Pinnaplasty: the correction of the prominent, protruding or lop ear

This article gives an overview of the authors' approach to the pinnaplasty procedure including assessment of the defect, the procedure itself and aftercare with a synopsis of possible complications to be aware of.

The human ear, like the human face, differs considerably from one individual to the next. Strong cultural differences appear to be associated with the prominence of the human ear. In the Far East prominent ears are often regarded as a sign of good fortune or aesthetically pleasing, yet in western society we tend to be less positive and may regard them as a sign of idiocy and a source of peer ridicule. One must be careful not to assume that one particular shape is normal.

Surgeons should be careful not to stigmatize these patients as not worthy of their attention and be careful not to confuse body dissatisfaction with body dysmorphic disorder (Veale, 2004). Peer ridicule is a hypothesized risk factor for the development of body dysmorphic disorder, which can handicap a person's ability to interact on a social level.

Protruding ears occur in approximately 5% of the population yet in only 8% of those does there appear to be a family history. Various causative theories exist. Sixty one per cent of prominent or protruding ears will be apparent at birth (Tan et al, 1994).

Embryology

The external ear develops first followed by the middle then inner ear. The auricle is formed from the first and second branchial arches at about 6 week's gestation from the six paired hillocks of His in the mesenchymal tissue of the first and second branchial arches. The six hillocks rotate and fuse to form the auricle. The first three hillocks develop from the first branchial arch to form the anterior auricle and the fourth to sixth hillocks develop from the second branchial arch to form the posterior auricle. The conchal bowl originates from the first branchial groove. The auricle at birth is 66% of the length and 76% of the width of a normal ear. By the age of 5 years the external ear has achieved 85% of its adult size.

Variations of pinna development

There are three main defects that contribute to the development of the prominent ear:

- The under-development of the helical rim leading to an inadequate antihelical fold
- Over-development of the concha leaving a large, deep conchal bowl
- Prominent lobule (*Figures 1a* and *b*).

Rogers (1968) originally divided ear deformities into four main types: microtic, lop, cup and protruding ears.

Frequently these terms are misused and one can simplify these deformities by dividing them into dysmorphic and dysplastic. Grade I deformities have all the anatomical subunits present but are misshapen with the commonest deformity of the dysmorphic auricle being the prominent ear. Grade II deformities are dysplastic because they lack anatomical subunits and grade III deformities represent the most severe dysplastic anomalies, microtia.

Conservative treatment of protruding ears

A variety of non-surgical techniques have been used by patients to camouflage their prominent ears.

If detected early, moulding or splinting of the neonatal ear deformity can produce a normal or near normal pinna in over 90% of cases (Tan et al, 1994). Splinting within the helical fold and taping the ears back for periods of 5–20 weeks have produced excellent results without surgery. Early intervention is the key as a steady decline in neonatal oestrogen levels over the first 6 weeks of life decreases cartilage compliance.

Long hair is an obvious solution and thus the onset of hair recession in the male occasionally acts as a trigger for the first consultation.

Prominent ear correction has occasionally been undertaken to help retain behind the ear hearing aids to prevent them from falling off, and a variety of ingenious techniques have also been used including the use of cyanoacrylate adhesive to physically stick the ears back.

Figures 1. a and b. Preoperative photographs.

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Preoperative assessment

Where conservative treatment has not been available or failed, the ideal age of surgery is probably between the ages of 4–6 years (Gosain and Recinos, 2002). At this age the ear has nearly grown completely and the child has not yet started school when social interaction may result in teasing or peer ridicule. At this age the child will not usually have been exposed to teasing and therefore naturally does not wish to have surgery. The parents, however, may be keenly aware of the psychological damage that teasing may have and wish, through the advent of corrective surgery, to avoid these potential traumas for their child.

Preoperative evaluation should include photographs in the frontal, oblique, lateral, and rear views to document the preoperative condition and to allow comparison following surgery.

Surgical treatment

More than 200 different techniques have been described in the literature and most provide a high degree of patient satisfaction. Each technique has its own inherent strengths and weaknesses. In all cases there is a compromise of function with perceived beauty. The aim is to produce consistently satisfactory cosmetic results, a high level of patient satisfaction while minimizing complications.

In the majority of cases surgery is undertaken to address the inadequate antihelical fold, the overdeveloped conchal bowl and the lobule. The particular technique used depends on the type of deformity.

The six goals of otoplasty

In 1968 McDowell proposed a number of goals for successful otoplasty:

1. The protrusion in the upper third of the ear should be eliminated
2. The helix of both ears should be seen lateral to the antihelix from the front view
3. The helix should have a smooth and regular contour throughout
4. The post-auricular sulcus should not be markedly decreased or disturbed
5. The ear should not be placed too close to the head but within 20 mm of the mastoid
6. The contours and position of the two ears should match closely but not be symmetrical.

Measurements

There are three measurements critical for the proper positioning of the reconstructed auricle: axis, level and distance from the orbit.

The axis is defined as the line through the long axis of the ear, also known as the line of balance. The normal ear inclination is at 15–20° from the vertical, tilting it posteriorly, slightly more vertical than the nasal dorsum.

With the head in the Frankfort horizontal position, the top of the ear is at the level of the brow or supraorbital rim, with the lobule aligning with the base of the columella. The vertical height of a normal ear ranges from 5.5–6.5 cm, which is attained at 13 years in girls and 15 years in boys. The horizontal width is achieved at an earlier age. The posterior position of the ear is 6 cm behind the lateral orbital rim. Protrusion of the ear from the surface of the mastoid is usually 1.5–2 cm, creating a post-auricular angle of 25–30°. The width of the ear is normally 55–60% of its height. In adults this is approximately 6 cm.

Surgical techniques

Before addressing the deformity, the neo-antihelix is fashioned by pinching it between thumb and forefinger (*Figure 2*) then marking it out with paired methylene blue needle stabs on opposing sides of the fold (*Figure 3*). These will also help to precisely locate the sutures which will hold the new antihelix position. The approach is then undertaken through a post-auricular incision with the skin injected with 2% lignocaine/1:80 000 adrenaline; the incision can be extended on to the lobule but not overdone as it may result in a telephone ear deformity.

The anatomical deformities are then addressed:

Re-creation of the antihelical fold

Many techniques have been described in the literature to address the inadequate antihelical fold and two important principles should be understood:

1. The cartilage may need to be weakened first in order to reduce the incidence of postoperative unfurling of

Figure 2. Recreating the new antihelix.

Figure 3. The new antihelix delineated by methylene blue needle marks.

the antihelix and a number of modalities can be used to achieve this: burring of the posterior cartilage, anterior scoring, and excision of cartilage. In an ear with soft, immature cartilage it may be entirely possible to proceed without using the weakening process. In the authors' unit a 4 mm diamond burr is used to weaken the cartilage. It is important to be careful to stay between the methylene blue markers and leave enough tissue either side of the weakened tract to enable decent purchase with the suture later on (*Figure 4*).

2. The antihelical fold can then be re-shaped and fixed using non-absorbable sutures, a procedure popularized by Mustarde (Mustarde, 1963; Bull, 1994).

The authors use 4–0 Goretex (Goretex, Texas) sutures but undyed 4–0 silk is a suitable alternative. Box sutures are inserted precisely where the methylene blue markers have been placed to achieve an accurate re-alignment (*Figure 5*). To ensure that the sutures are placed through the posterior surface of cartilage/residual soft tissue but not through the anterior skin, keep the non-dominant index finger in the conchal bowl during suturing.

Elevation of the anterior skin for scoring, abrasion or cutting has an increased risk of haematoma formation and infection but is a perfectly acceptable and useful approach in skilled hands. Percutaneous scoring of the anterior cartilage with a micro-rasp is used by some to achieve the same anterior scoring effect but with a slightly lessened risk of haematoma formation than the traditional anterior scoring methods.

Figure 4. Diamond burring of new antihelical fold posteriorly.

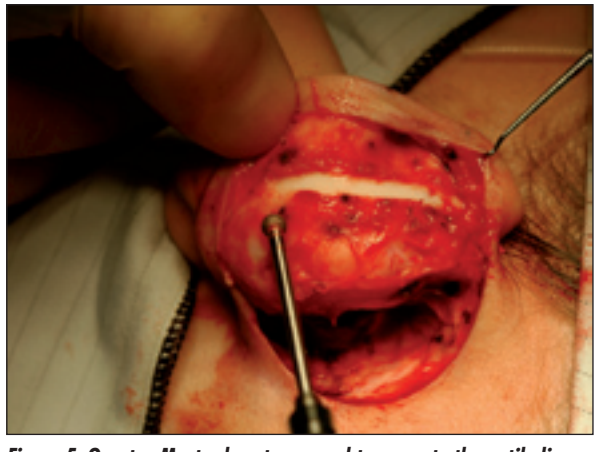

Figure 5. Goretex Mustarde sutures used to recreate the antihelix.

Reduction of conchal bowl depth

Overdeveloped conchal bowls can be set back against the mastoid periosteum with a simple suture technique popularized by Furnas (1968). This is often used in combination with antihelix surgery to correct the prominent ear and uses the same sutures as mentioned above.

A gutter must initially be created by excising tissue from the conchomastoid gutter to create space for the new conchal bowl to be advanced back into. It is important to place the sutures as far posteriorly into the mastoid periosteum as possible in order to redefine the normal pinna anatomy plus reduce the chance of external auditory canal stenosis (by pushing the conchal bowl forward). It may be necessary to use more than one suture to achieve a balanced, symmetrical result.

In more difficult cases conchal cartilage can be excised to set it back but this may result in redundant skin that may take a while to settle.

Re-alignment of the lobule

This is an often forgotten aspect of pinnaplasty and it is surprisingly difficult to produce reliable, repeatable results. Be as conservative as possible when excising tissue in this area and be cognisant of the individual's predisposition to keloid formation.

The lobule can be approached by extending the ellipse posteriorly or fashioning a separate incision. The authors find that a separate 'fish-tail' or 'W' incision works well. Once the tissue is excised careful wound suturing with 6–0 nylon produces acceptable results. An elliptical post-auricular incision is made with the upper limb following the methylene blue markings and the lower limb following the post-auricular sulcus. The skin within the ellipse is then excised. It is important not to excise excessive skin as this may lead to post-auricular webbing.

Postoperative care

Ears are bandaged postoperatively for splinting, protection and prevention of haematoma.

Cotton wool soaked in a topical antiseptic such as proflavine is placed over the posterior auricle and anteriorly into the folds of the ear to reduce dead space and haematoma formation (*Figure 6*). The soaked cotton is then covered with fluffed gauze and a final elasticated dressing applied. The authors use a large tubi-grip, but crepe bandage is just as effective.

The dressing should be left for 7 days, although some recommend a firm dressing for only 24 hours, and a headband must be used at night for several weeks to retain the shape of the new pinna. Bandages are often displaced and should be firm enough to splint the ears but not so tight as to cause discomfort or pressure necrosis. A number of adjustable, neoprene headbands are available with velcro strip closures that can help to splint the ears back.

Complications

The correction of prominent ears is not without complications (Weerda and Siegert, 1994; Jeffery, 1999) and in all cases one must balance function and beauty with the risk of complications.

Most patients are satisfied with a reduction in the prominence of their ears despite the operation not fulfilling all six goals of otoplasty proposed by McDowell (McDowell, 1968). Certain techniques have particular complications associated with them. Anterior scoring risks the development of sharp edges, haematoma and cartilage necrosis, while the Mustarde technique risks stitch extrusion, failure of sutures, asymmetry and telephone ear deformities.

In classifying complications it is best to subdivide these into immediate, early and late.

Immediate

Asymmetry, with either inadequate correction or overcorrection with a telephone deformity of the middle third of a prominent ear. Narrowing of the external auditory canal can occur with conchal furnas sutures.

Early complications

These include haematoma, infection, and skin and cartilage necrosis as well as skin sensitivity to dressings.

Haematomas require immediate drainage and, along with the treatment of infections, require the use of antibiotics and regular antiseptic dressings. It is important to be vigilant in this situation and inspect the wounds on a daily basis.

Sensitivity to the dressings requires removal of the dressings plus use of steroids and an antihistamine.

Late complications

These are usually related to inadequate correction, asymmetry or the recurrence of deformity as the result of suture failure. Spitting or the release of the sutures is possible without any cosmetic problems but if there is the recurrence of the deformity, it is advisable to let things settle for 3 months before re-operating to correct the problem.

Figure 6. Proflavine-soaked cotton wool packing before head bandaging.

Post-auricular suture line problems include granulomas, and hypertrophic scar formation. Granulomas require the removal of the suture plus possible use of antibiotics while hypertrophic scars may need revision but are usually well tolerated. Loss of correction is a problem with most techniques and is attributed to the traction exerted by the cartilage spring causing cartilage cut through by sutures.

Postoperative numbness can be a feature of pinnaplasty and usually resolves but can take up to 6 months. No reliable method of intervention can hasten the recovery of nerve function but steroids have been used with variable results.

Conclusions

Prominent ears are a common occurrence worldwide yet in only a few cultures is this viewed negatively. When considering surgery the surgeon, patient and parents need to balance function, beauty and the potential for psychological damage and the risk of complications. A variety of techniques are available, all with a high degree of patient satisfaction. There is no one correct technique but the combination of different techniques usually gives reliable results with the Mustarde technique appearing to offer the lowest complication rate (Lavy and Sterns, 1997) despite having a slightly higher rate of recurrence. As such the authors combine this with cartilage weakening techniques plus use Furnas sutures routinely. **BJHM**

Conflict of interest: none.

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KEY POINTS

- Detailed counselling and clinical photographs are essential preoperatively.
- Correction of the antihelical fold will usually require both suturing and cartilage weakening measures.
- Do not forget to address the deep conchal bowl and prominent earlobe.
- Postoperative proflavine packs and a head bandage for a week will help to reduce postoperative complications.