

## Chapter 24

# Ear Reconstruction

## Background

The ears are paired sensory organs comprising the auditory system, involved in the detection of sound, and the vestibular system, involved with maintaining body balance/equilibrium. The ear divides anatomically and functionally into three regions: the external ear (Figure 24.1), the middle ear, and the inner ear. All three regions are involved in hearing. Only the inner ear functions in the vestibular system.

The external ear (or pinna, the part that is visible), is composed of cartilage and skin, and has a relatively poor blood supply. The external ear serves to protect the tympanic membrane (the eardrum), and to collect and direct sound waves through the ear canal to the eardrum. About 2.7–3 cm long, the canal contains modified sweat glands that secrete cerumen, or earwax. Excess amounts of cerumen can block sound transmission.

The external size of the ear is 85% grown by the age of four years, and by year six the costal cartilage is suggested to be matured sufficiently to provide a reconstruction size and form similar to that of an adult.

The aetiology of ear abnormalities is considered under two headings – congenital and acquired. Boxes 24.1 and 24.2 provide examples of both.

## Box 24.1 Congenital malformations.

<b>Atresia</b>	partial or complete absence may be seen as part of syndromic craniofacial malformations
<b>Microtia</b>	abnormally small – incidence about 1–7000, predominantly on the right side (may be seen as part of syndromic craniofacial malformations)
<b>Macrotia</b>	abnormally enlarged
<b>Bat/shell ears</b>	protruding ears or the absence of the antihelix fold (surgical procedure often referred to as an otoplasty) <sup>1–9</sup> .

## Box 24.2 Acquired malformations – trauma and disease.

- Trauma – haematoma due to accident or assault, dog or human bite, burns, cauliflower ear (repeated damage, as in boxing, promoting thick fibrous tissue), motor vehicle accidents
- Benign cysts, benign tumours related to sun damage, keloid scars related to ear piercing
- Malignant skin tumours (70% due to sun damage, some pathology basal cell carcinoma but mainly squamous cell carcinoma with high metastatic spread, more common in males, occasionally melanoma<sup>1–5</sup>).

## Reconstructing the external ear

Such is the anatomical complexity of the ear and the nose, their recreation in order to appear normal and aesthetically acceptable to the patient, are stated to be two of the most difficult and challenging of all reconstructive procedures<sup>1–9</sup>.

Ear reconstruction is a procedure to correct a malformation of the ear resulting from a congenital or acquired condition<sup>1–9</sup>. The operation may be a single procedure, or multistaged with a range of approaches. In using the patient's own tissues and/or adjuncts, multiple procedures may be required to reconstruct a single or matching set of ears.

Some reconstructive procedures in children (e.g. congenital conditions described, such as deformities of the helix or antihelix (Figure 24.2), 'bat', shell, or malformed ears (Figures 24.2–24.4), are planned to be fully completed prior to the child commencing school, corresponding to the child's growth, to prevent teasing from other children, and to minimise time away from school.

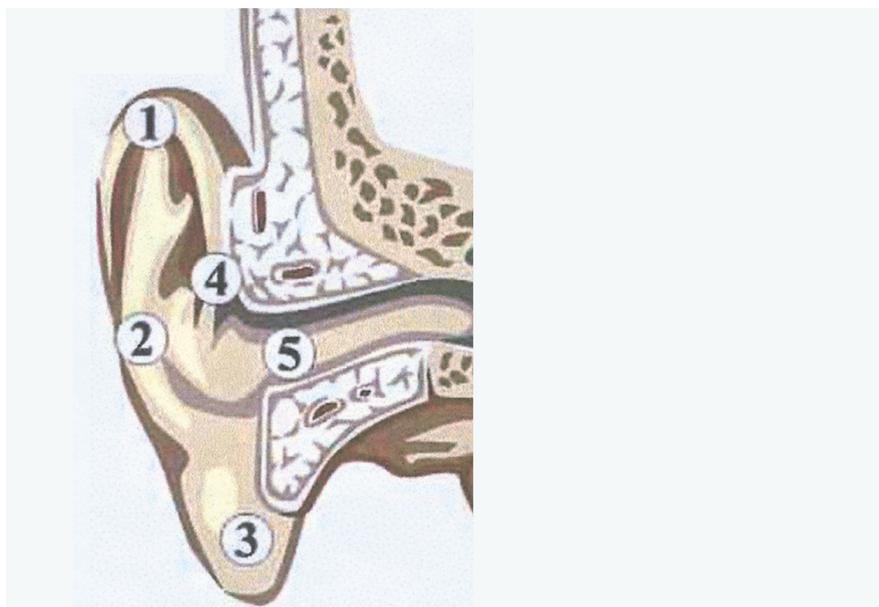


Figure 24.1 Anatomy of the ear.

**Definitions of parts shown above**

1. **Helix** – the in-curve rim of the external ear
2. **Antihelix** – a landmark of the outer ear
3. **Lobule** – a landmark of the outer ear. The very bottom part of the outer ear
4. **Crest of helix** – a landmark of the outer ear
5. **External auditory meatus** – or external auditory canal. The auditory canal is the channel through which the sounds are led from the outside to the middle ear

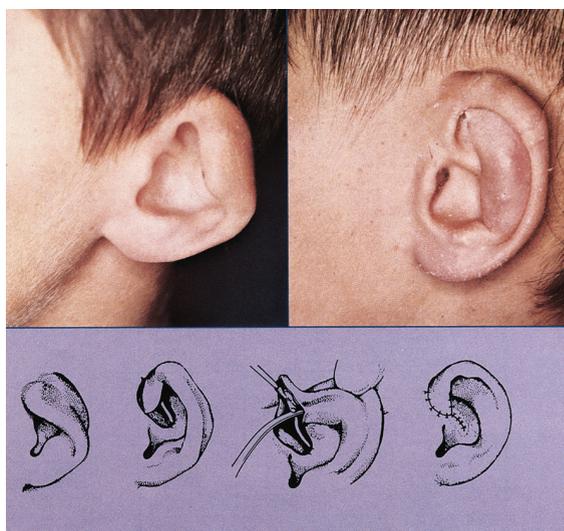


Figure 24.2 Malformation of the upper rim of the ear.



Figure 24.3 Unilateral protruding (shell type) ear.

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**Figure 24.4** Unilateral protruding (shell type) ear.

#### Box 24.3 Elective ear reconstruction approaches – examples.

- Use of the patient's own local/regional tissue (e.g. skin, cartilage, bone) with or without the use of tissue expansion
- Costal cartilage from a rib is stated to continue to be the most reliable source of tissue for use as an underlying framework for skin cover
- Tissue expansion followed by insertion of a custom moulded Silastic® implant, placed under expanded skin
- Attaching a custom designed prosthetic ear by using clips/studs/magnets (Brånemark® technique), or surgical glue (see Chapter 25).

#### Box 24.4 Reconstruction following trauma.

- Following animal or human bite, anti-tetanus and antibiotic cover is required
- Primary or secondary surgical repair by suturing
- Microvascular reconstruction following trauma (Figure 21.10)
- Elective reconstruction following the healing process.

Such is the anatomical complexity of the ear that its reconstruction, other than for a protruding ear(s) in the child or adult, may involve multistaged and/or microsurgical procedures or combinations<sup>1–10</sup>.

#### Box 24.5 Surgical options and risk management issues.

- Split to full thickness skin grafts – rarely used
- Local advancement skin flaps may be used for reconstruction following skin cancer<sup>5</sup>
- Tissue expansion (potential for over expansion with resultant avascular necrosis and prosthesis extrusion) (see Chapter 22)
- Combined skin flaps and tissue expansion
- Tubed pedicles (potential for failure to vascularise, infection)
- Silastic prosthetic implants (potential for rejection, infection)
- Costal cartilage grafts (potential for pneumothorax during harvesting)
- Brånemark® reconstruction (potential for excess wound granulation at titanium implant sites) (see Chapter 25).

#### Box 24.6 Preferred surgical outcomes of ear reconstruction.

<b>Corrective</b>	to correct malformations of the ear that result from birth defects, trauma or tumours
<b>Restorative</b>	to restore optimal structural stability that assist in optimal function
<b>Aesthetic</b>	to restore, or improve, the visual aesthetics of the ear.

**Review**

*Perioperative management – children, Chapter 16.*

**Box 24.7 Preoperative preparation.**

- Nurse clinicians charged with the care of patients postoperatively should be clear regarding the extent of the surgery to be undertaken for children, as the parents may not have completely understood the extent of the donor sites required
- Clinicians should enquire from the surgeon the extent of the surgery and what potential clinical complications may occur postoperatively
- Enquiry should include any donor sites, drains, wound care, dressings, and potential complications that require a high level of postoperative monitoring/observation and discharge management<sup>10</sup>
- The absence or malformation of an ear can be emotionally traumatic at any age, and the risks of even minimal failure must be well understood by all concerned
- Pre-surgical preparation is extremely important with psychological considerations high on the list<sup>11,12</sup>
- Some procedures may be recognised as being more to appease the parents rather than the child. Children in their very early years may not appreciate the long-term implications that may occur in respect of their body image
- The patient's hair should be washed preoperatively and long hair should be tied back.

**Box 24.8 Intraoperative period – bat/shell ear reconstruction.**

- Prior to surgery, surgical soap or Vaseline® may be applied to keep stray hairs away from the operation site. This makes early hair washing and the removal of old blood remaining postoperatively much easier
- In most instances local anaesthetic (lidocaine) and adrenaline is injected to reduce intra-operative bleeding, and provide postoperative comfort management
- This also separates the skin off the cartilage, assisting in the surgical dissection.

**Box 24.9 Wound dressings following surgery.**

- Wound dressings will reflect the simplicity/complexity of the procedure undertaken
- Postoperative dressing application is undertaken to protect the avascular cartilage from excess compression and secondary injury (e.g. haematoma) (Figure 24.5)
- The potential complications related to dressing compression, requires special care to be taken when wound dressings are applied to the ear
- Vaseline® gauze, acriflavine impregnated wool, or normal soft wool is usually used to pack 'dead space' in the front of the ear and behind the ear, moulding the exact ear shape desired (Figure 24.5)
- Providing dressing uniformity in height, and contour, with the surrounding skull, assists in exerting equal compression as bandages are applied
- Any form of soft wool type dressing is preferable to gauze, as the roughness of the gauze is likely to cause skin irritation, causing children to attempt to prematurely remove the dressing
- The head may remain bandaged for up to two weeks postoperatively, or according to the surgeon's preference<sup>6,7,9</sup> (Figures 24.6 & 24.7)
- One research paper has shown that for the majority of patients having an aesthetic otoplasty, bandaging for two days may be sufficient<sup>13</sup>
- Hair washing and the application of 'branded' sports head bands, ski caps, knitted hats or elasticised, tubular, low compression bandages are becoming more commonly used for children and adult patients who are considered co-operative.



**Figure 24.5** Internal packing of ear contours (eliminating dead spaces) as part of dressing the ear post surgery.



**Figure 24.6** External bandaging following surgery for protruding ears.



**Figure 24.7** Family of three children from same family, post surgery for protruding ears.

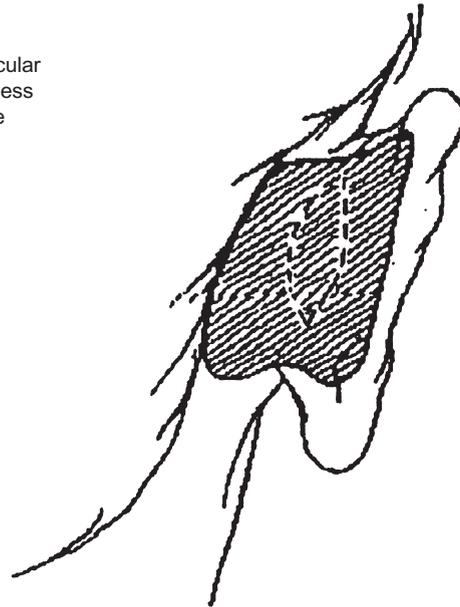
### Wound dressings – full thickness donor sites from behind the ear

Full thickness grafts are frequently harvested from behind the ear (Figure 24.8) for local defects following removal of tumours located in the antihelix.

Donor sites are commonly repaired with a continuous suture combined with a tie-over dressing on the suture line (Figure 24.9).

This fills the dead space, protects the suture line, and provides temporary compression. Bandages may or may not be applied if only one ear is operated upon. If bandaging is undertaken, both ears will usually be included. Wool should be placed in front of, and behind the ear to provide uniformity of height and to prevent irritation from the crepe bandage.

Post auricular  
full thickness  
donor site



**Figure 24.8** Donor site full thickness graft from behind the ear.

### Postoperative nursing care – risk management issues

#### Box 24.10 Clinical risk management – postoperative 1.

- The zone of the ear is a highly fixed skin region with a specialised circulatory system to the skin (cartilage has no discrete blood supply)
- Regardless of the reconstructive procedure undertaken, the actual or potential complications parallel those that exist for healing of any wounds<sup>10</sup>
- Complications may be accentuated by the adverse events peculiar to specific techniques used, particularly as the principal region for reconstruction may require more than one donor site<sup>1-10</sup>
- A potential complication post-harvesting of costal cartilage is pneumothorax<sup>10</sup>
- The incidence of haematoma, avascular necrosis of the skin/flaps, and infection, can be significant
- Scrupulous preoperative planning ensures the surgery is undertaken with high regard to the specifics of the local blood supply, and postoperative management is in the hands of experts at all levels of care<sup>10</sup>.



**Figure 24.9** Tie-over dressing to donor site to apply minimal compression and eliminate dead space and protect sensitive cartilage prior to traditional ear dressing (Figures 24.5 and 24.6).

## Clinical risk management – postoperative 2 – the ear wound(s)

### Box 24.11 Safety.

- Development of even a small haematoma (causing extreme pain and necrosis)<sup>10</sup>
- With the ear, two principal complications are seen, vascular compromise within the wound, indicated by pain, and unrelieved nausea and/or vomiting which in itself may be related to bandage compression and vascular compromise<sup>1–10</sup>
- Following a 'perfect' operation, the undue pressure of wound dressings and bandages may cause:
  - Avascular 'spotting' with ulceration developing
  - Tension on skin edges that may cause wound breakdown
  - Any single or combination of complications may compromise the entire reconstruction.

- Vascular compromise/pain/wound monitoring is based on the potential for circulatory compromise mainly to the cartilage and a strict record of any pain and/or blood loss should be maintained and reported immediately
- Vascular compromise is an urgent complication, which should be reported immediately, and relieved by bandage decompression to prevent avascular necrosis of the cartilage and draped over skin<sup>6–12</sup>
- Excessive compression of head bandages may result in air pressure changes within the inner ear (the labyrinth), affecting balance and inducing vomiting
- Primarily, an antiemetic should be given, but continuous vomiting will cause distress and a raised intracranial pressure. This may generate wound bleeding, haematoma etc.
- If vomiting or nausea is not relieved, bandage decompression must be considered
- Decompression of the bandages must be with permission from the surgeon, and bandages should be cut down to the skin in a vertical line at the forehead site
- This action allows for pressure to be released immediately and, as vomiting, pain or severe discomfort is relieved, a new securing bandage can be applied over the existing bandages without disturbing the inner dressings
- Failure of either or both of these complications to be relieved by decompression will require the entire wound dressing(s) to be taken down and the wound fully inspected. This should be anticipated by the clinician and redressing components pre-emptively made available to save time
- Pain management and sedation may be required to settle the patient
- Pain may be related to 'tie-over' dressings (e.g. skin grafts) compressing fragile tissues, particularly cartilage
- Complex redressing should not be undertaken in an uncooperative patient or in a patient who is distressed.

### Box 24.12 Comfort.

- In the postoperative phase, the declining efficacy of local anaesthesia and vasoconstrictors may see the precipitation of pain and wound bleeding
  - Whilst regional blocks that provide long-term analgesia are state of the art, they may mask the
- Continued*

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development of a haematoma or any bleeding – any strikethrough bleeding should be reported immediately

- The nurse clinician should review analgesia given in the post anaesthesia care unit and provide for analgesia to be given orally (or rectally, if appropriate, in children) as ordered strictly four-hourly for the first 72 hours<sup>14,15</sup>
- Pain not relieved by analgesia should be reported immediately
- This pain may be accompanied by nausea and vomiting (see above under *Safety*)
- Children need to be free of pain and nausea, warm and comforted with a sense of safety, as crying and irritability can raise the blood pressure and increase the tension on the wound(s) and potential for bleeding<sup>14,15</sup>
- In both children and adults, additional wounds may be present
- Pain may be quite significant from donor sites such as the hip (movement) or chest wound sites (breathing), and provision for comfort measures should be made for these or other wounds
- Following complex multisited procedures, narcotic analgesia may be required initially for one to two doses, and, for some patients, a short term narcotic infusion may be useful<sup>14,15</sup>
- Pain may result from blood that has leaked into the ear labyrinth
- The ear should be checked with an auriscope and carefully cleaned with saline soaked cotton buds
- Temporomandibular joint pain may result from children or adults clenching or grinding their teeth – oral analgesia and/or low dose diazepam may be required to relieve the spasm and resultant pain.

### Review

*Setting goals of care and preferred clinical and patient outcomes, Chapter 2, Boxes 2.7–2.9. Adapt as appropriate to the patient's clinical needs.*

### Box 24.13 Wound management – general nursing care.

- Assess for the presence of other wounds including, for example, wound drainage sites if skin, cartilage, costal cartilage or bone is used, and that additional drainage bottles are present
- If costal cartilage has been harvested the potential for pneumothorax is significant and the patient may have a chest tube inserted to assist in ventilation of the lung
- For procedures that include insertion of tissue expander(s), see Chapter 22
- Following aesthetic otoplasty or other similar procedures, dressings may be changed on day one postoperatively to assess for haematoma or malpositioning, which is easier to correct in the early stages<sup>6–9</sup>
- Nurse clinicians removing the primary and secondary dressings should be extremely careful at all stages to ensure that bleeding or pain and that dislodgement of dressings does not occur
- For congenital malformations, and skin tumours of the ear, skin grafts or flaps may be used, and primary dressings may also be undertaken on day 1 postoperatively<sup>1</sup>
- Some procedures may be left open without dressings, particularly tubed pedicles, which require vascular monitoring
- For dressings left intact for a longer period, it is important to observe for bleeding through the bandages, or poorly-filled drainage tubes or collecting bottles, as children cannot support excessive blood loss
- The removal of dressings postoperatively requires the patient to be in a reclining position and the bandages cut as for decompression (middle of the forehead down to the skin)
- Each layer is removed individually and gently. If no further dressings are required, the patient may go home and gently shower and wash the hair under warm (not hot) water
- Hair drying should be undertaken by gentle towelling – not rubbing – or using hair dryer on cool – not hot
- Emphasis is put on the need for protection and safety of the ears(s), as cartilage is slow to heal and the procedure may fail
- Headbands should remain on overnight to protect against secondary injury to the ear
- A soft diet is required for the first 7–10 days as excessive or hard chewing will cause discomfort to ears, as the temporomandibular joints are very close<sup>11</sup>.

**Box 24.14 Independence**

- Most procedures are undertaken as day or short stay procedures
- Early mobilisation is usually possible but this is dependant on the extent of donor sites that may compromise full mobility for a few days
- Decisions will be based on an overall assessment of the safety of the wounds and the patient
- Children will require diversionary activities and should be persuaded towards quietness and protection of the wounds – structured play, not rough and tumble games.

**Box 24.15 Discharge management.**

**The patient should be given the following verbal and written advice:**

- Do not remove dressings unless otherwise instructed
- The ears must remain free from any undue pressure at all times
- Do not consciously lie on the ear(s)
- Quiet activity – resting as much as possible for the first few days or until instructed
- Wear knitted ski hat or beanie over dressings in bed at night to secure the bandages
- Soft diet – no straining
- Report any excessive pain, unusual odour or bleeding to your surgeon or nearest emergency room
- Do not get bandages wet, and if this does occur return to the surgeon's rooms for changing
- When dressings are removed, wear a favourite tennis headband, knitted ski hat or beanie at night for about four weeks to ensure ears do not accidentally fold forward – cartilage heals slowly and is easily fractured.

**Review**

*Auditing preferred clinical and patient outcomes, Chapter 2, Boxes 2.10–2.12.*

**References**

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**Recommended websites**

**Photo galleries of pre-operative, surgical procedure and post surgery outcomes**

- <http://www.plasticsurgery.org/index.cfm>  
<http://www.earreconstruction.com/surgical-technique.html>  
<http://www.plasticsurgerydoctors.com/procedures/plasticsurgeryprocedureindex.html>  
<http://www.plasticsurgery.com.au/index.shtml>