Nasal reconstruction using the Washio retroauricular temporal flap

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SUMMARY. Reconstruction of an external nasal defect presents a challenge to the reconstructive surgeon. Transferring retroauricular tissue on a temporal pedicle was first described by Washio as a means to repair the central portion of the face. This paper describes our experience with the Washio retroauricular temporal flap for nasal reconstruction in twelve patients, together with our modifications to simplify the planning and raising of the flap. There was one patient with a stitch abscess, one case of hair loss from the pedicle which recovered within one month and one elderly patient who developed thromboembolic complications. There was no instance of flap necrosis. Our results confirm that the Washio retroauricular flap is an excellent technique for difficult nasal reconstruction in young patients.

Key words: nasal reconstruction, Washio retroauricular flap, temporal pedicle.

Introduction

Transferring retroauricular tissue on a temporal pedicle was first described by Washio and popularised by Maillard and Montandon. Although this flap is an extremely useful method for nasal reconstruction, many surgeons seem unaware of its advantages.

The Washio retroauricular temporal flap is safe, providing thin skin and cartilage that can be adapted for many different defects. The donor site is well hidden and it avoids any additional visible scar on the face.

This paper describes our experience with the Washio retroauricular temporal flap for nasal reconstruction. We have modified the original technique to simplify the planning and raising of this flap.

Patients and methods

Twelve Washio retroauricular temporal flaps were performed for a variety of external nasal defects between 1984 and 2002 (Fig. 1). There were eleven males and one female. The mean age of patients was 37 years (range 17–67 years) (Table I).

Planning the flap

Whilst planning of the flap has been described by both Washio and Maillard and Montandon, the following description may be helpful.

The first step in planning the flap is to palpate the superficial temporal artery and locate the point at which it emerges from behind the mandible into the subcutaneous tissues. Point A is marked just posterior to this
between the superficial temporal artery and the tragus of the ear. A tape measure is then laid across the cheek and up onto the nose to measure the distance from Point A to the farthest point of the defect, Point X (Fig. 2).

This distance (AX) is then rounded up to the nearest centimetre and divided by two. The resulting measurement becomes the side of the equilateral triangles upon which the design of the flap is based. Point B is then located just within the temporal hairline at this distance from Point A.

(5) Complete the first equilateral triangle ABC with Point C being located above and behind the pinna.

(6) Construct another equilateral triangle, BCD, based on the line BC.

(7) It may be helpful to construct a third equilateral triangle CDE based on the line CD.

(8) Project the line BC posteriorly for a distance of 6 cm. This becomes Point F.

(9) Plan the curved superior margin of the flap commencing at Point B and passing through Points D, E and F before curving down to the posterior aspect of the pinna.

### Table I  Details of the twelve Washio retroauricular temporal flaps performed

<table>
<thead>
<tr>
<th>Age at surgery/sex</th>
<th>Injury</th>
<th>Defect</th>
<th>Nasal lining</th>
<th>Post-operative complications</th>
<th>Revisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 47 yrs, male</td>
<td>Human bite</td>
<td>Left nostril</td>
<td>Marginal turnover flap</td>
<td>Stitch abscess</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>2. 26 yrs, male</td>
<td>RTA</td>
<td>Columella</td>
<td>Not applicable</td>
<td>Nil</td>
<td>Thinning of flap; release of right ear contracture</td>
</tr>
<tr>
<td>3. 29 yrs, male</td>
<td>Human bite</td>
<td>Nasal tip</td>
<td>Marginal turnover flap</td>
<td>Nil</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>4. 57 yrs, male</td>
<td>Adnexal carcinoma</td>
<td>Glabellar region</td>
<td>Not applicable</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>5. 48 yrs, male</td>
<td>RTA</td>
<td>Left nostril</td>
<td>Washio flap</td>
<td>Nil</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>6. 43 yrs, male</td>
<td>Pressure necrosis</td>
<td>Columella</td>
<td>Not applicable</td>
<td>Nil</td>
<td>Columella cartilage graft</td>
</tr>
<tr>
<td>7. 17 yrs, male</td>
<td>Human bite</td>
<td>Right nostril</td>
<td>Washio flap</td>
<td>Nil</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>8. 27 yrs, male</td>
<td>Human bite</td>
<td>Right nostril</td>
<td>Washio flap</td>
<td>Loss of hair from pedicle (regrowth in 1 month)</td>
<td>Fistula repair; thinning of flap</td>
</tr>
<tr>
<td>9. 67 yrs, male</td>
<td>Basal cell carcinoma</td>
<td>Right nostril</td>
<td>Washio flap</td>
<td>Deep venous thrombosis and pulmonary embolus</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>10. 27 yrs, male</td>
<td>Basal cell carcinoma</td>
<td>Right nostril</td>
<td>Washio flap</td>
<td>Nil</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>11. 31 yrs, male</td>
<td>RTA</td>
<td>Left nostril</td>
<td>Washio flap</td>
<td>Nil</td>
<td>Thinning of flap</td>
</tr>
<tr>
<td>12. 20 yrs, female</td>
<td>Self inflicted trauma</td>
<td>Right alar base</td>
<td>Washio flap</td>
<td>Reconstruction picked away by patient</td>
<td>Nil</td>
</tr>
</tbody>
</table>

### Table II  Planning the Washio retroauricular temporal flap

1. Locate Point A between the superficial temporal artery and the tragus of the ear.
2. Using a tape measure, measure the distance from Point A across the cheek and up onto the nose to the farthest point of the defect, Point X.
3. Round up the distance AX to the nearest centimetre and divide by two. This figure will be the side of the equilateral triangles upon which the design of the flap is placed.
4. Locate Point B just within the temporal hairline at this distance from Point A.
5. Complete the first equilateral triangle ABC with Point C being located above and behind the pinna.
6. Construct another equilateral triangle, BCD, based on the line BC.
7. It may be helpful to construct a third equilateral triangle CDE based on the line CD.
8. Project the line BC posteriorly for a distance of 6 cm. This becomes Point F.
9. Plan the curved superior margin of the flap commencing at Point B and passing through Points D, E and F before curving down to the posterior aspect of the pinna.

Figure 2—Design of the Washio retroauricular temporal flap; (A) schematic diagram; (B) preoperative markings.
superficial temporal artery, which is the arterial pedicle of the flap. If the patient is a male with a receding hairline it may not be possible to place Point B within the hairline.

Another equilateral triangle is then planned based on the line BC so that the triangle BCD lies higher on the tempo-parietal scalp. It may be helpful to construct a third equilateral triangle CDE based on the line CD. The line BC is projected posteriorly for a distance of 6 cm.2 This becomes Point F. The curved superior margin of the flap commences at Point B and passes through the Points D, E, and F before curving down to the posterior aspect of the pinna, though it may lie within Point E. The tissue to be transferred can be taken either from the hairless mastoid skin or from the thin tissue on the back of the pinna, or from both. When the flap is raised, this plan will ensure that the tissue to be transferred will comfortably reach the defect without tension (Table II).

Raising the flap

The proposed incision lines are first infiltrated with a dilute solution of adrenaline, though we have been cautious about infiltration around the superficial temporal artery and in the vicinity of the tissue to be transferred. The curved incision from Point B round to the retro-auricular area is deepened through the galea and any major bleeding vessels coagulated. The line AC is incised in reverse direction from Point C downwards to the pinna, and finally in front of the pinna. Due to the close proximity of the main arterial pedicle it may be wise to leave the last centimetre or so of this incision until the flap has been raised, and then to incise it under direct vision so as to protect the vessels. When raising the tissue to be transferred from the retroauricular area it is important that the full thickness of subcutaneous tissue is raised with the flap. The plane of dissection should be immediately above the mastoid periosteum. Further, if some or all of the flap is being taken from the posterior aspect of the pinna, it is important that sufficient deep tissue is raised from the retroauricular sulcus to include the posterior auricular area which sends fine branches to the tissues on the posterior aspect of the pinna.5,6 Having raised the tissue to be transferred, it is then convenient to raise the rest of the flap, commencing in the parietal area, in the usual way in the subgaleal plane. The last part of the flap to be raised should be that across its base, i.e. the line AB. The flap is then folded upon itself so that the triangle BCD overlaps the triangle ABC thus eliminating much of the raw surface. The remainder of the pedicle should be gently tubed as far as possible, though it is not usually possible to close it completely. The tissue to be transferred is then inset into the defect (Fig. 3). The secondary defect in the scalp should be grafted with thin split skin grafts and a small piece of thick split skin graft applied to that part of the secondary defect in the retro-auricular area. Finally, any remaining raw areas on the pedicle which could not be covered by tubing are also grafted with thin split skin grafts.

If the defect is in the ala nasi it may be helpful to place a stout silk suture from the alar base to the nearest scalp portion of the flap to avoid any tension on the relatively delicate retro-auricular tissues.

Post-operative care

As with any pedicle flap it is of crucial importance to ensure that the pedicle is not subject to either tension or kinking. The scalp portion of the flap is thick and robust and is relatively immune to these problems, but the retro-auricular tissues are thinner, softer and more liable to vascular compromise. The possible use of a tension relieving suture has been mentioned above. In addition, in the early post-operative phase when the patient may be lying in bed, a rolled up gauze swab may be placed under the pedicle to support it. At a later stage, when the patient is sitting up, on occasions we have found a loose loop of adhesive surgical tape to be of value in supporting the weight of the tubed part of the pedicle.

Division of the flap

Although other authors have divided the flap at two weeks5, it has been our practice to leave it for three weeks. The flap is divided at the margin of the defect and the pedicle is untubed. The thin split skin grafts are excised from the secondary defect and the flap is replaced. It may be necessary to undermine the edges of the adjacent scalp a little to facilitate closure. The only skin graft which should remain, is the thick graft placed in the region from which tissue was transferred. The divided tissue on the nose is simply tacked in place, as we have carried out a third minor procedure for thinning, trimming and inseting this region in every case (Fig. 4). It has been our practice to try to ensure that the distal part of the inset was such that no subsequent adjustment would be required in this area.

Discussion

Reconstruction of an external nasal defect presents a challenge to the reconstructive surgeon, because the nose draws attention to itself by virtue of its central, prominent position on the face.7,8 Achieving an optimal aesthetic result requires provision of skin with the appropriate colour and texture, underlying structural support and a suitable donor site that does not in itself create a noticeable secondary deformity.

Local flap techniques, such as the nasolabial or forehead flap, may provide very satisfactory tissue, particularly in elderly patients, but in young patients the additional secondary scarring on a visible area of the face is unacceptable.

In 1914 Konig7 reported the use of free composite ear grafts in nasal reconstruction. Limberg10 preferred the concha as a donor site, feeling that use of the helix too often resulted in graft loss. Composite grafts provide a simple, one-stage method of nasal reconstruction and many authors have since reported their successful use11, but they often require enlargement of the recipient site to provide a larger dermal bed and precise approximation...
Figure 3—Nasal reconstruction using the Washio retroauricular temporal flap: (A) the defect recreated and nasal lining provided by a marginal turnover flap; (B) the flap raised; (C) the flap transposed. (D) the flap inset, the pedicle tubed and any remaining raw area skin grafted.
of the edges to promote rapid revascularisation. Ruch\textsuperscript{12} stated that no part of the graft should be further than 1 cm from the margin from which it will obtain its blood supply. Avelar\textsuperscript{13} reported the use of larger composite grafts, however, his observations have not been supported by further clinical studies. In addition a larger donor defect cannot be closed without causing a significant cosmetic deformity of the ear and free composite ear grafts are best reserved for small full-thickness defects.\textsuperscript{7}

In 1985 Parkhouse and Evans\textsuperscript{14} described a new method of nasal reconstruction using a composite free flap taken from the anterior part of the pinna based upon the superficial temporal vessels. A similar case was reported by Shenaq.\textsuperscript{15} Although this technique may provide a very satisfactory reconstruction it may also produce significant deformity of the pinna and involves additional scarring to locate suitable recipient vessels.

For many reconstructive surgeons, the forehead flap is still regarded as the gold standard for nasal reconstruction and the inevitable secondary scar is accepted. However, some now believe that the forehead should be spoiled as little as possible in partial and total reconstruction of the nose.\textsuperscript{16}

The retroauricular temporal flap was introduced by Washio in 1969.\textsuperscript{1} Washio recognised the benefit of retroauricular tissue as a good donor area for tissue with which to repair the central portion of the face. However, use of this tissue requires a pedicle for transport.

The retroauricular temporal flap relies upon rich anastomoses between the superficial temporal and posterior auricular vessels of the ipsilateral side. It is an axial pattern flap and delay is unnecessary. The donor site is well hidden in the retroauricular region. Two prerequisites are a palpable superficial temporal artery and no evidence of scarring in the temporoparietal region. The tip of the flap can be designed with retroauricular skin, ear cartilage and subcutaneous tissue from the mastoid region. Nasal lining may be provided by a local turnover flap or by a turnover extension on the post auricular tissue. The position of the pedicle is well tolerated. It does not interfere with vision and can be dressed easily. Although other authors have reported division of the pedicle at two weeks\textsuperscript{3}, as stated above, it has been our practice to divide it after three weeks.

The Washio retroauricular temporal flap is notable in comparison with other techniques in that it avoids any visible scar on the face. The only drawback to the procedure is the limitation in the amount of material available for reconstructive purposes and Washio\textsuperscript{5} stated that it is not possible to attempt total reconstruction of the nose by this flap alone.

Maillard and Montandon\textsuperscript{3} reaffirmed the soundness of the technique and expanded its use. They incorporated a conchal cartilage graft into the flap and tubed the pedicle. Tubing prevents dessication and oozing from the inferior surface of the flap. This should be done carefully to avoid any compression or excessive traction on the vessels. Although others authors have reported leaving

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image.png}
\caption{Front (A) and side view (B) showing result after 6 month follow-up.}
\end{figure}
the secondary defect in the temporoparietal area to granulate, our preference has been to skin graft it.

The Washio retroauricular flap is an alternative to other procedures for reconstruction of external nasal defects. The nose requires relatively thin tissue and the skin of the posterior aspect of the ear is an excellent colour and texture match, comparable only to that of a forehead or local flap.

We have performed twelve Washio retroauricular temporal flaps for nasal reconstruction. There was one patient with a stitch abscess, one case of hair loss from the pedicle, which recovered within one month and one elderly patient who developed thromboembolic complications. There was no instance of flap necrosis. Our results confirm that the Washio retroauricular flap is an excellent technique for difficult nasal reconstruction in young patients.

References


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