symptom Onset) and Presentation (Range)	4.83 days (0-44 days)	6.88 days (0-61 days)
$p = 0.233$		
Classification of Infection		
Abscess	6	3
Animal bite	21	19
Cellulitis*	17	9
Felon*	1	2
Flexor sheath	10	5
Gout	2	1
Necrotising fasciitis	1	0
Osteomyelitis	2	0
Paronychia* $p = 0.018$	2	7
Post-operative	2	2
Septic arthritis	8	1

\* Represent clinically complicated cases of these types of infections where operative management was absolutely indicated. For example, infections requiring debridement or exploration for suspected osteomyelitis, or involving infected foreign bodies.

**Table 2** Admission type and duration, readmission rates, and complications.

	Pre-OPD4	Post-OPD4
Admission Type		
In patient	64 (88.9%)	21 (42.9%)
Day case	4 (5.56%)	3 (6.12%)
Outpatient	4 (5.56%)	25 (51.0%)
Average number of days for inpatient stay (Range) $p = 0.0002$	3.74 days (1-21 days)	1 day (0-7 days)
Readmission within 90 days		
Number of cases	8	4
Readmission rate $p = 0.5564$	11%	8%
Complications		
Functional deficit	4	1
Hypertrophic scarring	2	1
CRPS	1	0
Wound dehiscence	1	0

Our study captures a snapshot of a limited number of patients over a short period of time and we acknowledge this as a significant limitation of our study. However, it remains surprising to find that post-OPD4 patients had reduced readmission and complication rates in absolute terms, and we posit that different microbiology patterns could explain these observed disparities. Pre-OPD4 patients grew greater numbers of *Staphylococcus aureus* and *Pasteurella*, with

eight cases of Group A *Streptococcus* compared to none in the post-OPD4 group. Indeed, *Streptococcus* spp. are associated with more aggressive infections of the hand.<sup>5</sup>

Despite the obstacles faced in delivering high quality surgical care during a global pandemic, it has remained imperative to maintain emergency surgical services. For patients with acute upper extremity infections, perhaps selective admission (Group A *Streptococcus* cases, for instance) with

strict follow-up of patients with milder symptoms can be feasible. It may prove cost-effective to continue with our dedicated clinic and operating theatre in the longer term, even after the pandemic. Of course, beyond cost efficacy, a shift to outpatient management would most certainly improve patient experience as well.

## Ethical Approval

Not required.

## Declaration of Competing Interest

None to declare.

## Funding

None to declare.

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# The effect of adjuvant radiotherapy on clinical, imaging, and patient reported outcomes in implant-based breast reconstruction - Pilot study of a new scale for evaluating breast changes on MRI



Dear Sir,

## Introduction

With a goal of reducing recurrence and improving survival, radiation therapy is part of the oncological treatment for some patients, however may cause adverse reactions, and result in poor reconstructive outcome and higher complication rate. Patient reported satisfaction with reconstruction is also negatively affected by radiation therapy.<sup>1,2</sup> The purpose of this study is to assess clinical, radiological and patient reported outcomes in women undergoing mastectomy, immediate breast reconstruction and adjuvant radiation, and to assess correlations between outcomes, compared with non - radiated controls. We performed a pilot study proposing a new scale to classify breast changes on MRI.

## Methods

This was a retrospective study of 28 patients undergoing immediate implant and acellular dermal matrix breast reconstruction for breast cancer or risk reduction. 14 breasts received post-mastectomy radiotherapy. Outcomes and MRIs in this group were compared against a control group of 32 breasts with implants, without radiation.

Plastic surgeon examined all patients in the study, in particular, noting capsular contracture (CC) and post-radiation reactions according to *the absolute side-effect scale*.<sup>3</sup>

Patients in the study underwent post-operative MRI 6 months after surgery or after completion of radiation treatment, In order to standardize MRI changes after mastectomy and implant - based reconstruction, a senior radiologist created a new scale - *Reconstructed Breast MRI Scale* (RBMS) (Table 1 and Figure 1, Figures 2-5- Supplement) and blindly graded 46 breasts. Each finding had a value of zero or one; points were summed to a total score of zero to five.

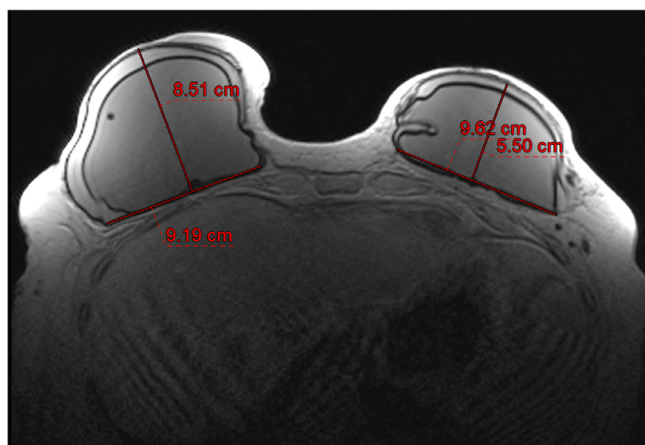
All patients filled out a validated Breast-Q Scale: Physical Well-Being: Chest.<sup>4</sup>

## Results

Baseline characteristics, oncological and reconstructive data, and complications are presented in Tables 2-4 (supplement).

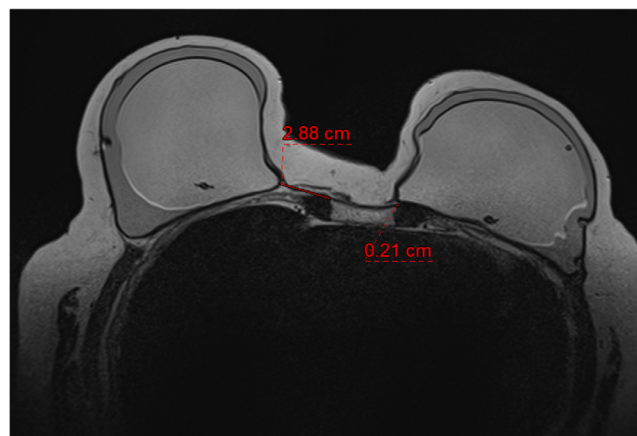
**Table 1** The Reconstructed Breast MRI scale (RBMS).

Imaging finding		Grade
Implant footprint to projection ratio	Rounded implant; implant width to projection ratio (Figure 1). Normal implant width to projection ratio is around 2:1, whereas contracted implants have decreased ratio. A ratio smaller by 50% from the original implant specifications was considered a positive finding.	0-No/ minimal change 1-Moderate change 2-1:1 ratio
Lateral implant migration	Lateral implant migration from sternal border (Figure 2- supplement). Implants are placed as medial as possible to fill the medial pocket pole and create an attractive cleavage. Pocket contraction tends to shift implants laterally. Migration of more than 2 cm from the sternal border was considered a positive finding.	0-No/ minimal migration 1-Moderate migration 2-Migration > 2cm
Implant "medial nose"	Implant "medial nose" (Figure 3- supplement). Implants have a small extension medially. Contracted implants are more rounded, thus lacking a "medial nose". This was considered a positive finding.	0-Presence of medial nose 1-Absence of medial nose
Posterior implant folds and undulations	Posterior implant folds (Figure 4- supplement). The posterior implant shell has undulations and folds. Contracted implants are rounded, obliterating the folds present in the posterior implant shell. Lack of was considered a positive finding.	0-Posterior folds and undulations 1-Absence of folds and undulations
Soft tissue changes	Soft tissue changes (Figure 5-supplemet). Breasts may present soft tissue changes i.e., edema and tissue thickening. The presence of soft tissue changes was considered a positive finding.	0-No/ minimal changes 1-Moderate changes 2-Sever changes



**Figure 1** Implant width to projection ratio. Contracted implant with decreased implant width to projection ratio (Right breast). Implant width to projection ratio around 2:1 (Left breast), similar to original implant (Mentor® Becker™ 35 460CC; Width 14 cm, Projection 6.2 cm). Radiated right breast also presents greater lateral migration, and lacks a "medial nose" and posterior folds compared to the non-radiated left breast.

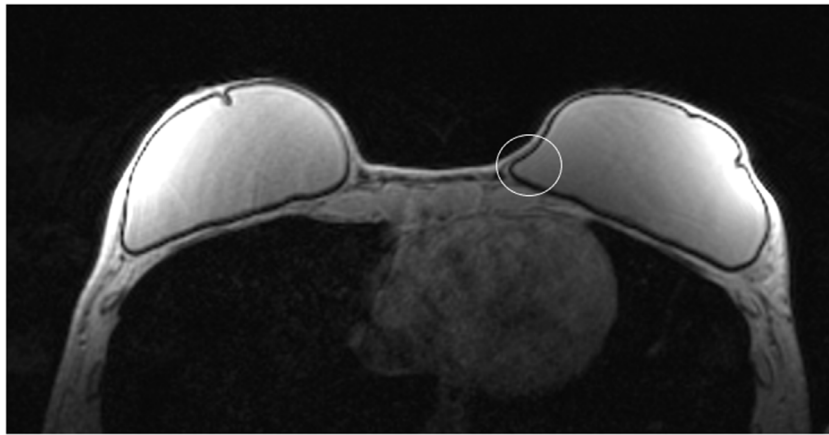
Radiotherapy was associated with fewer posterior folds ( $p = .03$ ), however, when summing the total score of all RBMS parameters, scores were similar in both groups. CC was associated with rounded implants ( $p = .05$ ) (Table 5-6, supplement).



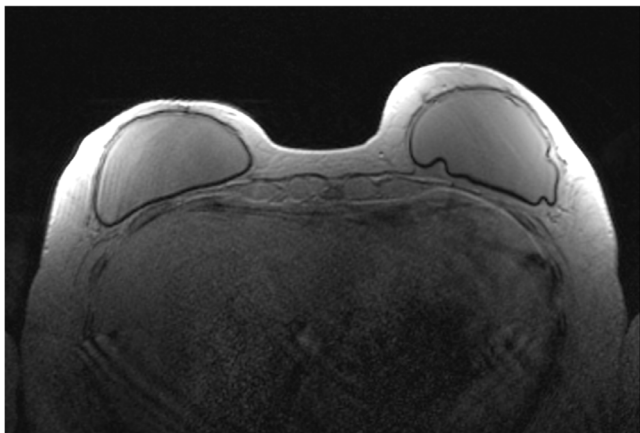
**Figure 2** Lateral implant migration from sternal border. Implant placed medially (Left breast). Pocket contraction shifts implants laterally (Right breast).

*BREAST-Q* scores were similar in radiated and non-radiated patients; Patients without CC had higher scores ( $p = .04$ ).

Radiation was significantly correlated with complications ( $r = 0.3$ ;  $p = .03$ ), CC ( $r = 0.5$ ;  $p = .001$ ) and the absolute side effect scale score ( $r = 0.43$ ,  $p = .007$ ). Higher RBMS scores were significantly correlated with increased complication rates ( $r = 0.3$ ;  $p = .009$ ) and CC ( $r = 0.3$ ;  $p = .001$ ) (Table 7- Supplement).



**Figure 3** Implant "medial nose". Implants have a small extension medially (Left breast). Contracted implants are more rounded, thus lacking a "medial nose" (Right breast).

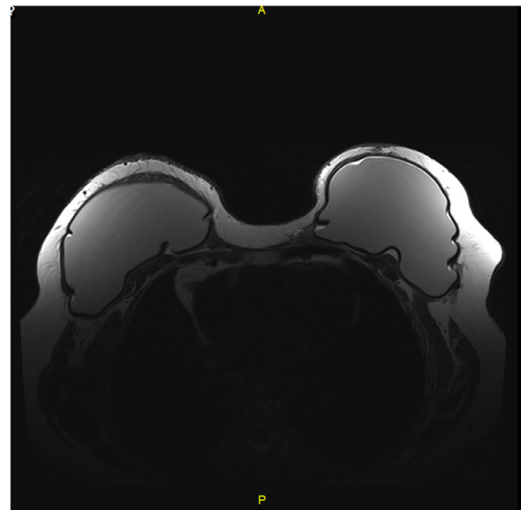


**Figure 4** Posterior implant folds and undulations. Folds and undulations in the posterior implant shell (Left breast). Contracted implants are rounded, obliterating the folds present in the posterior implant shell (Right breast).

Multivariable analysis for Breast-Q score demonstrated that CC has a negative impact on score ( $p = .005$ ), however, is not influenced by radiation.

## Discussion

The results of this study support known correlations between radiation and skin adverse reactions, increased complication rates, in particular capsular contracture, and lower Breast-Q scores, however, information regarding the effect of radiotherapy on MRI breast imaging is scarce and controversial. Middleton & McNamara JR. suggest that breasts with CC have a rounded shape.<sup>5</sup> As the capsule contracts around the implant, it tends to reduce the implant width to projection ratio, normally around 2:1, creating a rounder implant. Our study demonstrated a ratio of 1.2 in breasts with CC Vs. a ratio of 2.3 according to original implant measurements. We found that CC is associated with other implant changes visible on MRI; Implant shell posterior folds are usually present in non-contracted pockets.



**Figure 5** Soft tissue changes. Presence of soft tissue changes, i.e., edema or tissue thickening, was considered a positive finding (Right breast).

Our data confirm that fold flatten in breasts with CC or RX. During reconstruction, implants are placed as medial as possible in order to prevent a clinically visible dicit in the parasternal region. This creates a small medial extension of the implants' shell addressed by our radiologist as implant "medial nose". In the present study, rounding of the implant, caused by contraction, obliterated the nose, pushing the implant laterally relative to the sternal border. However, this was not a significant finding. A secondary goal of this study was to create a scale using the above-mentioned MRI changes to aid radiologists in quantifying breast changes and communicating them to surgeons. It may then aid surgeons in decision making such as need of revision surgery, and type of revision. It may also be useful in future clinical studies for better standardization of results. When we summed up all parameter scores, creating the *RBMS* score, we found a correlation between higher scores and increased complication rates, in particular CC.

The present study failed to show a significant difference in *BREAST-Q*, perhaps due to a small cohort. This lack of significant difference may be due to our long follow-up, that possibly facilitated adjustment to change, and may be encouraging for patients in the long run.

The study is limited by its retrospective design and small patient cohort. The *scale* suggested, although promising, has not been validated and a prospective, multicenter trial with a larger patient cohort would be welcomed.

## Conclusions

Compared to non-irradiated breast, post-mastectomy radiotherapy is associated with adverse clinical changes, higher rates of CC and complications, and typical changes on MRI. This study offers a new scale for describing radiation-induced changes.

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## Ethical approval

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## Declaration of Competing Interest

All authors report nothing to disclose.

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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.2022.06.094](https://doi.org/10.1016/j.bjps.2022.06.094).

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## Optimizing tissue expander breast reconstruction in nicotine users: An algorithmic approach



Dear Sir,

### Introduction

Nicotine use is a significant risk factor for complications following alloplastic and autologous breast reconstruction.<sup>1</sup> Although smoking cessation has positive effects on surgical outcomes,<sup>2</sup> not all individuals are successful in quitting.<sup>3</sup> Smokers who are diagnosed with breast cancer may have

Category	Group I	Group II	Group III	p value
Total patients	10	11	174	-
Total breast reconstructions	19	19	285	-
Age	54.1 (±8.6, 41.2-70.8)	48.8 (±8.9, 35-61.8)	48.9 (±10.7, 23.8-74.2)	0.316
BMI	24.5 (5.2)	26.3 (2.7)	28.7 (6.3)	0.042 <sup>1</sup>
Breast disease				
Breast cancer	90% (n = 9)	72.7% (n = 8)	78.7% (n = 137)	0.629
Ductal carcinoma in situ	10% (n = 1)	18.2% (n = 2)	18.4% (n = 32)	0.906
Lobular carcinoma in situ	0% (n = 0)	0% (n = 0)	1.1% (n = 2)	1
BRCA mutation	30% (n = 3)	9.1% (n = 1)	11.5% (n = 20)	0.195
Prophylactic (Non-genetic mutation)	0% (n = 0)	0% (n = 0)	1.1% (n = 2)	1
Benign breast disease	0% (n = 0)	9.1% (n = 1)	0% (n = 0)	0.108
Comorbidities				
Diabetes	0% (n = 0)	0% (n = 0)	14.9% (n = 26)	0.276
Hypertension	30% (n = 3)	27.3% (n = 3)	22.9% (n = 40)	0.772
COPD	20% (n = 2)	0% (n = 0)	1.1% (n = 2)	<0.001 <sup>1</sup>
Coronary Artery Disease	0% (n = 0)	0% (n = 0)	2.3% (n = 4)	1
Mastectomy type				
Skin-sparing mastectomy	68.4% (n = 13)	57.9% (n = 11)	35.8% (n = 102)	0.007 <sup>1</sup>
Nipple-sparing mastectomy	31.6% (n = 6)	42.1% (n = 8)	64.2% (n = 183)	0.007 <sup>1</sup>
Unilateral reconstruction	5.3% (n = 1)	15.8% (n = 3)	22.1% (n = 63)	0.604
Bilateral reconstruction	94.7% (n = 18)	84.2% (n = 16)	77.9% (n = 222)	0.604
Tissue expander placement				
Prepectoral tissue expander	0% (n = 0)	31.2% (n = 6)	70.5% (n = 201)	<0.001 <sup>1</sup>
				0.001 <sup>2</sup>
Subpectoral tissue expander + Mesh	42.1% (n = 8)	26.3% (n = 5)	12.6% (n = 36)	0.002 <sup>1</sup>
Total sub-muscular tissue expander	57.9% (n = 11)	42.1% (n = 8)	16.8% (n = 48)	<0.001 <sup>1</sup>
				0.012 <sup>2</sup>
Additional oncologic treatment				
Neoadjuvant chemotherapy	30% (n = 3)	36.4% (n = 4)	30.5% (n = 53)	0.929
Adjuvant chemotherapy	60% (n = 6)	36.4% (n = 4)	21.8% (n = 38)	0.013 <sup>1</sup>
Adjuvant radiation	10% (n = 1)	27.3% (n = 3)	34.5% (n = 60)	0.299
Wound complications				
Wound dehiscence requiring surgical debridement and/or device removal	5.3% (n = 1)	31.6% (n = 6)	6.3% (n = 18)	0.002 <sup>2</sup>
Infectious complications				
Infection requiring oral antibiotics	0% (n = 0)	5.3% (n = 10)	5.6% (n = 16)	0.847
Infection requiring IV antibiotics	0% (n = 0)	5.3% (n = 1)	3.2% (n = 9)	0.720
Infection requiring device removal	0% (n = 0)	5.3% (n = 1)	6.0% (n = 17)	0.848
Other complications				
Seroma	5.3% (n = 1)	15.8% (n = 3)	7.4% (n = 21)	0.361
Hematoma	0% (n = 0)	0% (n = 0)	1.1% (n = 3)	1

<sup>1</sup> Group I vs III.

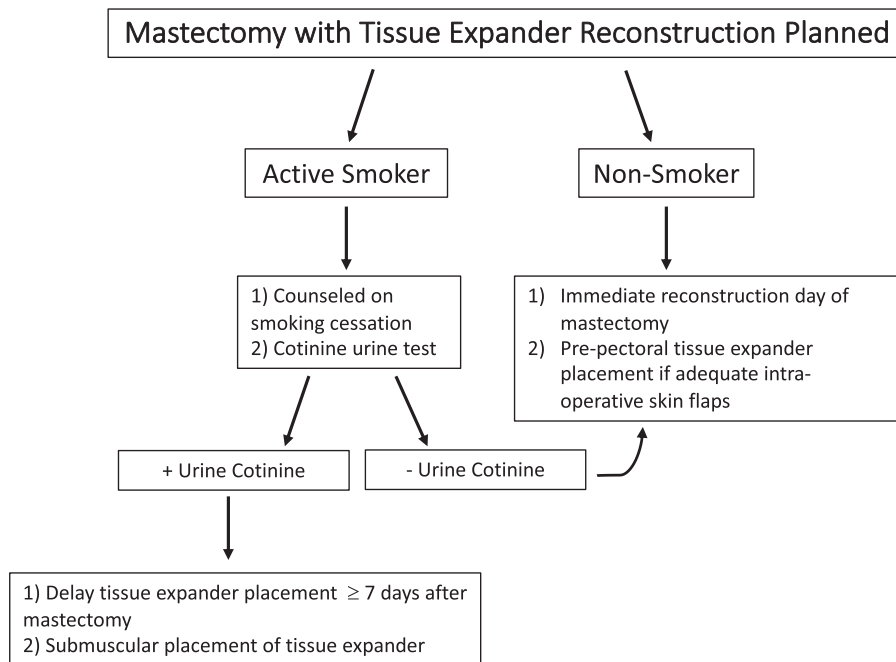
<sup>2</sup> Group II vs III.

difficulty being nicotine-free abruptly for immediate reconstruction, especially considering the stress of a new cancer diagnosis. Surgeons may elect to not to offer reconstruction to smokers because of the elevated complications while some will operate on informed patients who accept the higher risks. Consequently, there is a lack of best practice guidelines for managing patients who are actively smoking at time of breast reconstruction.<sup>4</sup> The purpose of this study is to assess an approach to tissue expander reconstruction in smokers to optimize outcomes.

## Methods

A retrospective study was performed on patients who underwent tissue expander reconstruction after mastectomy between 2017 and 2021. The approach to optimize outcomes in smokers was to 1) delay reconstruction at least 7 days after the mastectomy and 2) place the expander submuscularly (Group I). The other patients underwent standard immediate reconstruction on the day of mastectomy and were divided into Group II (active smokers) and Group III (non-smokers). Group III was considered the control group.





**Figure 1** An algorithmic approach to tissue expander breast reconstruction for nicotine users.

Prepectoral or subpectoral placement of the tissue expander in Groups II and III was determined intraoperatively based on the assessment of the skin flaps. A nipple sparing versus skin sparing mastectomy was chosen preoperatively with considerations to the tumor and ptosis. Intraoperatively, expanders were filled maximally without placing tension on the skin flaps. This varied based on the condition of the skin flap type of mastectomy (skin sparing, nipple sparing). Marginal necrosis was debrided during the delayed submuscular placement of the tissue expander for patients in Group I. Two weeks post-operation, in-office expansion was begun; skin necrosis and surgical site infection were considered for 90 days postoperatively. Group I comprised of consecutive patients who underwent reconstruction by the senior author (A.H.H.) after a change in approach for smokers in 2018. Outcome and demographic variables were evaluated. Two tailed T test, ANOVA, and Fishers exact test were performed for continuous and categorical data, respectively. P values  $<0.05$  were considered significant. Non-parametric data is presented as median ( $\pm$  interquartile range) and parametric data as mean ( $\pm$  standard deviation).

## Results

The study included 195 patients (323 breast reconstructions): Group I (10 patients, 19 expanders); Group II (11 patients, 19 expanders) and Group III (174 patients, 285 expanders). The median time interval between mastectomy and tissue expander reconstruction in Group I was 15.5 days ( $\pm 19.5$ ). Groups I and II had no significant demographic differences (Table 1). Mean BMI in Group I was  $24.5 \pm 5.2$  compared to  $28.7 \pm 6.3$  kg/m<sup>2</sup> in Group III ( $p = 0.042$ ). In Group

I, 20.0% had Chronic Obstructive Pulmonary Disease (COPD), versus 1.1% in Group III ( $p = <0.001$ ).

Group II exhibited significantly more wound dehiscence necessitating operative intervention, ( $n = 6/19$ ), compared to Group III ( $n = 18/285$ ) ( $p = 0.002$ ). There was no significant difference when comparing wound dehiscence in Group I, ( $n = 1/19$ ), and Group III ( $n = 18/285$ ) ( $p = 1.0$ ). There were also no statistically significant differences in infectious complications, seroma, or hematoma formation. Group I tissue expanders were all placed submuscularly per the approach. In Group II, 68.4% ( $n = 13/19$ ) were placed submuscularly, compared to 29.4% ( $n = 84/285$ ) in Group III. Wound dehiscence in submuscular expander placement in Group I (5.3%,  $n = 1/19$ ) and Group II (30.8%,  $n = 4/13$ ) were similar ( $p = 0.13$ ). In Group III, prepectoral expander placement had 7.0% ( $n = 14/201$ ) dehiscence versus submuscular placement (4.8%,  $n = 4/84$ ) ( $p = 0.60$ ).

## Discussion

Patients who use nicotine and undergo mastectomy pose a reconstructive challenge. Smokers diagnosed with breast cancer are counseled on smoking cessation and ideally quit swiftly. However, because of the effect of nicotine dependence, this is rare. Modalities to facilitate cessation either involve nicotine (e.g., patches) or medications that do not have an immediate effect. A shared decision-making approach allows patients to participate in choosing the management based on informed consent. Limitations in the study include small sample size resulting in potential underpowered comparisons, and one operator for Group I versus three for the other groups. Nevertheless, if patient's who use nicotine are offered tissue expander reconstruction, our

findings indicate performing the operation 1) at least 7 days after the mastectomy (to allow for vascular delay and demarcation and 2) in the submuscular plane can normalize the risk of skin necrosis to that of non-smokers who have standard (prepectoral or submuscular) reconstruction on the day of mastectomy. We have adopted these results for an algorithm for tissue expander reconstruction (Figure 1). Although prepectoral breast reconstruction has recently become very common, most surgeons place tissue expanders subpectorally if there is concern for skin perfusion.<sup>5</sup> However, this study suggests that managing nicotine users distinctly than non-smokers can improve outcomes.

## Declaration of Competing Interest

None.

## Ethical Approval

Not required.

## Funding

None.

## Disclosures

None.

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## Clinical variation in the treatment of trigger finger: An international survey of orthopaedic and plastic surgeons<sup>☆</sup>”



Dear Sir,

### Introduction

Trigger finger is a common hand condition with many treatment options, but the evidence for most treatment options is of low quality.<sup>1</sup>

The aim of this clinician survey was to gain insight into the current decision-making and preferred treatment options for surgeons in secondary care. The survey forms part of feasibility work for a future project to seek the optimum management of trigger fingers.

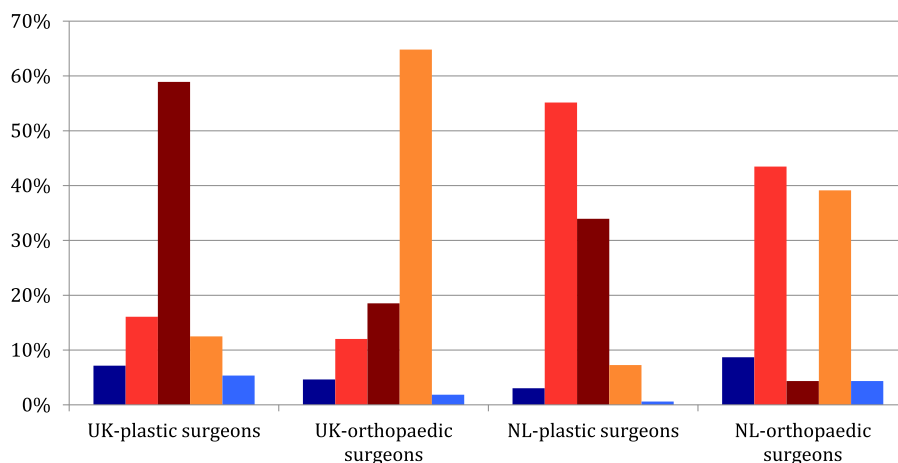
### Methods

The steering group developed a survey for hand surgeons that investigated personal preferences for managing trigger finger. It was composed of three sections: demographics; specific questions about treatment options; and three hypothetical clinical cases. The cases were presented in ascending order of severity: mild (uneven finger movement), moderate (triggering, correctable), severe (finger fixed in flexion).

In both the United Kingdom (UK) and The Netherlands, a trainee collaborative approach was used to create a list

#### <sup>☆</sup> Meetings at which the work was presented:

September 14, 2019 ICOPLAST-trainee meeting, Amsterdam  
 October 10+12, 2018 BSSH Autumn Scientific Meeting, London  
 June 14, 2018 FESSH, Copenhagen  
 June 17, 2022, Symposium Dutch Society for Hand Therapy, Bussum



**Figure 1** Preference for type of steroid ( $n = 408$ ).

of eligible respondents. Following piloting and revising the survey, an invitation email was sent 19th December 2017. Automated digital reminders were sent and our collaborators personally encouraged non-responders to complete the survey. The survey closed 1st March 2018.

## Results

A total of 713 plastic and orthopaedic surgeons were invited. 234 UK surgeons and 206 surgeons from The Netherlands completed the survey (response rate 62%).

Almost all (98%) Dutch surgeons stated they are not restricted in choosing a treatment, while 39% of the UK surgeons felt restricted by funding (71%), guidelines (10%) or both (19%). Respondents always (78%) or sometimes (20%) involved patients in the treatment decision making.

Over 90% of patients had received prior treatment before being seen in secondary care: injection (88%), NSAIDs (34%), physiotherapy (28%), splinting (20%) and/or surgery (4%).

In both the UK and The Netherlands, respondents mainly offered steroid injections (94%) and surgery (95%). Non-invasive treatments were less commonly used: splinting (12%), physiotherapy (11%), NSAIDs (6%).

When giving a steroid injection, most respondents (61%) preferred to give combined steroid and local anaesthetic. Plastic surgeons were more likely (40%) to give steroid alone than orthopaedic surgeons (12%). Each of the groups appeared to have a preferred type of steroid (Figure 1). The preferred site of injection was in the tendon sheath (volar 56%, dorsal 24%) followed by the subcutaneous tissue (14%). Ultrasound guidance is rarely used (7%). Following injection, most respondents recommended using the fingers normally (64%) rather than tendon gliding exercises (18%), relative rest (10%) or no instructions at all (8%). Most respondents always (52%) or sometimes (46%) organized a follow up appointment. Over 60% stated that two injections should be the maximum, with a preferred interval of 1-3 months (45%) or 3-6 months (47%). All respondents from The Netherlands and 97% of respondents from the UK offered open rather

than percutaneous release. There was no consensus on type of incision for open release.

Figure 2 shows treatment pathways for mild, moderate and severe cases of trigger finger. Most respondents treated mild or moderate trigger finger with a steroid injection. However, noninvasive treatment was preferred by most (50%) of Dutch orthopaedic surgeons. Dutch plastic surgeons had a higher (81%) preference for steroid injection in mild cases than to the other professionals (38-55%). The majority of respondents chose surgery in cases of severe triggering, but 43% of UK orthopaedic surgeons preferred a steroid injection as initial treatment.

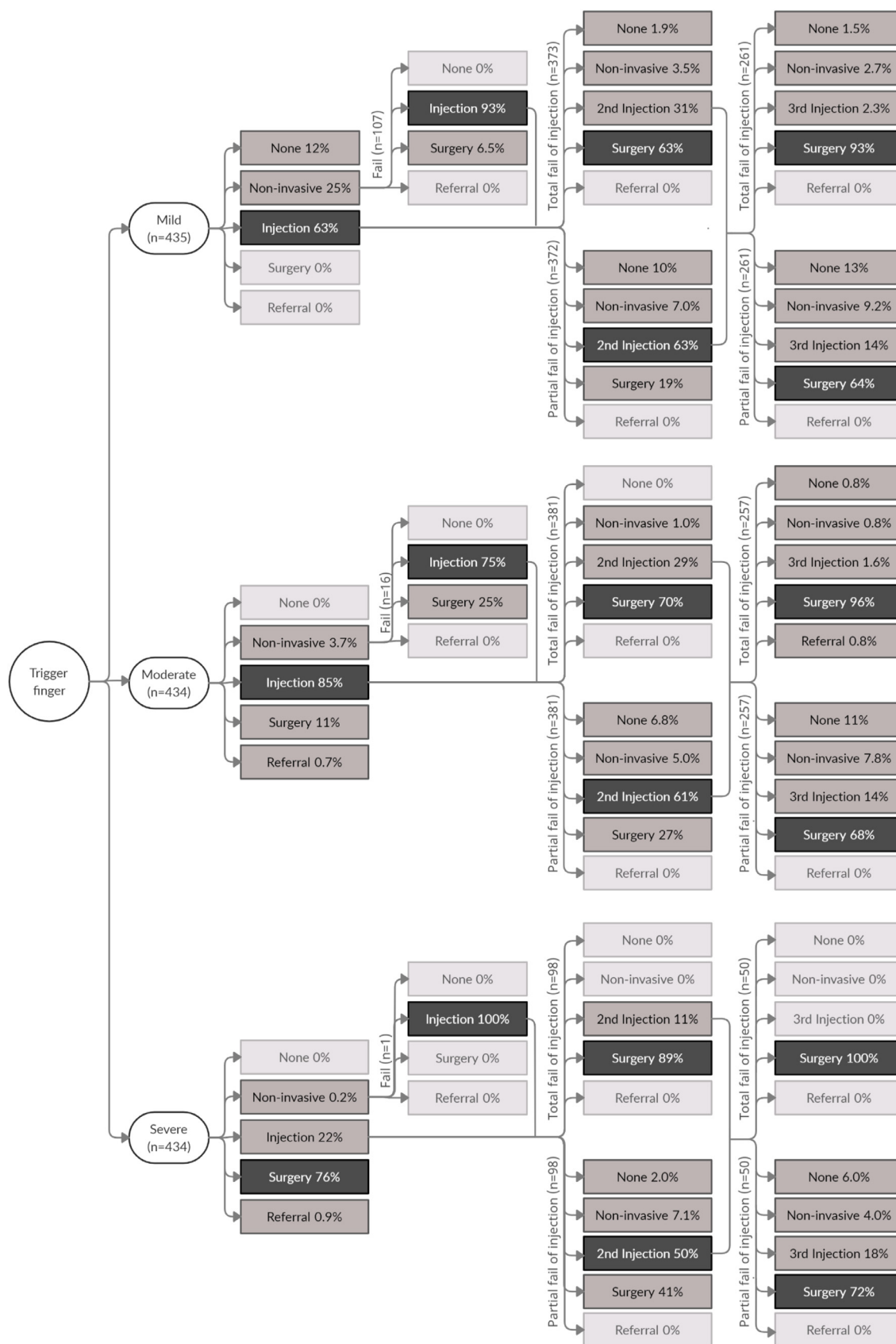
Forty-three percent of respondents treated patients with diabetes mellitus differently. Most of them (47%) avoided steroid injection while 43% used a steroid injection initially, but would move to surgery after failure or recurrence. In rheumatoid arthritis, 34% of the respondents treated patients differently: 18% avoided steroid injection, 34% avoided surgery and 49% had another preference.

## Discussion

This study was the first Anglo-Dutch trainee collaboration in hand surgery and the first to study current practice in treating trigger finger in secondary healthcare.

Steroid injection was the preferred treatment in mild and moderate cases. However, there was very little consensus on the best method in terms of type, dosage, placement, interval, maximum attempts and instructions given. Evidence for the use of noninvasive treatment options is very limited,<sup>1</sup> but they were still used as initial treatment by 25% of respondents in mild cases. Twelve percent preferred expectant management in these cases, which is supported by McKee et al. showing resolution of trigger finger without any treatment in 52% of patients.<sup>2</sup>

Open surgery was the treatment of choice for severe cases, but different incisions were used. Percutaneous release was barely used. This is surprising as it can be performed during consultation, is likely to be cheaper and more convenient, is comparable to open release in terms of treat-



**Figure 2** Treatment decisions in management of trigger finger. Mild: uneven finger movement; moderate: triggering, correctable; severe: finger is fixed in flexion.

ment failure (0.6%) and cadaveric studies did not reveal nerve injuries.<sup>1,3-5</sup>

This survey clearly demonstrates the variation in the management of trigger finger in secondary healthcare and highlights the need to build an evidence base to aid clinicians in treating trigger finger. In response to this, multiple international randomized controlled trials are being designed to seek the optimum management of trigger finger.

## Declaration of Competing Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Contributor statement

AD, MDG and EPAH conceived the idea; AD and MDG programmed REDCap; AD, RH, KS, MDG and JR managed recruitment of collaborators and survey response; AD, MDG and RMP drafted the manuscript; EPAH, JHC, JD, RH, KS and JR optimized the manuscript. EPAH, JHC, AJ and RMP supervised the project.

## Acknowledgement

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## Ethical approval

The study was reviewed by the Oxford Joint Research Office and deemed not to need ethical approval.

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## Using artificial intelligence to analyze emotion and facial action units following facial rejuvenation surgery

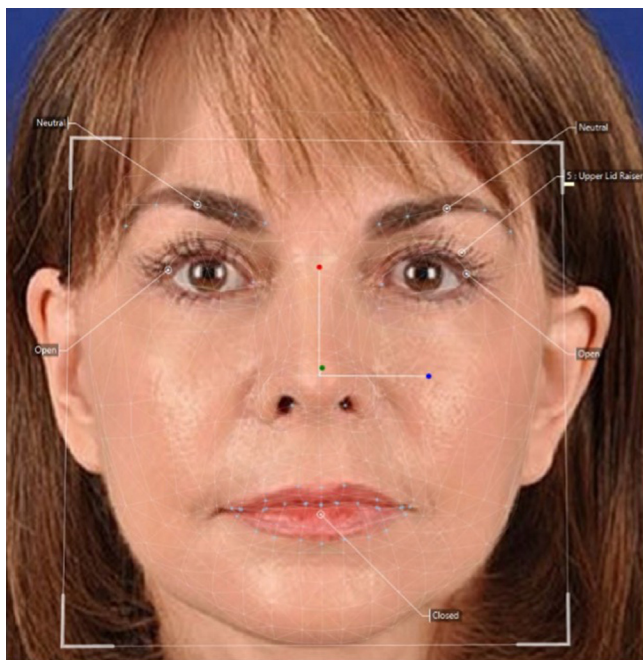


Dear sir,

### Introduction

Emotional expression is fundamental to human communication and connection. It includes sadness, happiness, anger, neutrality, surprise, fear, and disgust.<sup>1</sup> On one hand, it is linked to facial muscle action units functioning through the Facial Action Coding System (FACS), which can, on the other hand, be used to analyze facial expressions and emotions.<sup>1,2</sup>

Facial aging causes undesired emotional expression which can be surgically corrected. However, subjective surgical outcome measures may be biased. Such bias can be overcome by the use of objective measures, in this case, through emotional expressions post-surgery.



**Figure 1** Representative images of the FaceReader analysis. The facial images are overlaid with a virtual mesh with labelled action units with their respective functioning. Left: The example image demonstrates a pre-operative photo on the left and the corresponding post-operative photo on the right. The patient is a 49-year-old female who underwent high SMAS facelift with lateral temporal endoscopic browlift, bilateral canthopexy, and fat transfer to the lower eye lids, midface face, jawline, chin, and upper and lower lip.

The purpose of this study was to objectively measure outcomes of facial rejuvenation using artificial intelligence (AI) and determine whether this measure was appropriate for evaluation of emotional expression.

## Methods

This was a retrospective study approved by the institutional review board (IRB) and enrolled all patients who underwent facial rejuvenation surgery comprising high SMAS facelift with/without browlift, blepharoplasty, and fat grafting at our department in 2017. Pre- and post-operative patient photographs were taken in repose, and images were analysed using a commercially available facial expression recognition software package (FaceReader™, Noldus Information Technology BV, Wageningen, The Netherlands). This analytic method has an accuracy of 80% when tested against FACS.<sup>3</sup> FaceReader™ data included the proportion of each emotion expressed and associated facial action units intensity.

Appropriate statistical analyses were performed using JMP (SAS Institute Inc., NC, USA) at  $\alpha = 0.05$ .

## Results

15 patients (11 females, 15 Caucasians) with a mean age of 55.7 years old (range, 41-70 years old) were included.

Concomitant procedures included 11 browlifts, 8 upper and lower blepharoplasties, 13 fat grafting, and 3 chin augmentations. **Figure 1** shows an example of FaceReader analysis.

Facial analysis showed an increase in average perceived happiness from 1.03% to 13.17% ( $p < 0.01$ ) and a decrease in anger from 14.66% to 0.63% ( $p < 0.05$ ) in all patients pre- and post-operatively. (**Figure 2**) With additional procedures, the trends remain unchanged. Five patients underwent high SMAS facelift with upper or lower blepharoplasty, browlift, and/or fat grafting. Their average happiness emotion increased from 3.08% to 25.20% ( $p < 0.01$ ) and the average surprised emotion increased from 0.00% to 6.44% ( $p < 0.01$ ) post-operatively.

Facial action unit analyses correlated to emotional analyses. Pre-operatively, there was no detectable activation of the Lip Corner Puller, and the action unit of the zygomaticus major muscle essential for smile formation, in any patient.<sup>4</sup> The high SMAS facelift should raise the SMAS in the vector of the zygomaticus major, giving the patient a slight smile even at rest. As expected, after high SMAS facelift, 11/15 patients had activation of the Lip Corner Puller action unit ranging from 1/4 to 3/4 intensity. This was the most distinct and nearly universal change in all patients of all facial action units analysed.

## Discussion

In this study, we demonstrated objective AI-based outcome measures of facial rejuvenation surgery. Previous evaluation methods, such as patient satisfaction surveys and eye-tracking suffer from bias and contextual information.<sup>4,5</sup> AI advances could be an objective and standard technique for surgical evaluation. We used FaceReader's™ AI to overcome the aforementioned assessment drawbacks.

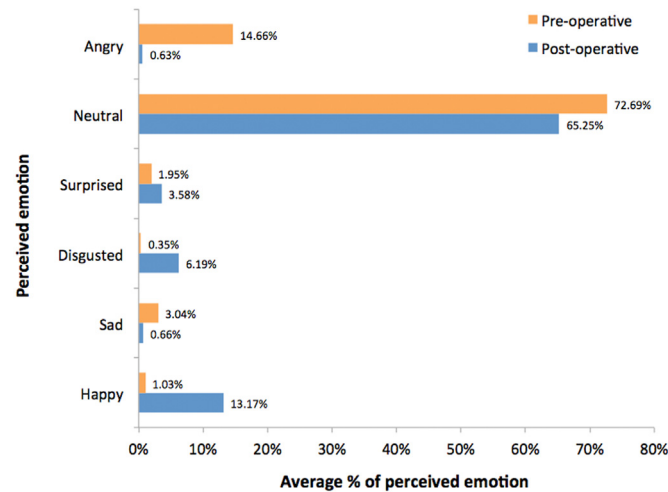
We found that FaceReader™ can quantify subjective measures, such as satisfaction, in a standard fashion. Furthermore, the significant increase in perceived happiness in patients' faces in neutral pose can be interpreted as successful facial rejuvenation. FaceReader™ facial action unit analysis also allowed us to correlate the changes in perceived emotions with muscle functioning.

Interestingly, AI software can compare results of different surgical techniques because it does so objectively.

## Conclusion

The growing popularity and availability of AI software such as FaceReader™ appear beneficial in measuring facial esthetic surgery outcomes. The outputted numerical values can avoid the inter- and intra-observer biases. To further assess the validity of FaceReader™ output, our future research will compare FaceReader™ analysis to validated outcome questionnaires, such as FACE-Q. Furthermore, we will continue to explore the use of this technology to assess surgical outcomes. If surgical outcomes are unbiased with standardized evaluations, we believe the efficacy of facial esthetic surgery will consequently improve.

Approved by Mayo Clinic IRB. IRB #:17-009,087



**Figure 2** Analysis of the perceived seven cardinal emotion averages in the 15 facial rejuvenation patients. Statistically significant emotions were determined to be the happy emotion and the angry in an inversely proportional manner. Pre-operative emotion was shown above the post-operative value within each emotion category.

## Conflicts of interest

None declared

## Funding

None

## Ethical approval

Not required

## Consent

Patient used in [Figure 1](#) has provided written consent for photo publication

## Financial Disclosure

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## A novel, innovative clamp with vessel eversion feature for end-to-end microvascular anastomosis



Dear Sir,

### Introduction

Free tissue transfer, or free flaps are a cornerstone of modern reconstructive surgery, particularly when dealing with vascular, cancer and trauma surgeries. Microvascular anastomosis has a steep learning curve and remains the critical determinant of success in free tissue transfer<sup>1</sup>. A successful outcome in microvascular surgery is dependent on a variety of factors, including careful preoperative patient assessment, atraumatic surgical technique, recipient vessel preparation, performance of perfect microvascular anastomoses, and planning of pedicle geometry to avoid vessel kinking or extrinsic compression. The current use of Acland clamps, though having a proven track record and a relatively low cost, offers scope for several technical errors. Backwalling and incomplete bites constitute a majority of these errors, attributed to poor visibility of suturing armamentarium within the vessel lumen<sup>2,3</sup>. Innovative solutions to reduce technical errors in microvascular training, and thus reducing the learning curve, could be helpful in making microvascular surgery more accessible. This article presents a microvascular clamp with a new design for use in end-to-end anastomosis, which is extremely flexible from the standpoint of adjustability.

### Design

The new clamp design, developed by Shira MedTech Private Limited, India is shown in [Figure 1](#). The Shira Clamp offers a novel vessel eversion feature, which keeps the vessel walls open even after occlusion. This feature is provided by a three-jaw clamp design, in which a pair of jaws are used for occlusion of the blood vessels, while the third jaw is used for holding the adventitia of the vessel. ([Figure 2](#)) This is made possible by limiting the adventitiectomy only to the posterior wall. Anterior adventitia, instead of trimming, may be used for retracting the anterior vessel wall. The adventitia can be held using the third jaw as mentioned above. These clamps are available in different sizes depending upon the clinical need. These clamps are metallic with non glare surfaces.

### Technique

These innovative clamps were used on patients requiring microvascular reconstruction after approval from the ethical committee of the institute (Reference number: AI-



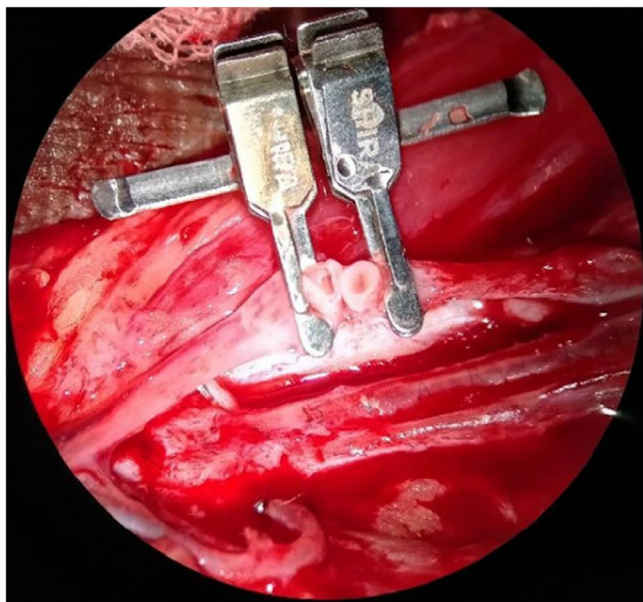
**Figure 1** Innovative three jaw design.

IMS/IEC/2021/3691) The recipient vessel is isolated, as well as the donor vessel is prepared. The vessels are dissected to allow placement of double clamps and enable placement of sutures. A dark colored background (blue/green) is placed to enhance the visibility of nylon suture and prevent microsurgeon discomfort. Once the ends are placed within the first two jaws of the clamps, the blood vessels are prepared for suturing. Traditionally, with the conventional clamps trimming of the adventitial layer is done. However, with Shira clamps, minimal adventitiectomy is done only on the posterior wall. Anterior adventitia, instead of trimming, is peeled off to be held by the third jaw of the clamp for retracting the anterior vessel wall. This results in everting the vessel lumen towards the surgeon while occluding the blood flow with the lower two jaws.

### Suturing

The ends of the blood vessels can be sutured using 8.0/9.0 nylon sutures. The blood vessel wall is divided into two by placement of a stay suture at the opposing ends. Subsequently, similar stay suture is placed at the opposite end of the blood vessel, however the needle thread is not cut. Additional passes of the suture needle, are then placed, from the distal side proximally, with the first one as close to the stay suture to prevent any leakage. However, due to the eversion of the vessel lumen, both the anterior and poste-





**Figure 2** Improved visibility due to everted vessel lumen allows suturing without flipping the clamp.

rior vessel walls can be sutured without 180° flipping of the clamps.

## Discussion

Microsurgery, being highly technique sensitive, requires patience, practice, dedication and effort as even a small inadvertent step can lead to failure of the lengthy, strenuous surgical intervention. Manual dexterity, deft tissue handling and manipulation skills can be obtained only through intensive training.

Basic microsurgery techniques have remained unchanged in the last forty years. The current gold-standard, Acland occlusion clamp, cause the blood vessel walls to collapse, which results into poor visual access for anastomosis, a key procedure in microvascular surgeries. Limited visual access and delicate structure of collapsed vessel walls to be anastomosed further increase the complexity of the surgery. Errors resulting in failure of microsurgery include insufficient approximation (26.1%), erroneous posterior wall sutures-vessel backwall (21.7%), incomplete bites (19.6%), tissue tear (19.6%), and irregular widths (13.0%)<sup>2</sup>. In order to avoid erroneous posterior wall sutures, Acland clamps need to be flipped. This further increases difficulty in severe space constrained areas like head and neck surgery.

Shira Clamp, with novel three-jaw design, solves a lot of these issues, thereby reducing the learning curve considerably. The eversion of the vessel walls provides better visibility of the posterior wall resulting in less chances of back walling as seen in [Figure 2](#). These clamps reduce the incidence of backwalling as well as of incomplete bites considerably. As Shira clamp does not require flipping during suturing of the vessels, micro-anastomosis becomes much more convenient in space constrained surgical areas such as the head and neck region.

## Conclusion

Microsurgery is an art that requires immaculate practice and patience to achieve perfect results. There is minimal scope for errors. Innovative solutions like Shira Clamp reduce the learning curve associated with microvascular techniques. The novel eversion design reduce the chances of error while providing superior outcomes. Subsequently, it could eliminate the necessity of an assistant while performing vascular surgery. These modifications without sacrificing the end result can be a major boon in bridging the shortage of specialists and medical-staff in the underdeveloped and developing parts of the world.

## Declaration of Competing Interest

The authors have no financial interest to disclose in relation to the content of this article. The authors have no conflict of interest.

## Funding

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## Ethical Approval

Approval received from the ethical committee of the institute (Reference number: AIIMS/IEC/2021/3691)

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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.2022.06.068](https://doi.org/10.1016/j.bjps.2022.06.068).

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## Correlation between tissue-harvesting method and donor-site with the yield of spheroids from adipose-derived stem cells



Dear Sir,

Adipose-derived stem cells (ASCs) are a variety of mesenchymal stem cells (MSCs) identified for the first time in 2001 in the adipose tissue.<sup>1</sup> In the past decade, successful isolation of multipotent ASCs, and their ability to preferentially home to damaged tissue, made ASCs a promising tool in regenerative medicine. Their clinical appeal is due to an easy harvest in large quantities through a non-invasive and well-accepted approach with an extremely low risk of complications.

Cells can be easily separated from subcutaneous fat deposits by different stages of washing, digestion and centrifugation, followed by *in vitro* growth under adherence or suspension conditions.

In recent years, the scientific community has considered two-dimensional (2D) cell cultures to be artificial and has therefore focused on three-dimensional spheroids of adipose-derived stem cells (SASCs) that possess higher stemness and regenerative capacity than classical two-dimensional cultures.<sup>2</sup> Donor-dependent differences exist in the yield of ASCs, in the proliferation and capacity of differentiation, also depending on age and body mass index (BMI).<sup>3</sup> Controversy still exists on if fat-harvesting technique and donor site could influence the yield of SVF cells and ASCs from adipose tissues.<sup>4</sup> However, so far, no studies have investigated if these factors could influence the yield of SASCs.

**Table 1** Characteristics of harvested and processed fat.

Variable	N = 92
Volume of harvested fat (mean $\pm$ SD, range) (mL)	81.4 $\pm$ 175.7 (2 - 1000)
SASCs absolute number (mean $\pm$ SD, range) (No of cells)	1705109.0 $\pm$ 2536664.9 (0 - 13000000)
SASCs density (mean $\pm$ SD, range) (cells/mL)	62504.7 $\pm$ 95371.1 (0 - 625000)

In this study, we investigated the effects of adipose tissue donor-site, harvesting technique and patients' characteristics on the yield of spheroids of adipose-derived stem cells. Ninety-two subcutaneous fat tissue samples were harvested from healthy patients undergoing plastic surgery procedures at the Plastic and Reconstructive Surgery Unit of the University Hospital "Paolo Giaccone" of Palermo. Fat samples were harvested from abdomen (n = 34), flanks (n = 12), thighs (n = 33) and breast (n = 13) using the syringe-assisted Coleman technique and subsequently processed with centrifugation (1500 RPM for 3 minutes) or by sedimentation (decantation in syringe). Briefly, the lipoaspirate samples were subjected to an enzymatic and mechanical digestion process to obtain a specific cell population, cultured in 3D as floating spheroids (Supplementary Figure 1). SASCs yield was hence defined as SASCs density (absolute cell number per mL of harvested adipose tissue). This was calculated - following culture under 3D stem cell condition- by counting the cells that forms the spheroids into a Burkler chamber.

Patients' mean age was 46.0  $\pm$  13.6 years (range 15 - 82), seventy-eight participants were female (84.8 %) and 14 were male (15.2 %), and BMI ranged from 19.0 to 35.8 (mean = 25.9  $\pm$  3.9). In 46.7% of patients, the sample was treated with additional centrifugation, while in 53.3% it was treated with sedimentation only. The mean volume of fat collected was 81.4  $\pm$  175.7 mL (range 2 - 1000) and the mean number of SASCs isolated was 1705109.0  $\pm$  2536664.9 (range 0 - 130000). The mean yield of SASCs was 62504.7  $\pm$  95371.1 cells/mL (range 0 - 625000) (Table 1).

Notably, in centrifuged samples, the density of SASCs was higher than in sedimentation-treated samples (88479 and 37200 cells/mL, respectively). The best collection sites in terms of SASCs density were thighs and abdomen (77740 and 69954 cells/mL, respectively) followed by hips (37274 cells/mL) and chest (13104 cells/mL) (supplementary Figure 1). In multivariate analysis, sex and fat donor site showed a statistical correlation with spheroid density (p = 0.0299 and 0.0474, respectively), with liposuction collected from male patients and thighs showing the highest yield of spheroids. Although not statistically significant, higher numbers of cells were obtained in centrifugation vs. sedimentation samples.

Adipose tissue harvested from the thigh by the Coleman technique with centrifugation was found to produce the highest number of adipose-derived stem cell spheroids. (Table 2).

In our study population, some interesting results emerged. First of all, male sex was statistically associated with the highest number of SASCs. This could be due to a richer content of fat cells in men compared to women. Data

**Table 2** Multivariate analysis of patient characteristics (multiple linear regression).

Variable	B	SE	P-value
Intercept	-67585	84132	0.4248
Sex			
Male	72925	32834	<b>0.0299 (*)</b>
Female	Reference		
Age	616.6	828.8	0.4596
BMI	453.1	2771	0.8706
Donor site			
Abdomen	62057	40801	0.1332
Flanks	46502	45293	0.3084
Thighs	87899	43484	<b>0.0474 (*)</b>
Breast	Reference		
Fat processing technique			
Centrifugation	19686	21578	0.3650
Sedimentation	Reference		

in the literature are only available from women that underwent cosmetic liposuction procedures,<sup>5</sup> and, to the best of our knowledge, this is the first study comparing data from a male and female population. No significant differences emerged with respect to BMI or age. The treatment of the lipoaspirate samples (centrifugation versus sedimentation) could affect the yield of SASCs; the density of SASCs after centrifugation was higher than after sedimentation treatment (88479 and 37200 cells/mL, respectively, OR: 2.4).

Finally, a significant correlation was also observed between the anatomical sites and the yield of SASCs. Thighs were significantly associated with a higher cell yield compared to other donor sites ( $p=0.0474$ ). Furthermore, there is a gender-specific interdependence with the male having a higher SASCs yield than the female ( $p=0.0299$ ).

The results of our study and characterization of this population of spheroids from adipose tissue could be useful for future translational research on regenerative surgery focusing on the use of fat enriched of SASCs.

Supplementary Figure 1. Representative image of SASCs (a). Correlation between S-ASCs yield and Harvesting Method (b) and Donor-sites (c)

## Declaration of Competing Interest

The authors declare that they have no known competing interests.

## Ethics

The study protocol was approved by our institutional ethics committee of University Hospital "Paolo Giaccone" of Palermo (Project No. GR-2016-02364931).

## Funding

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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.2022.06.091](https://doi.org/10.1016/j.bjps.2022.06.091).

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## “Depth of the dorsal nerve of the clitoris: Implications for cosmetic and urogynecologic surgery.” ☆



Dear Sir,

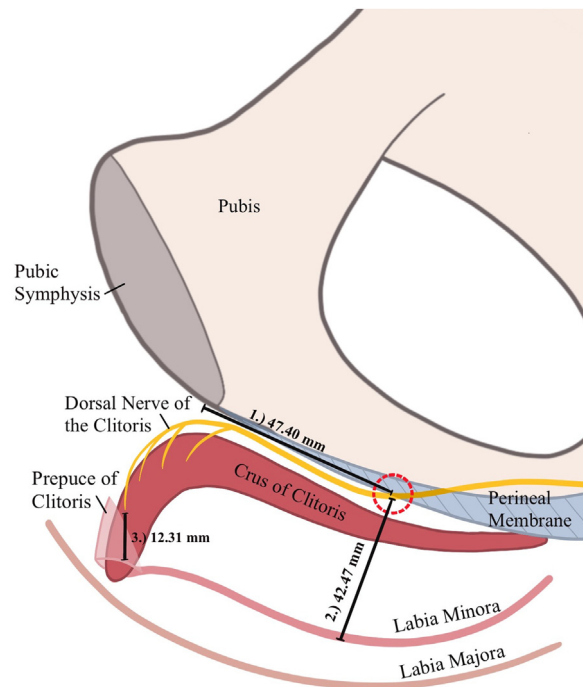
### Introduction

The dorsal nerve of the clitoris (DNC) is a terminal branch of the pudendal nerve that plays a vital role in female sexual health. Existing literature that addresses clitoral anatomy lacks detailed information about the path of the dorsal nerve when compared to external landmarks.<sup>1,2</sup> The superficial portion of the nerve has a high risk of injury during cosmetic surgeries such as a labiaplasty, and the deeper portions become vulnerable during urogynecologic procedures such as pelvic floor reconstruction.<sup>1</sup>

A recent study created a dorsal nerve of the clitoris “danger zone” for surgeons operating in this region.<sup>4</sup> We expanded this study by recording depth measurements of the DNC as it travels through the female pelvis, as well as novel distances between terminal nerve branches and the edge of the clitoral hood to form a clearer understanding of the dorsal nerve’s path.

### Materials and methods

Twenty-two formalin-preserved female cadavers were surveyed (age range 65-94). Each female contributed a left and



**Figure 1** Average lengths of pertinent measurements for the dorsal nerve of the clitoris. 1. Midpoint of pubic symphysis to its penetration of perineal membrane. 2. Furthest curvature of the nerve’s penetration of perineal membrane. 3. Terminal dorsal nerve branches to edge of prepuce. The dotted circle represents the penetration of the dorsal nerve of the clitoris through the perineal membrane.

right DNC. We incised approximately three inches from the pudendal cleft superiorly through the mons pubis. The fascia and subcutaneous tissue were separated to locate the body of the clitoris; the dorsal clitoral nerves were identified posterior to the body of the clitoris between the 10 and 11 o’clock and 1 and 2 o’clock positions. The nerve was traced proximally to its penetration of the perineal membrane and distally to its entrance into the clitoris with special care taken to not disturb the natural position and course. Digital calipers (Mitutoyo Absolute IP-67) were used to measure specific distances along the nerve’s path. By compiling the measurements taken, a map of the dorsal nerve’s pathway was created (Figure 1). Descriptive statistical analysis of the recorded distances was conducted using Microsoft Excel.

### Results

The averages and standard deviations of all recorded measurements are in Table 1. These measurements provide the point at which the DNC penetrates the perineal membrane vertically and horizontally, which is most susceptible to injury during deep pelvic floor surgeries (47.4 mm and 42.5 mm, respectively). Our data also provides an average distance from the most terminal DNC branch to the edge of the prepuce of the clitoris, where it is most susceptible to injury during cosmetic procedures (12.3 mm). These measurements are depicted in Figure 1. Additionally, the thickness

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**Table 1** Average Length of Measurements (+/- SD).

Measurement	Result (mm)
1. Midpoint of inferior pubic symphysis to DNC at penetration of perineal membrane.	47.40 +/- 6.09
2. Furthest curvature of labia minora to DNC at penetration of perineal membrane.	42.47 +/- 14.65
3. Terminal DNC branch to edge of prepuce.	12.31 +/- 4.99
4. DNC caliber at penetration of perineal membrane.	0.92 +/- 0.19
5. DNC caliber at angle of clitoris.	0.59 +/- 0.12
6. DNC caliber at terminal branch.	0.34 +/- 0.10
7. Furthest curvature of labia minora to DNC at angle of clitoris.	36.80 +/- 13.17
8. First branch point to angle of the clitoris (precedes angle).	4.02 +/- 6.36
9. First branch point to glans clitoris.	27.48 +/- 8.08
10. Furthest curvature of labia minora to glans clitoris.	14.14 +/- 8.43

of the nerve decreased proximally to distally, evidenced by an average caliber of 0.92 mm at the perineal membrane to a caliber of 0.34 mm at the terminal branch.

## Discussion

The point the DNC penetrates the perineal membrane is its first contact with the external female perineum beneath the pelvic floor. This landmark has not previously been described in the literature, particularly in the context of external landmarks used in urogynecologic procedures such as urethral sling placement and pelvic floor reconstruction.<sup>1,3</sup> Moss et al.<sup>3</sup> reported that 9% of pelvic reconstructive procedures result in postoperative pain, most likely due to injury of the dorsal nerve of the clitoris. Our data combined with the previous literature<sup>4</sup> provides a three-dimensional description of the DNC's deep anatomical location compared to external landmarks (Figure 1), allowing surgeons to be cautious when approaching this region.

Significant branching of the DNC has been described in previous studies,<sup>4</sup> which coincides with our finding of the nerve decreasing in thickness. Branches become more frequent toward the glans clitoris, delving into the clitoral body and surrounding subcutaneous tissue. The terminal branches are delicate and difficult to locate within the fascia, placing them at risk for injury in superficial, cosmetic procedures. For instance, the most common approaches to labiaplasty, edge and wedge excisions, involve excising portions of the labial subcutaneous tissue where branches may occur.<sup>5</sup> Damage to the terminal DNC branches within the subcutaneous tissue can result in chronic pain syndromes; therefore, surgeons should be cautious when removing this tissue as these branches may be easily missed.

Our study elucidates a previously undocumented measurement between the terminal DNC branches and the free edge of the prepuce, or clitoral hood. Terminal dorsal nerve branches end an average of only 12.31 mm from the free edge (Figure 1), putting them at significant risk during clitoral hood alteration. Based on the described surgical approach,<sup>5</sup> this procedure requires direct entry into regions where the distal DNC branches terminate subcutaneously. Surgeons performing clitoral hood alterations, particularly those involving excision of the free margin, should be aware of the proximity to terminal branches that extend into this region.

This study provides a significant contribution to the current literature regarding the depth of the DNC as it emerges from the female perineum, and the relationship of terminal nerve branches to the clitoral hood. This study's limits included the use of cadaveric tissue, which does not always represent the natural behavior of fresh tissue. Additionally, our data was restricted by the sample size available for this study.

## Declaration of Competing Interest

Dr. Surek receives book royalties from Thieme Medical Publishers and is a consultant for Galderma, Allergan and Cypris Medical.

## Funding

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## Ethical Approval Statement

IBC ethical approval was obtained prior to the initiation of this study (#1664420-3).

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## A systematic review of systematic review methodology in plastic surgery journals



Dear Sir,

### Introduction

Systematic reviews (SR) and meta-analyses (MA) are methods of research synthesis, to evaluate current literature. They are considered the highest level of evidence as they collate results of multiple primary studies. They can guide clinical practice, identify gaps in existing literature and direct future research. Plastic surgeons increasingly rely on these studies in their practice.<sup>1</sup> The quality of the studies can be limited by poor methodology leading to misleading conclusions, resulting in suboptimal evidence to guide patient care.

The aim of the study is to assess the quality of plastic surgery SRs and MAs using a validated assessment tool: essentially a “systematic review of plastic surgery systematic reviews”. It is hypothesised that, despite the current vogue for SRs in plastic surgery journals, they may not provide the best quality of evidence as the primary data is often lacking and review methodology is flawed.

### Methods

Following PRISMA guidelines, included studies met the following criteria: they had methodology consistent with an

SR, were described as an SR, were published in one of three top general plastic surgery journals by impact factor (Annals of Plastic Surgery, Journal of Plastic, Reconstructive & Aesthetic Surgery and Plastic and Reconstructive Surgery) and were published between July 2019 and July 2020 inclusive. Two authors independently performed study selection before final inclusion for analysis (N.S. and S.S.).

### Quality assessment and data extraction

Articles were assessed using A Measurement Tool to Assess Systematic Reviews (AMSTAR). AMSTAR has 11 questions pertaining to different aspects of methodological quality that can be marked and provide a total score. Data was recorded on the year of publication, number of authors, number of included studies, country of origin, source of funding, subspecialty area, topic, registration with PROSPERO (The International Prospective Register of Systematic Reviews) and statistical significance of MA results.

### Data analysis

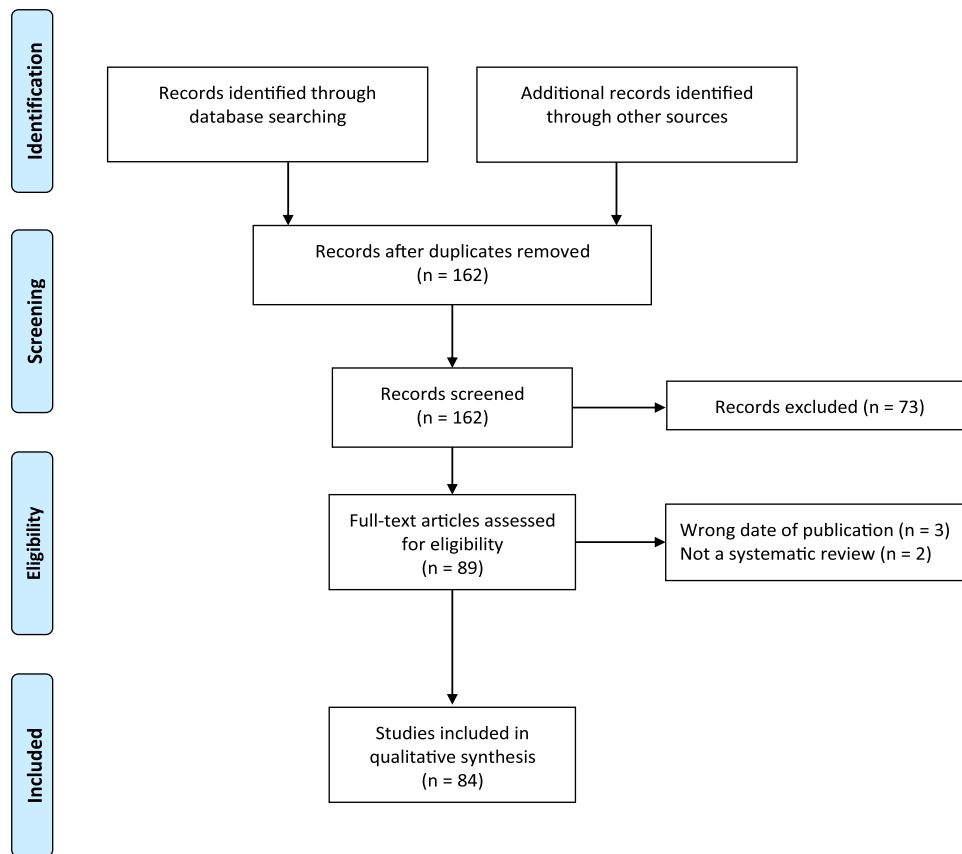
When comparing the median AMSTAR score between categorical variables the Wilcoxon-Mann Whitney test was employed. A p-value of  $<0.05$  was used as the level of statistical significance. All analyses were conducted using the R Project for Statistical Computing Software Version 1.3.959.

### Results

Eighty-four studies were included for appraisal (See Figure 1). Table 1 gives a further breakdown of the characteristics identified in the study. There were 32 studies from Plastic and Reconstructive Surgery, 31 from Journal of Plastic, Reconstructive & Aesthetic Surgery and 21 from Annals of Plastic Surgery. 45% of the studies were from the United States. The most common subspecialty areas of investigation were breast (20%), craniofacial (18%) and hand (11%). The median (IQR) number of primary studies included was 22 (12-34). Most studies had no funding source (92%). In 82.4% of SRs with MA, an outcome was statistically significant.

The range of AMSTAR scores was 0 to 8. The median (IQR) score for SRs was 1.5 (1-3) and for MAs was 4 (3-5.25). Fourteen (17%) studies were prospectively registered with PROSPERO. Studies from China had significantly higher scores than those from the US (2 vs 4,  $p = 0.026$ ), there was no other significant differences between countries. The median AMSTAR score of studies published in Journal of Plastic, Reconstructive & Aesthetic Surgery was higher than those studies published in Annals of Plastic Surgery (3 vs 2,  $p = 0.02$ ) and Plastic and Reconstructive Surgery (3 vs 2.5,  $p = 0.19$ ).

Studies on craniofacial had a significantly higher median AMSTAR score than breast (4 vs 2,  $p = 0.009$ ). Studies on research and microsurgery had significantly lower median AMSTAR scores than breast (1 vs 2,  $p = 0.021$  and 0.5 vs 2,  $p = 0.009$  respectively).



**Figure 1** Flow diagram of study search protocol.

## Discussion

This study evaluated 84 plastic surgery SRs and MAs to assess methodological quality. Most studies were of low quality. Factors associated with higher methodological quality included papers from China, publication in *Journal of Plastic, Reconstructive & Aesthetic Surgery* and craniofacial subspecialty topic. Most studies had no funding source (92%). Studies with a financial conflict of interest are significantly more likely to be published with a positive conclusion in plastic surgery.<sup>2</sup>

The finding of a median (IQR) score for systematic reviews of 1.5 (1-3) and for meta-analyses of 4 (3-5.25) is consistent with other studies. Published median AMSTAR scores range from 4 to 7.<sup>3,4</sup> Wasiack et al. found meta-analyses to have a significantly higher AMSTAR score than systematic reviews only ( $p < 0.001$ ), not explained by the 2 extra points available to meta-analyses.

The median AMSTAR score of studies published in *Journal of Plastic, Reconstructive & Aesthetic Surgery* was significantly higher than those studies published in *Annals of Plastic Surgery* (3 vs 2,  $p = 0.02$ ). Jenny et al. found *Journal of Plastic, Reconstructive & Aesthetic Surgery* and *Journal of Craniofacial Surgery* to have the highest mean scores at 5.41 and 5.88 respectively among 13 high impact plastic surgery journals.<sup>5</sup> This study found that SRs commonly stated that

they could not reach a conclusion due to inadequate quality of primary evidence.

Readers, researchers and journals can take several steps to improve systematic review and meta-analyses methodology. Including an author with prior systematic review or meta-analyses experience has been shown to improve quality. Researchers should be guided towards evidence-based review schemes like Cochrane and the Reconstructive Surgery Trials Network. Readers can familiarise themselves with common weakness in methodology and use caution when interpreting low-quality articles. Such skills can be addressed through summary articles, e-learning material or formal courses. Lastly, journals could publish objective criteria required for acceptance of systematic reviews and reject manuscripts that do not adhere and limit invitations to authors with expertise in research synthesis.

## Conclusions

This systematic review of SR methodology in plastic surgery reveals poor compliance with standards inherent to the conduct of an SR. While SRs have become an essential tool for the modern plastic surgeon, they pose a significant hazard

**Table 1** Characteristics of included studies. (US; United States, UK; United Kingdom, PRS; Plastic and Reconstructive Surgery, JPRAS; Journal of Plastics and Reconstructive Surgery, APS; Annals of Plastics Surgery, GRADE; Grading of Recommendations Assessment, Development and Evaluation, PRISMA; Preferred Reporting Items for Systematic Reviews and Meta-Analyses.).

Characteristic	<i>n</i> = 84
<b>Type of study</b>	
Systematic review	56 (67%)
Meta analysis	28 (33%)
<b>Year of publication</b>	
2019	43 (51%)
2020	41 (49%)
<b>Country</b>	
US	38 (45%)
Canada	12 (14%)
Netherlands	9 (11%)
UK	4 (4.8%)
China	5 (6.0%)
Other	16 (19%)
<b>Topic</b>	
Therapy	68 (81%)
Research	8 (9.5%)
Prognosis	4 (4.8%)
Education	3 (3.6%)
Policy (insurance)	1 (1.2%)
<b>Journal published in</b>	
PRS	32 (38%)
JPRAS	31 (37%)
APS	21 (25%)
<b>Sub-speciality</b>	
Breast	17 (20%)
Burns	4 (4.8%)
Cosmetic	4 (4.8%)
Craniofacial	15 (18%)
Hand	9 (11%)
Lower limb	4 (4.8%)
Microsurgery	6 (7.1%)
Other	19 (23%)
Research	6 (7.1%)
<b>Number of study authors</b>	5 (4, 6)
<b>Number of included studies</b>	22 (12-34)
<b>Funding source</b>	
Charity Grant	2 (2.4%)
Government Grant	4 (4.8%)
Industry fund	1 (1.2%)
None	77 (92%)
<b>Was primary outcome statistically significant</b>	
Yes	23 (27%)
No	6 (7.1%)
NA	55 (65%)
<b>GRADE system used for grading articles</b>	5 (6.0%)
<b>Study registered on PROSPERO</b>	14 (17%)
<b>PRISMA guidelines followed</b>	63 (75%)

when performed inadequately, and synthesising poor primary data.

#### Declaration of Competing Interest

None.

#### Funding

None.

#### Ethical approval

Not required.



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