

# Reconstruction of perioral defects post-Mohs micrographic surgery: a dermatological surgeon's approach

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## Summary

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**Background** The perioral location has great functional, aesthetic and social importance. Over 100 procedures have been described for lip reconstruction, emphasizing the challenges that reconstructive surgeons face when dealing with such defects.

**Objectives** To outline the surgical reconstruction techniques of perioral defects post-Mohs micrographic surgery (MMS).

**Methods** The design and surgical techniques of reconstruction of perioral defects post-MMS are described.

**Results** The results of the surgical techniques described are illustrated.

**Conclusions** Herein, we describe the nuances of reconstructive techniques that we have found useful for repairing perioral defects post-MMS.

### What's already known about this topic?

- Mohs micrographic surgery remains the gold standard in the management of non-melanoma skin cancers of the head and neck.
- Perioral Mohs defects pose a particular challenge for the reconstructive surgeon, with over 100 procedures described in the literature.

### What does this study add?

- We describe nuances in established workhorse techniques used for perioral reconstruction, which adds to the reconstructive repertoire of the dermatological surgeon.

The accepted standard of care for lip carcinoma is surgical excision.<sup>1,2</sup> To achieve the highest cure rates and smallest defect sizes, surgical resection should preferably be performed with Mohs micrographic surgery (MMS),<sup>3</sup> because this method of excision involves removal of minimal amounts of tissue. Mohs excisions are typically performed in 'cosmetically sensitive' areas such as the face.<sup>4</sup> Lip reconstruction is a highly challenging procedure that demands a specific approach depending on the size, location and depth of the lesion, and more than 100 procedures for lip reconstruction have been described.<sup>5–7</sup> Herein, we present various surgical techniques for reconstruction of perioral defects post-MMS undertaken at one regional centre, with a focus on reconstructive nuances in the workhorse techniques that are widely used. We acknowl-

edge that it is beyond the scope of this article to provide a comprehensive review of all the techniques used for perioral reconstruction. The majority of reconstructions were undertaken by dermatological surgeons accredited by the American College of Mohs Surgery (ACMS).

### Goals of reconstruction

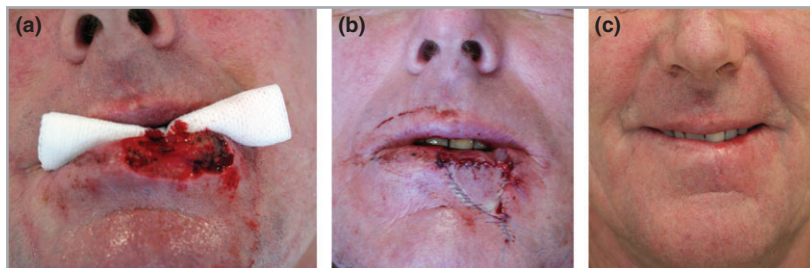
The aims of reconstruction should be to maintain oral competence, preserve mobility and sensation, and maximize cosmesis. When approaching lip reconstruction, a defect-based approach may be utilized. Defects can be divided into vermilion-only defects, partial-thickness (cutaneous) defects, defects less than one-third of the total lip length, defects between

one- and two-thirds of the total lip length, and total lip defects. In selecting the correct reconstructive technique, the location (central, lateral or commissural) is also of importance.<sup>6</sup>

There are some general principles that we have found useful in surgically reconstructing perioral defects. When reconstructing vermilion lip defects, we typically use absorbable, braided 6/0 polyglactin 910 subcuticular sutures (Vicryl; Ethicon, Blue Ash, OH, U.S.A.) as we have found that patients generally find these sutures more comfortable compared with absorbable, monofilament sutures such as 6/0 poliglecaprone 25 (Monocryl; Ethicon). Surface sutures typically used include 7/0 polypropylene (Prolene; Ethicon) and 6/0 Fastgut (Ethicon) sutures intraorally, the latter having the inherent advantage of self-dissolving within 1–2 weeks with no observed complications. In addition, we routinely use the crossover tip stitch to maximize eversion,<sup>8</sup> for example apposition at the melolabial crease with O-T advancement flap repairs or at the delicate vermilion cutaneous junction when executing a bilateral vermilion advancement flap repair. Surgical reconstruction in the perioral location has a tendency for significant postoperative oedema and pin-cushioning, particularly in the reconstruction of chin defects. Therefore, it has been our standard practice for some time to administer a reducing course of oral prednisolone over 3–5 days ( $0.5 \text{ mg kg}^{-1}$ ) to minimize these undesirable postoperative sequelae, which, anecdotally, has benefited our patients. Administration of corticosteroids in this context remains our personal choice based on our own positive personal experiences.

### Vermilion defects

Figure 1(a–c) illustrates a shallow defect involving the vermilion and lower cutaneous lip that was repaired with a mucosal advancement and inferiorly based island pedicle flap repair, which was elevated by the method of Chan.<sup>9</sup>



**Fig 1.** (a–c) A  $3.6 \times 1.8$ -cm Mohs defect following excision of a multiple recurrent, moderately differentiated squamous cell carcinoma (Breslow thickness 1.5 mm). The defect breached the vermilion–cutaneous junction (VCJ) and was repaired with a mucosal advancement and an inferiorly based cutaneous island pedicle flap repair. The key step is to ensure that there is sufficient length of the pedicle to replace the cutaneous component of the defect thereby ‘pushing up’ the VCJ to the normal resting position and reducing the risk of eclabium. In practice, we have found the island pedicle flap needs to be inset 1–2 mm higher than what is visibly apparent because the loss of volume secondary to resected orbicularis reduces the natural convexity of the vermilion, thereby developing a tendency for the VCJ to be displaced inferiorly. We have found that suturing the flap into place with subcutaneous sutures inferiorly towards the vermilion facilitates the ‘pushing-up’ effect of the flap with any excess tissue superiorly removed thereafter.

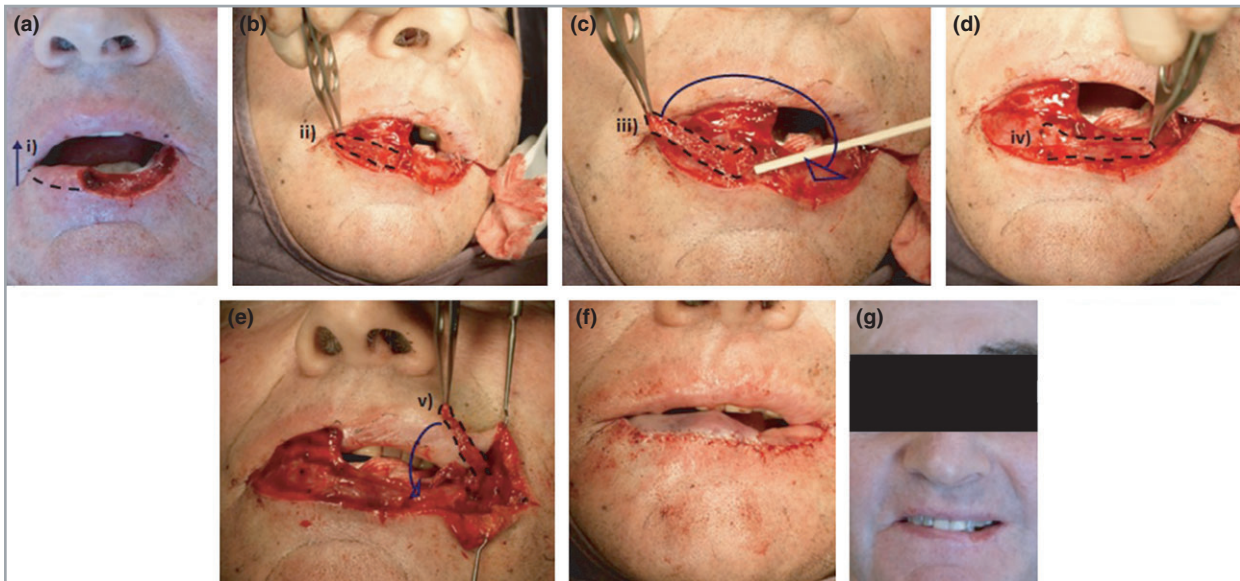
Figure 2(a–g) shows reconstruction of a  $4.0 \times 2.1$  cm full-thickness defect involving the lower lip. Full-thickness defects require reconstitution of skin, orbicularis and mucosa. Although wedge-shaped excisions with primary closure can be performed with upper lip defects less than one-third the length of the lip and up to one-half the length of lower lip defects, this can result in microstomia. Such deep defects require volume replacement, which was achieved in this case with bilateral orbicularis hinge flaps. We have previously described the utility of muscular hinge flaps in facial reconstructive surgery,<sup>10</sup> and the well vascularized, versatile orbicularis provides a reliable hinge flap for reconstruction of deeper defects in the perioral location. Potential complications of labial buccal advancement include thinning of the lip as a result of scar contracture, excessive lip fullness from over advancement of the flap and colour mismatch.

The Bernard–von Burow–Webster technique is essentially an advancement flap with the excision of cutaneous triangles to allow for flap advancement and reduce standing cones.<sup>11</sup> Upper lip reconstruction requires excision of four triangles of cheek skin and lower lip reconstruction with the excision of three triangles. Figure 3(a–c) shows a modified unilateral Webster’s advancement used for reconstruction of a full-thickness lower lip defect. The principal advantage of utilizing the aforementioned methods of closure for larger defects of the lower lip is that these techniques, despite significant tissue dissection, are readily performed under local anaesthetic and allow restoration of cutaneous lip length, thereby reducing the risks of microstomia.

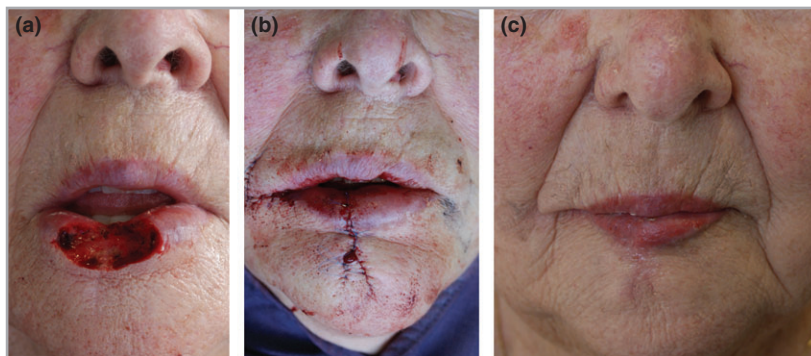
### Cutaneous defects

#### Lower cutaneous lip and chin defects

Partial-thickness defects can be closed primarily or with local transposition flaps, with only skin and subcutaneous tissue transfer and preservation of the underlying musculature. Cuta-



**Fig 2.** (a–g) A 4.0 × 2.1-cm Mohs defect after two stages following excision of an infiltrative squamous cell carcinoma (Breslow thickness 5 mm; Clark V). The defect was repaired with bilateral orbicularis oris hinge flaps (denoted by black dashed lines), which were harvested by reflecting the vermillion back exposing the strip of orbicularis (i, ii) and ‘flipping’ the orbicularis hinge flap to the contralateral side while attached to the midline (ii–iv), and secured in place with a single absorbable braided 6/0 polyglactin 910 subcuticular suture (Vicryl; Ethicon, Blue Ash, OH, U.S.A.). The length of the defect required a further strip of orbicularis (v), which was harvested by extending the incision laterally from the commissure from the ipsilateral side of the defect and secured in place in the same fashion. The hinge flaps not only replace volume, but by crossing the midline also help to preserve symmetry of the lip. Harvesting the remaining strip of orbicularis from a releasing incision laterally from the commissure avoids blunting of this important anatomical structure. Bilateral cutaneous and vermillion advancement flaps were utilized to cover the hinge flaps. The posterior mucosa was dissected deeply at the junction of the wet and dry vermillion to preserve the labial artery. (f, g) Final closure and review at 2 months.



**Fig 3.** (a–c) A 3.2 cm × 1.7-cm Mohs defect after two stages for a recurrent moderately differentiated squamous cell carcinoma of the central lower lip repaired with a unilateral Webster advancement flap repair. No microstomia or saliva drooling was evident. The key point for this method of reconstruction is that the releasing incision at the lateral commissure should be orientated inferiorly to avoid creating a ‘joker smile’ appearance, which inherently is extremely difficult to correct when it occurs. In addition, we have found that the Burow’s triangle may not be required for standard Burow’s wedge advancements for smaller defects and therefore should only be initiated, preferably along pre-existing rhytids, if required. Adopting this approach helps avoid creating excess fullness of the lip, which may require a secondary revision procedure to correct. When Burow’s triangles are required for larger defects, we prefer to design these no more than half the width of the defect to avoid excess tissue laxity at the oral commissure.

neous lower lip reconstruction can be accomplished with a variety of transposition flaps from the chin and submandibular region. Because the chin is a very visible important aesthetic subunit, incisions should be planned where there is minimal chin distortion. Owing to propensity of developing pincushion-

ing at this site, our preferred method is primary closure wherever possible. For chin defects that require flap reconstruction, our closure of choice is O-T advancement flap repair with incisions along the melolabial crease. For larger laterally based defects on the chin, we have found transposition flaps from the

melolabial fold (Fig. 4a,b) and inferiorly based bilobed flaps useful; the former reconstructive option, in our experience, has a lower risk of developing pincushioning at this site.

### Cutaneous upper lip defects

For smaller, shallow defects (< 1 cm), rotational flaps are invaluable; however, larger, deeper defects require more complex repairs. Figure 5(a–c) shows an upper cutaneous lip defect involving multiple cosmetic units, including vermilion, melolabial fold and alar-facial sulcus. The defect was repaired with a large rotating island pedicle flap repair with a good functional and cosmetic result. Figure 6(a–c) shows an extensive full-thickness defect through to the oral cavity following MMS for an eccrine carcinoma. A major disadvantage of such repairs is the marked displacement of the melolabial crease, which, inevitably, creates cheek asymmetry. Revision procedures may be performed to reposition the melolabial crease to provide a more natural appearance. This usually involves incising along the scar overlying the melolabial crease, excising an appropriately sized crescent, followed by wide undermining

laterally and advancing the cheek into the preferred position of the melolabial crease.

Perialar crescentic advancement (PACA) flaps are a well established repair option for defects in the perialar region.<sup>12–14</sup> Although PACA flap repairs have primarily been used for closure of small perialar defects, we have extended the versatility of this flap for the reconstruction of larger defects of the nasal sidewall and nasal dorsum.<sup>15</sup> For reconstruction of small upper cutaneous lip and perialar defects, the standard method to create extra length would be to initiate the crescent either along the nasofacial junction or lateral to the melolabial fold. Figure 7(a–c) illustrates our method of closure using an inferiorly based ‘reverse’ PACA flap, with the crescent initiated medial to the melolabial fold.

### Philtral defects

The philtrum, with its unique anatomical features, can present a challenge to reconstruct, as minor deviations in anatomical boundaries are readily apparent. Figure 8(a–c) shows a challenging defect involving the philtrum, vermilion and cutaneous lip. The defect was repaired with a philtral island pedicle flap, bilateral vermilion and mucosal upper lip advancements.

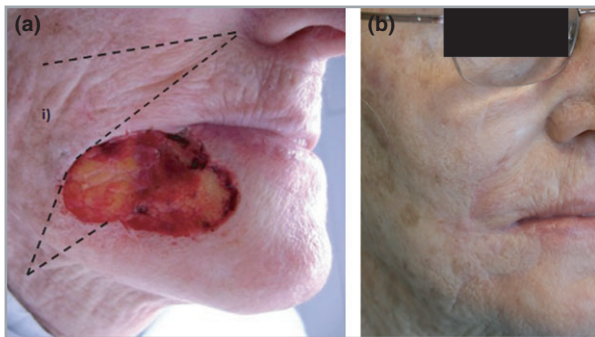


Fig 4. (a,b) A 5.5 × 3.0-cm defect on the right chin after three stages of Mohs surgery for a recurrent infiltrative basal cell carcinoma repaired with a melolabial transposition flap repair as shown (i). Postoperative photos were taken at 3 months without any revision procedures.

### Discussion

Managing tumours in the perioral location with MMS not only allows assessment of 100% of the true surgical margin intraoperatively, but also, and more importantly, permits tissue conservation. The advantage of creating shallow defects with MMS allows the reconstructive surgeon to use simpler, single-stage reconstructive techniques. This is particularly important in older patients who commonly have lower lip cancer and would not be able to tolerate food cessation so easily and would have difficulty wearing dentures in the presence of postoperative microstomia. Although numerous reconstructive techniques have been described in the literature for larger defects of the lower lip, including the Bernard flap,<sup>16</sup> the Karapandzic flap, the Bernard–Freeman–Fries flap, the Web-

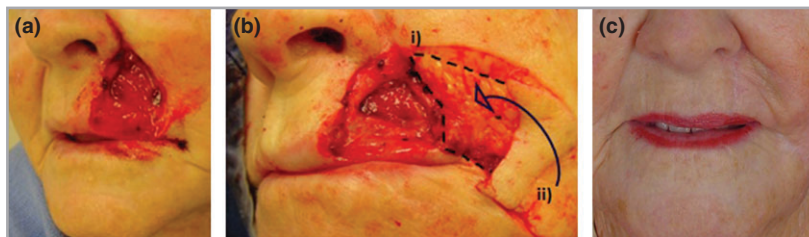
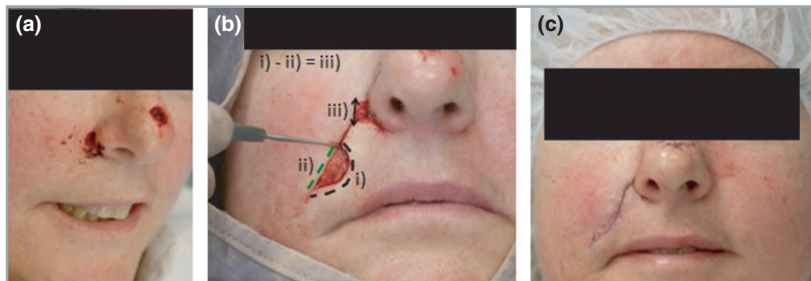


Fig 5. (a–c) A large, deep defect of the upper lip involving multiple cosmetic units repaired with a rotating island pedicle flap. The flap was dissected following the method of Chan,<sup>9</sup> with the leading edge dissected superficially [denoted by dashed line (i)] allowing the flap to rotate into the defect (ii), resulting in a good cosmetic result. The key to the success of this flap is taking accurate measurements from the melolabial crease to the furthest point of the defect. As the flap is rotated into the defect, there is a tendency for the flap to lose height and therefore allowance has to be made for this in order to avoid falling short at the distal end of the defect. Another method of marking an appropriately sized flap is to create a template from the contralateral cutaneous upper lip and melolabial fold. We routinely use the outer foil packet of suture material (which is readily accessible) to create a template that is then ‘flipped over’ to provide a quick and easy way of not only designing an appropriately sized flap, but also ensuring symmetry.

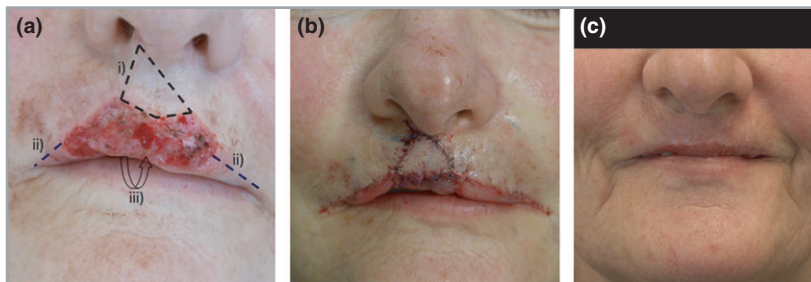




**Fig 6.** (a–c) An extensive through-and-through defect to the buccal cavity involving multiple cosmetic units. Reconstruction required a complex repair involving a cartilage stent harvested from the antihelix to restore the structural integrity of the nasal sill, and a split-thickness skin graft that was harvested from the thigh to recreate the internal mucosal lining and which provided the base for a large rotating island pedicle flap that was then inset into the defect.



**Fig 7.** (a–c) A 0.8 × 0.9-cm upper cutaneous lip defect repaired with an inferiorly based 'reverse' perialar crescentic advancement flap with the crescent initiated medial to the melolabial fold to minimize distortion of the natural cosmetic boundary with preservation of the upper lip sulcus. The key step is to ensure that the crescent removed (black dashed line) is sufficient to allow extra length to cover the vertical height of the defect (i–ii = iii) without distorting the upper lip, as shown. This method of closure can be utilized for the reconstruction of small (< 1 cm) upper cutaneous lip defects. However, for larger upper cutaneous lip defects, the crescent needs to be initiated in the jowl area to achieve greater length and is best initiated laterally to the melolabial fold to avoid distortion of the oral commissure.



**Fig 8.** (a–c) A 3.7 × 1.2-cm Mohs surgical defect after four stages for a basosquamous carcinoma affecting the philtrum, upper cutaneous lip and vermilion. The defect was repaired with a (i) philtral island pedicle flap, (ii) bilateral cutaneous and vermilion lip advancements, (iii) and mucosal advancement flap repair from the inner buccal cavity as shown with the arrow. Owing to the natural concavity of the Cupid's bow, we have found it important for the flap to be 'pushed down' inferiorly in an attempt to recreate the natural contour of the Cupid's bow.

ster–Bernard technique, and the Abbe–Estlander and Gillies flaps,<sup>16–22</sup> we (all ACMS-accredited dermatological surgeons) were able to achieve good functional and aesthetic outcomes without resorting to these reconstructive techniques, some of which have significant postoperative morbidity. This was primarily owing to the ability to preserve tissue with the MMS technique, in particular the orbicularis oris muscle, resulting in comparatively smaller, shallower defects and thereby preserving underlying musculature and function.

Surgical algorithms for reconstruction of lip defects have been suggested by some depending on the anatomical loca-

tion, width of defect and extent of tissue loss.<sup>23</sup> Although a wide variety of flap closures can be utilized to reconstruct perioral defects, where possible, direct linear closure is preferred as this method of closure results in superior cosmetic results that are more predictable when compared with flap options, which can result in pincushioning and other undesirable outcomes. Indeed, one recent study showed that up to 73% of patients with lip defects underwent linear closure with defects approaching 40% of the upper lip and 50% of the lower lip,<sup>24</sup> resulting in favourable aesthetic results without functional disability. Clearly, the upper lip has more distinct ana-

tomical features than the lower lip, which is essentially featureless and will tolerate much larger attempts at direct closure. Aside from scarring issues, primary closure avoids the risk of flap ischaemia and necrosis. For chin defects, wherever possible, primary closure should be the closure of choice as there is greater risk of postoperative pincushioning.

The upper cutaneous lip is a common site for the development of lip carcinoma, yet it remains an area where closure can be challenging. Primary closure is generally limited to defects smaller than 1 cm in diameter to avoid distortion of the free margin of the lip.<sup>25</sup> Options for closure of larger defects in this area include the melolabial transposition flap, the cheek advancement flap, the tunnelled subcutaneous pedicle transposition flap and the island pedicle flap.<sup>25,26</sup> The disadvantages of the first three flaps include distortion or ablation of the melolabial fold and, in men, moving glabrous skin in the moustache area. Blunting of the melolabial fold may be minimized by placement of sutures to the deep buccal tissue to create a new fold.<sup>24</sup> Bilateral PACA flaps have also shown to provide excellent cosmetic results for large midline philtral defects.<sup>27</sup>

Owing to the multitude of reconstructive techniques used for perioral reconstruction, it is beyond the scope of this article to discuss these in detail. The purpose of this article was to share some reconstructive nuances of workhorse flaps that we have found useful for the reconstruction of perioral Mohs defects.

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