Journal of Plastic, Reconstructive & Aesthetic Surgery (2008) **61**, 736—743

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

Volumetric short scar rhytidectomy — indications, technique and outcomes

Barry M. Jones *, Damian D. Marucci, Gary L. Ross

King Edward VII's Hospital, Beaumont Street, London W1G 6AA, UK

Received 24 September 2007; accepted 13 November 2007

KEYWORDS
Short scar rhytidectomy;
SMAS imbrication

Summary *Background:* Procedures combining a short scar with superficial musculoaponeurotic system (SMAS) manipulation are increasingly popular for patients with early signs of mid- and lower-facial laxity seeking rhytidectomy. We present the senior author's experience with a short scar volumetric malar imbrication rhytidectomy, which avoids post-auricular incisions and sub-SMAS dissection.
Patients and methods: Between January 2004 and April 2007, 54 patients underwent a short scar volumetric rhytidectomy (9.6% of all facelifts). These procedures were primary in 38 and secondary in 16 patients, at a mean age of 49 years (range 35—77 years). Average operating time was 90 min. Resultant vertical and horizontal skin movement at the helical root was recorded. Concurrent procedures included blepharoplasty, canthoplasty, endoscopic forehead rejuvenation and fat grafting. Minimum follow up was 3 months. Pre- and 3 month postoperative photographs of 25 randomly selected patients were rated by three independent surgeons. A seven-point scale was used to grade the improvement in the malar eminence, melolabial fold, jowls and cervicomental angle. The overall aesthetic result was assessed using the MDACS grading system. Statistical analysis was performed using Student's t-tests and general estimation equations where appropriate.
Results: There were no significant complications. Three patients developed minor cheek swellings which all settled with antibiotics. Mean postoperative aesthetic outcomes were rated as 'Good' using the MDACS scale (mean score 0.64), with no 'Poor' results. Vertical skin lifting was significantly greater than the horizontal skin lifting ($P < 0.001$). Mild postoperative improvements were noted in the malar eminence soft tissue volume, nasolabial fold diminishment, jowl diminishment and cervicomental angle.
Conclusion: In the appropriately selected face, short scar volumetric malar imbrication rhytidectomy is a straightforward, safe and effective procedure for improving the early signs of ageing.

* Corresponding author. 14A Upper Wimpole Street, London W1G 6LR, UK. Tel.: +44 20 7935 1938; fax: +44 20 7935 6607.
E-mail address: andrewjdiver@hotmail.com

1748-6815/$ - see front matter
doi:10.1016/j.bjps.2007.11.062

Lower facial descent and jowl formation is a common complaint amoung 'younger' patients seeking facial rejuvenation through rhytidectomy.[1,2] The ideal surgical procedure to address these early signs of facial laxity is minimally invasive (i.e. short scar), involves minimal convalescence, has a low complication rate and short operating time, and produces an aesthetic result that is both long lasting and 'natural'.[2,3] Many techniques combining a short scar with manipulation of the deeper tissue planes have been described to cater for this patient group and which meet many of the above criteria.

Previously reported short scar rhytidectomy incisions usually involve a temporal and pre-auricular incision without any post-auricular extension. Avoiding the posterior component (post-auricular and occipital) of the traditional face lift incision diminishes the potential for haematomas, visible scarring, hairline distortion, skin flap necrosis and injury to the greater auricular nerve or external jugular vein.[1,4] However, the tradeoff is a reduced ability to manipulate the platysma and improve neck contour.

Since its description by Mitz and Peyronie,[5] procedures involving manipulation of the superficial musculoaponeurotic system (SMAS) have been the workhorse for surgical rejuvenation of the ageing face.[1] Various methods of elevating ptotic soft tissues using the SMAS have been described including SMAS resuspension, SMAS segmentation, lateral SMASectomy and SMAS plication.[2–4,6–14]

Little[15] introduced the 'volumetric resculpturing' concept to facial rejuvenation surgery. In brief, the goal of a rhytidectomy should be the restoration of the curvilinear profile of the face (the architectural ogee) when viewed obliquely. Rhytidectomy techniques that aim to efface the nasolabial fold through tension on the skin and subcutaneous tissues have the effect of flattening the cheek, rather than restoring volume. Little advocates vertical plication of the subcutaneous tissues followed by skin redraping without tension in order to restore the malar fullness and oblique ogee associated with the youthful face.[8]

The senior author (B.J.) has developed a hybrid short scar rhytidectomy technique for use in patients with early jowl formation and lower facial descent where there is no need for platysmaplasty to address the neck.[16] The technique combines a pre-auricular and anterior temporal hairline incision (which is bevelled perpendicular to the hair shaft, after Camirand[17]) with a vertical cheek SMAS plication to produce volumetric changes in the malar region (after Little[8]). We present the indications, technique and outcomes for this short scar volumetric rhytidectomy.

Table 1 Additional procedures performed at the same time as short scar rhytidectomy ($n = 54$)

Procedure	Number
Submental liposuction	3
Endoscopic browlift	15
Upper blepharoplasty	10
Lower blepharoplasty	13
Coleman fat grafting	7

Figure 1 Point marked at the intersection of a vertical line running inferiorly from the lateral canthus and a horizontal line running laterally from the alar base.

Patients and methods

Between January 2004 and April 2007, 54 patients underwent a short scar volumetric malar SMAS imbrication rhytidectomy (9.6% of all facelifts) at a mean age of 49 years (range 35–77 years). Additional procedures preformed concurrently are listed in Table 1. Patients were selected on the basis of requiring mid-facial rejuvenation with mild to moderate jowling, but with little neck laxity and no platysmal bands. Older patients (60 plus) with significant jowling, pronounced neck laxity, a poor cervicomental angle and platysma banding were not offered short scar rhytidectomy and instead treated with either lateral SMASectomy[6,18] or volumetric rhytidectomy.[8]

Short scar volumetric rhytidectomy procedures were primary in 38 and secondary in 16 patients. Previous rhytidectomy techniques for those undergoing secondary procedures included 10 SMASectomy, two sub-periosteal, three endoscopic face lifts and one patient who had undergone both a cutaneous face lift and a subsequent sub-periosteal face lift. The average time between initial

Figure 2 Short scar incision.

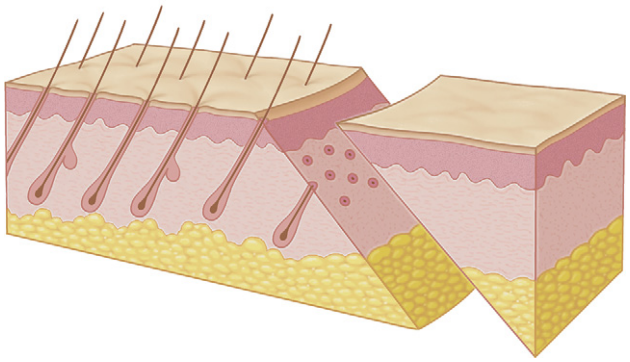

Figure 3 Temporal hairline incision — the blade is bevelled across the hair follicles, not parallel to them. (Reproduced with permission from Jones BM, Grover R. *Facial Rejuvenation Surgery*. London: Mosby Press, 2008.).

procedure and secondary procedure was 7 years (range 2–11 years).

Surgical technique

To aid in planning the SMAS plication, a point was marked on the skin corresponding to the intersection of a vertical line running inferiorly from the lateral canthus with a horizontal line running laterally from the alar base (Fig. 1). General anaesthesia with orotracheal intubation was used for all patients. Approximately 150 ml of tumescent solution was infiltrated subcutaneously into the facial soft tissues using a blunt cannula. The tumescent solution was made up of 25 ml of 0.25% bupivacaine, 25 ml of 1% lignocaine, 1.25 ml of 40 mg/ml triamcinolone and 1 ml of hyaluronidase (1500 U) dissolved in 500 ml of lactated Ringer's solution. This tumescent solution did not contain adrenaline, as this has been shown to increase the incidence of postoperative haematoma formation.[19] Liposuction of the jowl region was performed through a stab incison at the oral commissure. The skin incision (Fig. 2) commenced just within the temporal hairline following its general contour but in a w-plasty configuration. This incision was bevelled across the hair follicles, (i.e. at 90° to them not parallel to them) (Fig. 3). This encourages hair growth through the scar postoperatively, effectively making it invisible.[17] The incision followed the natural line of the helix, continued retrotragally and terminated at the most inferior extent of the lobule where it turned posteriorly. The incision did not extend on to the posterior aspect of the concha. Sharp subcutaneous dissection was carried as far as the lateralmost aspect of the orbicularis oculae (Fig. 4), the nasolabial furrow and over the margin of the mandible into the neck, with a limited dissection extending posteriorly towards the mastoid and sternocleidomastoid muscle.

Figure 5 Line of SMAS imbrication marked, from preoperative skin marking to inferior margin of tragus, with further parallel lines marked above and below.

The SMAS plication was then planned. A horizontal line was drawn on the SMAS directly under the point preoperatively marked on the skin (Fig. 5). This line extended from the most anterior part of the skin dissection running laterally to the inferior extent of the tragus. Two further lines were drawn parallel to this, the first approximately 1.5 cm inferior to it and the second approximately 0.5 cm superior to it, and the inferior and superior lines were approximated using interrupted 3/0 absorbable sutures. All

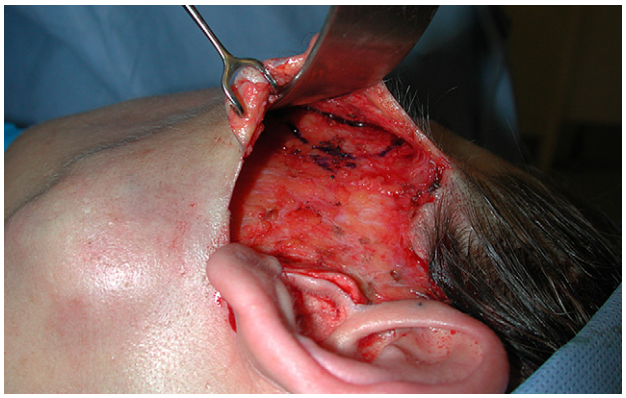

Figure 4 Anterior extent of subcutaneous dissection showing lateral orbicularis (marked with ink).

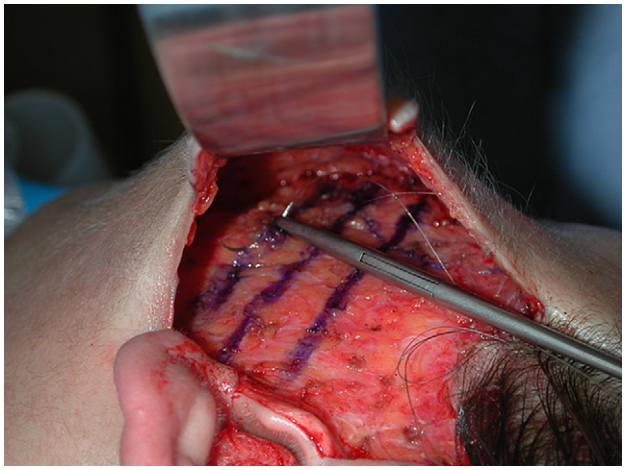

Figure 6 First layer of imbrication sutures, with the needle passed parallel to the course of facial nerve branches.

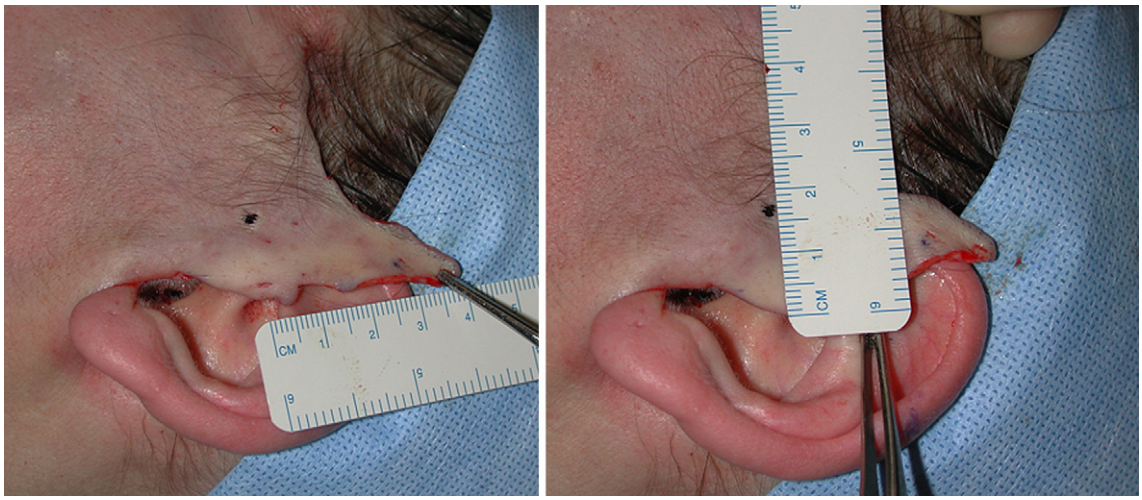

Figure 7 Measurement of superior and posterior skin advancement.

needle passes were in a horizontal vector (i.e. parallel to the facial nerve branches in the cheek) (Fig. 6). A further running 4/0 absorbable stitch overlay was used to ensure that there were no subcutaneous irregularities.

Once the skin had been redraped, the distance the skin has been elevated both superiorly and posteriorly with respect to the helical root was recorded (Fig. 7). The excess skin was trimmed. Mini-suction drains were placed in the subcutaneous pocket to decrease postoperative bruising.[20] The dermis was anchored with resorbable sutures. All incisions were closed with a running 5/0 non-absorbable suture with slight gathering of the post-auricular skin (Fig. 8).

Postoperatively, the wounds were dressed with paraffin gauze and wool with light pressure applied via a net dressing. Drains and dressings were removed on the first postoperative day.

Outcomes

Frontal, oblique and lateral digital photographs were taken in the preoperative evaluation and at 3 months postoperatively. These were evaluated by a panel of three plastic surgeons, who were unfamiliar with the patients and blinded as to the surgical technique and operating surgeon. Two different satisfaction assessments were performed.[21] Four aspects of the face and neck (the malar eminence, the nasolabial fold, the jowls and the cervicomental angle) were rated for degree of improvement using a seven-point visual analogue scale (Table 2). This scale is a modification of one previously used to assess rhytidectomy results.[22] The overall postoperative aesthetic result was assessed using the MDACS grading system.[23,24] Using the MDACS assessment, a grade level was assigned to one of five items: malposition, distortion, asymmetry, contour deformity and scar. Grades in each category were combined to give a final score for the overall aesthetic result: Excellent (0), Good (1 to 4), Mediocre (5 to 14) or Poor (>15). The MDACS grading system has previously been applied to assess rhytidectomy outcomes.[1]

Figure 8 Closure of temporal and pre-auricular skin incisions.

Statistical analysis

The resulting mean scores were compared with the Student's *t*-test and generalised estimation equations. All statistical analysis was carried out in SPSS, version 12 for Windows (SPSS Inc., Chicago, IL, USA).

Results

The amount of intraoperative superior skin movement with respect to the helical root averaged 2.6 cm (range 1.5—3.5 cm) and posterior skin movement averaged 1.55 cm (range 1.0—2.0 cm). The increased superior skin movement was statistically significant using the paired *t* test ($P < 0.001$). Superior skin movement was significantly less for patients undergoing secondary procedures, compared with those undergoing primary rhytidectomy ($P < 0.05$). There was no significant difference in posterior skin movement between primary and secondary cases (Table 3).

There were no postoperative facial nerve injuries or haematomas. Three patients developed swellings within the first 2 weeks postoperatively. In two of these cases

Table 2 Visual analogue scale used to rate patient photographs

Malar eminence: degree of soft tissue volume increase						
1	2	3	4	5	6	7
None	Mild	Moderate improvement				Dramatic improvement
Nasolabial fold: degree of diminishment						
1	2	3	4	5	6	7
None	Mild	Moderate improvement				Nearly effaced
Jowling: degree of diminishment						
1	2	3	4	5	6	7
None	Mild	Moderate improvement				Nearly effaced
Cervicomental angle: degree of improvement						
1	2	3	4	5	6	7
None	Mild	Moderate improvement				Dramatic improvement

Pseudomonas was cultured and treated with ciprofloxacin. In all three cases the swellings resolved by 3 months.

Using the MDACS scale to assess the overall postoperative aesthetic result, 44% of patients were rated as 'Excellent' (score = 0), 52% were rated as 'Good' (score 1 to 4) and 4% were rated as 'Mediocre' (score 5 to 14) (Table 4). No patient was rated as having a 'Poor' result. There was no significant difference between the mean postoperative MDACS score between those patients undergoing primary or secondary rhytidectomy ($P < 0.19$).

Mild improvements were noted in the postoperative photos for all patients in the degree of soft tissue volume increase in the malar eminence (mean 2.4), the degree of diminishment of the nasolabial fold (mean 2.8), the degree of diminishment of jowling (mean 2.9) and the degree of improvement of the cervicomental angle (mean 2.6) (Table 4). Illustrative pre- and 3 month postoperative results are shown in Figs. 9 and 10.

Discussion

Short scar rhytidectomy is not appropriate for all patients requesting facial rejuvenation surgery. The described technique represented 9.6% of the senior surgeon's rhytidectomy workload for the given time period. Older patients (especially those over 60) with significant jowling, pronounced neck laxity, a poor cervicomental angle and platysma banding were not offered short scar volumetric rhytidectomy. Most patients were instead treated with either lateral SMASectomy[6,18] or volumetric subperiosteal rhytidectomy.[8] Where platysmaplasty is required or where skin excess is apparent following a neck lift, we find that these patients benefit from a retroauricular incision and incision in the posterior hairline to facilitate neck skin redraping.

Of the selected group of patients who underwent short scar volumetric rhytidectomy in this study, 96% obtained 'Excellent' or 'Good' results. There were no 'Poor' results, facial nerve injuries or haematomas, confirming that the technique is both safe and effective. This compares favourably with other studies which have used the MDACS scoring system to assess the results of short scar rhytidectomy results.[1] It is important to note that the scars were only 3 months old at the time of assessment, and one would expect the scars to improve further as they mature. Only mild improvements were seen in the four areas of the face (soft tissue volume increase of the malar eminence, degree of diminishment of the nasolabial fold and jowls, and degree of improvement of the cervicomental angle) assessed by our surgical panel. In a relatively young patient group such as this, 'dramatic' changes are neither necessary nor desirable. Short scar volumetric rhytidectomy is not appropriate for those patients seeking 'dramatic' changes to the face and neck. Adamson et al. used a similar scoring system to assess the same regions of the face and found more dramatic results using both lateral SMASectomy and deep plane rhytidectomy.[22]

S-shaped pre-auricular incision of short scar rhytidectomy techniques, first described by Passot in 1919,[25]

Table 3 Mean skin movement in both superior and posterior directions for primary and secondary procedures

	Superior	Posterior
Primary	2.96 cm (range 2–3.5 cm)[a]	1.54 cm (range 1.5–2 cm)
Secondary	2.27 cm (range 1.5–3.5 cm)[a]	1.46 cm (range 1–2 cm)

[a] $P < 0.001$.

Table 4 Assessment of results by the surgical panel

MDACS score (%)	
Excellent (0 points)	44
Good (1–4 points)	52
Mediocre (5–14 points)	4
Poor (>15 points)	0
Assessment of improvement in areas of face/neck (Scale 1 to 7 – see Table 2)	
Malar eminence	2.4 (SD 0.74)
Nasolabial fold	2.8 (SD 0.90)
Jowling	2.9 (SD 1.0)
Cervicomental angle	2.6 (SD 0.75)

Figure 9 Pre- (above) and 3 month postoperative (below) results. (Reproduced with permission from Jones BM, Grover R. *Facial Rejuvenation Surgery*. London: Mosby Press, 2008.).

involve temporal hairline incisions.[2–4,7,9–11,13,26–29] This study has confirmed the excellent scars produced by using w-plasty incisions in the temporal hairline, which are bevelled across the hair follicles at an angle of 30 to 45° to the surface of the scalp, as described by Camirand.[17] This permits the deeper part of the hair follicles in the proximal flap to grow into and in front of the scar, making it invisible.

The main rejuvenating vector for the soft tissues in the face is vertical.[13,15,28,29] Vertical lifting of the cheek SMAS in particular restores the soft tissue volume of the malar eminence and re-establishes the youthful ogee of the face when viewed obliquely. Previous authors have combined a short scar incision with vertically-oriented SMAS plication sutures to restore malar volume. These techniques include the mini rhytidectomy,[3] the S-lift[11,12] and the MACS lift.[13,28,29] These techniques avoid the potential morbidity of sub-SMAS dissection, including damage to branches of the facial nerve.[30] However SMAS suture plication as used in these techniques may lead to contour irregularities due to the microimbrications of the subcutaneous tissues.[29]

Vertical cheek SMAS imbrication as used in our technique results in an effective augmentation of the malar eminence without using any purse string sutures. It also assists in effacing the nasolabial fold and jowls and results in a mild improvement in the cervicomental angle. No patients in this series required surgical revisions for any reason, including contour deformity due to palpable plicated SMAS. By placing all needle passes in the horizontal vector when performing the SMAS imbrications, the potential for damage to the facial nerve branches is minimised. Subsequent skin redraping occurs in a vertical, more than a posterior, vector at the level of the root of the helix.

Outcomes assessment is an important component in the evaluation of any aesthetic surgical technique. This study used a panel of plastic surgeons who were blinded as to the surgical technique employed and the identity of the operating surgeon to assess the pre- and postoperative digital photos using standard satisfaction assessment. Both the 7-point visual analogue scale used to assess specific relevant changes in the face and the MDACS scale used to assess the overall aesthetic result have been previously used in studies of rhytidectomy outcomes, allowing comparison with other techniques.[1,22–24] We believe that the use of standardised assessment scales by blinded independent surgeons is an effective way of presenting meaningful outcome data for patients undergoing aesthetic surgery.

In conclusion, short scar volumetric rhytidectomy (S-shaped pre-auricular incision, including w-plasty incisions in the temporal hairline bevelled perpendicular to the hair shaft, coupled with vertical malar SMAS imbrication) is a safe and effective procedure for those patients with early signs of facial ageing. This technique results in

Figure 10 Pre- (above) and 3 month postoperative (below) results. This patient also underwent transconjunctival lower blepharoplasty. (Reproduced with permission from Jones BM, Grover R. *Facial Rejuvenation Surgery*. London: Mosby Press, 2008.).

improvements in the soft tissue volume of the malar eminence, the nasolabial fold, jowls and the cervicomental angle. Short scar rhytidectomy techniques are not appropriate for those patients requiring major cervical rejuvenation or dramatic changes to their facial appearance.

Acknowledgements

Mentor Corporation sponsored the International Aesthetic Fellowships of Mr Marucci and Mr Ross. The authors thank Sheila Killick, Dee Allen and Janette Karaphillides for their assistance in the preparation of this manuscript.

References

1. Prado A, Andrades P, Danilla S, et al. A clinical retrospective study comparing two short-scar face lifts: minimal access cranial suspension versus lateral SMASectomy. *Plast Reconstr Surg* 2006;**117**:1413—25.
2. Fulton JE, Saylan Z, Helton P, et al. The S-lift facelift featuring the U-suture and O-suture combined with skin resurfacing. *Dermatol Surg* 2001;**27**:18—22.
3. Duminy F, Hudson DA. The mini rhytidectomy. *Aesthetic Plast Surg* 1997;**21**:280—4.
4. McCarty ML, Brackup AB. Minimal incision facelift surgery. *Ophthalmol Clin North Am* 2005;**18**:305—10. vi—vii.
5. Mitz V, Peyronie M. The superficial musculo-aponeurotic system (SMAS) in the parotid and cheek area. *Plast Reconstr Surg* 1976;**58**:80—8.
6. Baker DC. Lateral SMASectomy. *Plast Reconstr Surg* 1997;**100**:509—13.
7. Baker DC. Minimal incision rhytidectomy (short scar face lift) with lateral SMASectomy. *Aesthetic Surg J* 2001;**21**:68—80.
8. Little JW. Three-dimensional rejuvenation of the midface: volumetric resculpture by malar imbrication. *Plast Reconstr Surg* 2000;**105**:267—85.
9. Massiha H. Short-scar face lift with extended SMAS platysma dissection and lifting and limited skin undermining. *Plast Reconstr Surg* 2003;**112**:663—9.
10. Panfilov DE. MIDI face-lift and tricuspidal SMAS-flap. *Aesthetic Plast Surg* 2003;**27**:27—37.
11. Saylan Z. The S-lift: Less is more. *Aesthetic Surg J* 1999;**19**:406.
12. Saylan Z. Purse string-formed plication of the SMAS with fixation to the zygomatic bone. *Plast Reconstr Surg* 2002;**110**:667—71.
13. Tonnard P, Verpaele A, Monstrey S, et al. Minimal access cranial suspension lift: a modified S-lift. *Plast Reconstr Surg* 2002;**109**:2074—86.
14. Waterhouse N, Vesely M, Bulstrode NW. Modified lateral SMASectomy. *Plast Reconstr Surg* 2007;**119**:1021—6 [discussion: 27—8].
15. Little JW. Volumetric perceptions in midfacial aging with altered priorities for rejuvenation. *Plast Reconstr Surg* 2000;**105**:252—66.
16. Jones BM, Grover R. *Facial rejuvenation surgery*. London: Mosby Press; 2008.
17. Camirand A, Doucet J. A comparison between parallel hairline incisions and perpendicular incisions when performing a face lift. *Plast Reconstr Surg* 1997;**99**:10—5.
18. Baker D. Rhytidectomy with lateral SMASectomy. *Facial Plast Surg* 2000;**16**:209—13.

19. Jones BM, Grover R. Avoiding hematoma in cervicofacial rhytidectomy: a personal 8-year quest. Reviewing 910 patients. *Plast Reconstr Surg* 2004;**113**:381–7.
20. Jones BM, Grover R, Hamilton S. The efficacy of surgical drainage in cervicofacial rhytidectomy: a prospective, randomized, controlled trial. *Plast Reconstr Surg* 2007;**120**: 263–70.
21. Ching S, Thoma A, McCabe RE, et al. Measuring outcomes in aesthetic surgery: a comprehensive review of the literature. *Plast Reconstr Surg* 2003;**111**:469–80.
22. Adamson PA, Dahiya R, Litner J. Midface effects of the deep-plane vs the superficial musculoaponeurotic system plication face-lift. *Arch Facial Plast Surg* 2007;**9**:9–11.
23. Strasser EJ. Application of an objective grading system for the evaluation of cosmetic surgical results. *Plast Reconstr Surg* 2002;**109**:1733–40.
24. Strasser EJ. An objective grading system for the evaluation of cosmetic surgical results. *Plast Reconstr Surg* 1999;**104**:2282–5.
25. Passot R. La chirurgie esthetique des rides du visage. *Presse Med* 1919;**27**:258–62.
26. Matarasso A, Rizk SS, Markowitz J. Short scar face-lift with the use of fibrin sealant. *Dermatol Clin* 2005;**23**:495–504. vii.
27. Saylan Z. Minimal access cranial suspension lift. *Plast Reconstr Surg* 2003;**111**:1774–5.
28. Tonnard PL, Verpaele A, Gaia S. Optimising results from minimal access cranial suspension lifting (MACS-lift). *Aesthetic Plast Surg* 2005;**29**:213–20.
29. Verpaele A, Tonnard P, Gaia S, et al. The third suture in MACS-lifting: making midface-lifting simple and safe. *J Plast Reconstr Aesthet Surg*; 2007.
30. Baker DC. Deep dissection rhytidectomy: a plea for caution. *Plast Reconstr Surg* 1994;**93**:1498–9.

CLINICAL TIP

The 'WiMP' formula for local anaesthetic volume calculation

The maximum volumes of local anaesthetic solutions can be difficult to calculate. The potential toxicity of these drugs, however, means that we should all be in a position to quickly calculate these prior to administration. A formula was devised which could be applied to any of the common agents, and allow quick calculation of maximum volumes. The maximum volume 'V' of local anaesthetic (in millilitres) which can be given is calculated by the **'WiMP'** formula:

$$\mathbf{V}(\mathrm{ml}) = ((\mathbf{W}\text{eight} \times \mathbf{0.1}) \times \mathbf{M}\text{aximum dose (mg/kg)})/ \mathbf{P}\text{ercentage concentration}$$

Or $\mathbf{V} = \mathbf{W}(\mathbf{0.1})\mathbf{M}/\mathbf{P}$

$= \mathbf{W.1M/P}$ (hence the **'WiMP'** formula)

Thus, if a 50 kg lady is given 2% lignocaine with adrenaline (maximum dose 7 mg/kg), then the maximum volume V is calculated as follows:

$$V = W(0.1)M/P$$
$$V = 50 \times (0.1) \times 7/2$$
$$V = 17.5 \text{ ml}$$

If the same lady is being given plain 0.25% bupivacaine (maximum dose 2 mg/kg), then

$$V = W(0.1)M/P$$
$$V = 50 \times (0.1) \times 2/0.25$$
$$V = 40 \text{ ml}$$

It is hoped that this formula will be useful to those who regularly administer local anaesthetics for surgical procedures.

Andrew James Diver
Ulster Hospital, Plastic Surgery,
Upper Newtownards Road, Dundonald Belfast,
Northern Ireland BT16 0RH, UK
E-mail address: andrewjdiver@hotmail.com

doi:10.1016/j.bjps.2007.09.057