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## Contents

Preface 5  
Consent table 6

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Grommet insertion</td>
<td>11</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Removal of lesion from pinna – wedge excision</td>
<td>12</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Excision of preauricular sinus</td>
<td>13</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Myringoplasty</td>
<td>14</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Ossiculoplasty</td>
<td>18</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Stapedotomy</td>
<td>20</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Mastoidectomy and canalplasty</td>
<td>22</td>
</tr>
<tr>
<td><strong>8</strong></td>
<td>Cochlear implantation</td>
<td>27</td>
</tr>
<tr>
<td><strong>9</strong></td>
<td>Manipulation under anaesthesia of fractured nose</td>
<td>30</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>Septoplasty</td>
<td>31</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>Surgery to inferior turbinates</td>
<td>34</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td>Endoscopic sphenopalatine artery ligation</td>
<td>36</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>Anterior ethmoidal artery ligation</td>
<td>37</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td>Functional endoscopic sinus surgery (FESS)</td>
<td>39</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td>Septorhinoplasty</td>
<td>42</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td>Lateral rhinotomy and medial maxillectomy</td>
<td>46</td>
</tr>
<tr>
<td><strong>17</strong></td>
<td>Maxillectomy</td>
<td>49</td>
</tr>
<tr>
<td><strong>18</strong></td>
<td>Endoscopic dacryocystorhinostomy</td>
<td>51</td>
</tr>
<tr>
<td><strong>19</strong></td>
<td>External carotid artery ligation</td>
<td>52</td>
</tr>
<tr>
<td><strong>20</strong></td>
<td>Midfacial degloving</td>
<td>54</td>
</tr>
<tr>
<td><strong>21</strong></td>
<td>Fine needle aspiration cytology</td>
<td>56</td>
</tr>
<tr>
<td><strong>22</strong></td>
<td>Lymph node biopsy</td>
<td>57</td>
</tr>
<tr>
<td><strong>23</strong></td>
<td>Tonsillectomy and adenoidectomy</td>
<td>59</td>
</tr>
</tbody>
</table>
Contents

24 Uvulopalatoplasty  62
25 Tracheostomy  64
26 Diagnostic procedures in the upper aerodigestive tract  68
27 Paediatric microlaryngoscopy and bronchoscopy (MLB) foreign body removal  74
28 Phonosurgery  77
29 Microlaryngoscopy and laser use  80
30 Pharyngeal pouch  82
31 Submandibular gland excision  85
32 Superficial parotidectomy  87
33 Thyroglossal cyst excision  90
34 Thyroidectomy  92
35 Neck dissection  96
36 Total laryngectomy  101
37 Pectoralis major myocutaneous flap  105
38 Local flaps  107
39 Pinnaplasty  112
40 Blepharoplasty  115
41 Face lift  118
Index  123
Preface

There are a number of excellent operative textbooks available, which provide detailed specialist and subspecialist knowledge. However, we feel there is a need for a clear, concise, step-by-step operative guide, to which the junior trainee can refer for an overview of core Otolaryngology, Head and Neck, and Facial Plastics procedures. This book hopes to provide comprehensive information to allow the trainees to perform the operations themselves under appropriate supervision, and is designed to be small enough to carry with you day to day.

As a team of authors, we have drawn on our experience, both at trainee and consultant level, and from colleagues within the specialty to put together a practical guide of how to make an operation succeed. Although different surgical approaches can provide equally good outcomes, this is beyond the scope of this textbook. We have simply described tried and tested techniques, which we find work.

Similarly, while we have included an easy reference table of complications that should be discussed with the patient when obtaining consent, we have not included a discussion on the surgical anatomy, indications, or benefits.

We are extremely grateful to our coauthors, and would like to thank them for their help and contributions, as outlined below. In addition, special thanks go to Nikos Papadimitriou for his help in the early stages of writing, and to Alasdair Mace for his invaluable help with reviewing this book.

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34 – Mr. N. Tolley
## Consent Table

<table>
<thead>
<tr>
<th><strong>Otology</strong></th>
<th><strong>Bleeding</strong></th>
<th><strong>Infection</strong></th>
<th><strong>Chronic otorrhoea</strong></th>
<th><strong>Residual perforation</strong></th>
<th><strong>Scar</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Grommet insertion</td>
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<td></td>
<td></td>
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</tr>
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</tr>
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<th><strong>Septal perforation</strong></th>
<th><strong>Scar</strong></th>
<th><strong>Nasal obstruction</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>9 MUA of fractured nose</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Septoplasty</td>
<td>√</td>
<td>√</td>
<td>√</td>
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</tr>
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</table>

**Surgical management of epistaxis:**

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<th><strong>Bleeding</strong></th>
<th><strong>Infection</strong></th>
<th><strong>Scar</strong></th>
<th><strong>Tracheostomy</strong></th>
<th><strong>Nerve injury</strong></th>
</tr>
</thead>
<tbody>
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### Otology

<table>
<thead>
<tr>
<th>Alteration in taste</th>
<th>Dizziness</th>
<th>Reduced hearing</th>
<th>Tinnitus</th>
<th>Dead ear</th>
<th>Facial nerve injury</th>
<th>Further surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<th>CSF leak</th>
<th>Visual disturbance</th>
<th>Further surgery</th>
<th>Nasal packs</th>
<th>POP</th>
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### Rhinology

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<tbody>
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### Head and Neck

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<tr>
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### Dental

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<th>Further surgery</th>
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</tr>
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### (Continued)
<table>
<thead>
<tr>
<th>Head and Neck</th>
<th>Bleeding</th>
<th>Infection</th>
<th>Scar</th>
<th>Tracheostomy</th>
<th>Nerve injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Endoscopy – diagnostic procedures of upper aerodigestive tract</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 Paediatric MLB and bronchoscopy</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>28 Phonosurgery</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>29 Microlaryngoscopy</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>30 Pharyngeal pouch repair – endoscopic and open approach</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>31 Submandibular gland excision</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 Parotidectomy</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 Thyroglossal cyst excision</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 Thyroidectomy</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 Neck dissection</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 Total laryngectomy + TEP</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facial Plastics</td>
<td>Bleeding</td>
<td>Infection</td>
<td>Scar</td>
<td>Necrosis of skin/flap</td>
<td>Unsatisfactory cosmetic result</td>
</tr>
<tr>
<td>38 Local flaps</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>39 Pinnaplasty</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>40 Blepharoplasty</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Face lift</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**

- Scar - may be normal/hypertrophic/keloid
- CSF: cerebrospinal fluid
- DCR: dacryocystorhinostomy
- EBSLN: external branch of superior laryngeal nerve
- FNAC: fine needle aspiration cytology
- MLB: microlaryngoscopy and bronchoscopy

MUA: manipulation under anaesthesia
SPA: sphenopalatine artery
POP: plaster-of-Paris
TEP: tracheoesophageal puncture
<table>
<thead>
<tr>
<th>Dental trauma</th>
<th>Nasal regurgitation</th>
<th>Pain</th>
<th>Perforation</th>
<th>Recurrence</th>
<th>Further surgery</th>
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</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Incomplete excision</th>
<th>Nerve injury</th>
<th>Dry eyes</th>
<th>Ectropion/entropion</th>
<th>Visual disturbance</th>
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</tr>
</thead>
<tbody>
<tr>
<td>√</td>
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1.1 The tympanic membrane.

1.2 Inserting the grommet.

1.3 Completion of grommet insertion.

SURGICAL STEPS

1. Positioning the patient
2. Examination under the microscope
3. Myringotomy
4. Grommet insertion

PROCEDURE

1. Positioning the patient
Position the operating table head-up. Turn the patient’s head away from the operative side and position the aperture drape.

2. Examination under the microscope
Clean the external auditory canal and inspect the tympanic membrane. Take care to avoid injury to the external auditory canal skin.

3. Myringotomy
Use a myringotomy knife to make a radial incision in the antero-inferior quadrant of the tympanic membrane (1.1). The length of the incision should match the diameter of the inner flange of the grommet. Any middle ear effusion should be removed using 22 gauge suction.

4. Grommet insertion
Insert the grommet through the myringotomy incision using crocodile forceps (1.2). Complete insertion of the grommet using a slightly curved needle (1.3). Suction any blood or fluid from the grommet lumen. Instill drops to prevent blockage of the grommet lumen.

Surgeon’s tip
If operating on a patient with Down’s syndrome, take care with neck positioning as there is a higher incidence of atlanto–axial instability.

Surgeon’s tip
Avoid touching the edges of the myringotomy with the suction tip as this may cause peri-operative bleeding and tympanosclerosis.
Removal of lesion from pinna – wedge excision

**SURGICAL STEPS**

1. Positioning the patient
2. Draping and local anaesthetic
3. Excision of the lesion
4. Closure and dressing

**PROCEDURE**

1. **Positioning the patient**
   The patient is placed supine on the operating table, on a head ring. Turn the patient’s head away from the operative side. Use a sterile marker pen to mark the resection margins (2.1). Commonly, lesions occur on the edge of the pinna, and a wedge excision gives adequate clearance and a reasonable cosmetic result. See Table 2.1 for excision margins required for different lesions.

2. **Draping and local anaesthetic**
   Prepare the skin with betadine, and use a small piece of cotton wool to prevent it entering the external auditory canal. If the procedure is being done under general anaesthesia, use a head drape; leave the face exposed if the procedure is being done under local anaesthetic. Inject 2–4 ml of local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline using a dental syringe.

3. **Excision of the lesion**
   Use a 15 blade to excise the lesion as marked, using a full thickness incision (2.2). Use a marking stitch (2/0 silk) to orientate the specimen for histology.

4. **Closure and dressing**
   Use 5/0 prolene to suture the skin edges anteriorly and posteriorly, making sure that the cartilage edges are completely covered. Use a paraffin impregnated gauze such as Jelonet® to fill the contours of the external ear and cover the postauricular aspect of the incision. Apply a head bandage.

**Table 2.1: EXCISION MARGINS FOR LESIONS**

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<th>Lesion</th>
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<td>Morpheaform BCC</td>
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<td>Low risk SCC (i.e. diameter &gt;2 cm or depth &gt;6 mm)</td>
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<tr>
<td>High risk SCC</td>
<td>6 mm</td>
</tr>
<tr>
<td>Malignant melanoma</td>
<td>Dependent on staging</td>
</tr>
</tbody>
</table>

BCC: basal cell carcinoma; SCC: squamous cell carcinoma

---

**Surgeon’s tip**

Once you have excised the lesion, excise a small ellipse of cartilage on either side of the wedge so that you may achieve an adequate approximation of the skin both on the anterior and posterior aspect of the pinna.

---

2.1 Marking of pinna wedge.
2.2 Wedge excision.
Excision of preauricular sinus

**SURGICAL STEPS**

1. **Positioning the patient**
2. **Examination under the microscope**
3. **Injection of methylene blue to define the sinus tract**
4. **Skin incision**
5. **Excision of the sinus tract**
6. **Closure**

**PROCEDURE**

1. **Positioning the patient**
   Position the operating table head-up. Turn the patient’s head away from the operative side. Mark an elliptical incision around the opening of the sinus. Prepare the skin with betadine, and drape the patient tightly with a head drape to hold hair out of the operative field.

2. **Examination under the microscope**
   Examine the external auditory meatus under the microscope to exclude the pit of a preauricular fistula opening into the ear canal.

3. **Injection of methylene blue to define the sinus tract**
   Using a blunt needle, gently inject methylene blue into the sinus. Probe the sinus with a lacrimal probe to determine direction and length of the sinus tract. Alternatively, a thick prolene suture can be used. Inject skin with approximately 1–2 ml of 2% lignocaine with 1/80,000 adrenaline.

4. **Skin incision**
   Using a 15 blade, make the skin incision following relaxed skin tension lines. Raise skin flaps anteriorly for approximately 2 cm, and as far as the perichondrium of helical cartilage posteriorly. Use an assistant to retract skin flaps with skin hooks.

5. **Excision of the sinus tract**
   Retract an island of tissue around the sinus opening with Allis forceps. Using iris scissors, carefully dissect the sinus tract through subcutaneous tissues. Take care not to breach the walls of the sinus. If the fundus of the sinus is adherent to the helical perichondrium, excise a segment of cartilage with the specimen.

6. **Closure**
   Ensure haemostasis. Skin incisions are closed with 3/0 vicryl and 4/0 prolene and sprayed with a transparent dressing such as Opsite spray. No other dressing is required.

**Surgeon’s tip**

Take care not to damage the walls of the sinus with the probe or needle.

**Surgeon’s tip**

A lacrimal probe can be placed in the sinus tract to help identify it when you are dissecting through subcutaneous tissues.

**Surgeon’s tip**

Look for bluish colouration of methylene blue to highlight the sinus tract.
4 Myringoplasty

SURGICAL STEPS

1 Positioning the patient
2 Examination under the microscope; freshen the edges of perforation
3 Surgical approaches:
   – Postauricular
   – Endaural
   – Permeatal
4 Harvesting the temporalis fascia graft
5 Elevating the tympanomeatal flap
6 Positioning the graft
7 Packing and closure

PROCEDURE

1 Positioning the patient
Position the patient on a head ring with operating table head-up. Turn the patient’s head away from the operative side. Shave the hair over the incision site. Inject approximately 10 ml of local anaesthetic and adrenaline in the form of 1% lignocaine and 1/200,000 adrenaline. Prepare the skin with betadine, and drape the patient tightly with a head drape to hold hair out of the operative field.

2 Examination under the microscope; freshen the edges of perforation
Using a microscope, clean the ear canal and assess perforation site and size. Inject 1–2 ml of 2% lignocaine and 1/80,000 adrenaline using a dental syringe. Inject slowly at the edge of hair-bearing skin, from 12 o’clock to 6 o’clock (4.1). Freshen the edges of perforation using a slightly curved needle to remove the thin rim of squamous epithelium from the perforation edge.

3 Surgical approaches
Postauricular
Using a 10 blade, make a skin incision 0.5–1 cm behind the postauricular sulcus, from the inferior margin of the external auditory meatus inferiorly to the level of the zygomatic arch superiorly (4.2). Continue the incision through the postauricular muscles to the level of the temporalis fascia superiorly. Dissect as far as the posterior edge of bony external auditory canal.

4.1 Clockface used to describe positions on the tympanic membrane or ear canal.

4.2 Postauricular skin incision.
Using a 15 blade, make a T-shaped incision (4.3). Elevate periosteum with a Freer elevator, taking care not to tear periosteum or external auditory canal skin, especially at the spine of Henle. Enter the ear canal lumen using an incision through external auditory canal skin (4.4, 4.5). Quarter-inch ribbon gauze is passed through the incision and the two ends held in a clip, retracting skin and pinna anteriorly. Insert two self-retaining retractors.

**Surgeon’s tip**

Holding the pinna between thumb and index finger, with the index finger in the external auditory meatus, retract the pinna anteriorly. Using a knife at 45° to the skull, dissect anteriorly in this plane, as far as the posterior edge of bony external auditory canal. This avoids damaging the temporalis fascia or perforating the posterior external auditory canal skin.

**Surgeon’s tip**

If the full extent of the perforation cannot be visualised because of a narrow or tortuous external auditory canal, a canalplasty may be required. See 7 – Mastoidectomy and canalplasty.
Endaural approach to myringoplasty.

**Endaural**

Using a 15 blade, make a skin incision between the tragus and root of helix, and extend superiorly over the zygomatic arch as far as the temporalis fascia (**4.6**). Take care to avoid damaging cartilage. Using a Lempert speculum, extend the incision deep through the peristeum from the level of the zygomatic arch superiorly into the roof of the ear canal for 5 mm. Insert two self-retaining retractors.

**Permeatal**

Make a single hairline incision to access the temporalis fascia and a tympanomeatal flap incision in external auditory canal skin.

**4 Harvesting the temporalis fascia graft**

Lift the scalp with a Langenbeck retractor. Dissect the plane above the temporalis fascia using scissors. Incise the temporalis fascia, and separate fascia off muscle with a Freer elevator. Using nontoothed forceps and curved iris scissors, harvest the graft (size appropriate to the tympanic defect). Spread the graft out on a glass slide to dry.
5 Elevating the tympanomeatal flap
Using a 45° round canal knife, make an incision 10 mm lateral to the annulus, extending from 12 to 6 o’clock. Use a Plester D-knife to make two longitudinal incisions as shown in Figure 4.7. Use the round canal knife to elevate the tympanomeatal flap until you reach the annulus.

Lift the annulus out of the annular rim using a flat canal elevator and use a slightly curved needle to enter the middle ear space. Elevate the annulus from 12 to 6 o’clock.

6 Positioning the graft
Cut the graft to size. Holding the front edge of the graft in a pair of crocodile forceps, place underneath the tympanic membrane, ensuring that the graft covers the defect. Place some pieces of sofradex-soaked absorbable gelatin sponge in the middle ear to support the graft.

7 Packing and closure
Pack the deep ear canal with pieces of absorbable gelatin sponge and bismuth iodoform paraffin paste (BIPP). Skin incisions are closed with 3/0 vicryl and 4/0 prolene. A pressure bandage of paraffin impregnated dressing such as Jelonet®, gauze, cotton wool, and crepe bandage may be applied overnight.

Surgeon’s tip
Tragal and conchal cartilage are frequently used as alternative graft materials, especially when a stronger reinforcement of the tympanic membrane is required. If a postaural approach has been used, conchal cartilage is readily accessible. It should be thinned to a diameter of 2–3 mm using either a scalpel or cartilage cutter. Tragal cartilage is thinner and can be harvested via a separate tragal incision.
**Ossiculoplasty**

**SURGICAL STEPS**

1. Positioning the patient
2. Examination under the microscope, tympanomeatal flap elevation
3. Ossicular assessment
4. Choice of prosthesis
5. Positioning the prosthesis
6. Packing and closure

**PROCEDURE**

1. **Positioning the patient**
   Position the operating table head-up. Turn the patient’s head away from the operative side. Attach a facial nerve monitor and ensure it is working. Prepare the skin with betadine, and drape the patient tightly with a head drape to hold the hair out of the operative field.

2. **Examination under the microscope, tympanomeatal flap elevation**
   Inject 1–2 ml of local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline using a dental syringe. Inject slowly at the edge of hair-bearing skin from 12 o’clock to 6 o’clock. Using a disposable tympanoplasty blade, make an incision into the external auditory canal skin 10 mm lateral to the annulus, extending from 12 to 6 o’clock. Use a Plester D-knife to make two longitudinal incisions. Use a round canal knife to elevate the tympanomeatal flap until the annulus is reached.

   Lift the annulus out of the annular rim using a flat canal elevator and use a slightly curved needle to enter the middle ear space. Elevate the annulus from 12 to 6 o’clock.

   Fold the tympanomeatal flap anteriorly, identify and preserve the chorda tympani. Use the House curette or a 1 mm diamond burr to remove bone of the scutum if necessary to expose the incudostapedial joint (ISJ) and stapes footplate.

3. **Ossicular assessment**
   Exclude any middle ear pathology. Use a slightly curved needle to gently assess ossicular mobility and continuity (Table 5.1). First probe the malleus and check ISJ mobility. Do not touch the stapes itself until this has been done. Secondly, assess the stapes footplate. Using gentle pressure on the ISJ, assess the mobility of the stapes. Is it fixed or mobile? Ensure at least 5 mm of middle ear space for reconstruction, particularly in post chronic suppurative otitis media cases.

4. **Choice of prosthesis**
   See Table 5.2, Figures 5.1 and 5.2.

5. **Positioning the prosthesis, e.g. PORP**
   Use a measuring rod to determine the distance that needs to be bridged and trim the prosthesis to size with a scalpel. Use fine crocodile forceps and the slightly curved needle to manipulate the prosthesis gently into place and achieve a snug fit. The prosthesis should sit comfortably on the head of the stapes. Malleus or incus should be placed onto the prosthesis making sure there is no deviation from the anatomical position. Assess continuity of movement.

6. **Packing and closure**
   Check that the prosthesis is not resting on the tympanic membrane, to avoid extrusion of the prosthesis. If the malleus is absent, insert a small piece of tragal cartilage between the tympanic membrane and the prosthesis. Replace the tympanomeatal flap and pack with pieces of absorbable gelatin sponge and BIPP (see 4 – Myringoplasty).
Table 5.1: MIDDLE EAR FINDINGS AND TREATMENT OPTIONS

<table>
<thead>
<tr>
<th>Likely findings</th>
<th>Treatment options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixation of incudomalleolar joint</td>
<td>Remove incus</td>
</tr>
<tr>
<td>Fixation of head of malleus</td>
<td>Remove malleus head with malleus head nippers</td>
</tr>
<tr>
<td>Erosion of LPI</td>
<td>Remove incus</td>
</tr>
<tr>
<td>ISJ discontinuity – post-traumatic</td>
<td>Re-establish continuity</td>
</tr>
<tr>
<td>Stapes footplate fixation</td>
<td>Stapedotomy</td>
</tr>
</tbody>
</table>

ISJ: incudostapedial joint; LPI: long process of the incus

Table 5.2: CHOICE OF PROSTHESIS

<table>
<thead>
<tr>
<th>State of ossicles</th>
<th>Prosthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malleus</td>
<td>Incus</td>
</tr>
<tr>
<td>Present Absent or eroded Intact</td>
<td>Incus transposition Or Incus prosthesis Or PORP, bypassing malleus</td>
</tr>
<tr>
<td>Present Absent Only footplate present</td>
<td>Incudostapedial prosthesis Or TORP, bypassing malleus</td>
</tr>
<tr>
<td>Absent Absent Intact</td>
<td>PORP</td>
</tr>
<tr>
<td>Absent Absent Only footplate present</td>
<td>TORP</td>
</tr>
<tr>
<td>Present Present Intact but fixed</td>
<td>Stapedotomy</td>
</tr>
</tbody>
</table>

PORP: partial ossicular reconstruction prosthesis; TORP: total ossicular reconstruction prosthesis.

**Surgeon’s tip**
No direct suction is used for fear of tearing the flap.

**Surgeon’s tip**
To avoid damage to the ossicular chain and chorda tympani, start the elevation of the annulus in the postero-inferior quadrant.

**Surgeon’s tip**
Beware a very narrow long process of incus, as this is probably a fibrous pseudojoint and will be compromised. If there is no ISJ, the stapes head may be fragile even if it looks normal at first inspection.
**Surgical Steps**

1. Positioning the patient
2. Permeatal approach
3. Confirming the diagnosis and measuring
4. Dislocating the incudostapedial joint and removal of the stapes superstructure
5. Fenestrating the stapes footplate
6. Positioning the prosthesis
7. Closure

**Procedure**

1. **Positioning the patient**
   Position the patient on a head ring with the operating table head-up. Turn the patient's head away from the operative side. Prepare the skin with aqueous betadine solution to the ear and ear canal, and apply a head drape. Inject local anaesthetic in the form of 2% lignocaine with 1/80,000 adrenaline to the ear canal.

2. **Permeatal approach**
   In the majority of cases, a permeatal approach allows adequate access; otherwise, consider an endaural incision.
   Make a semicircular incision 10 mm from the annulus from 12 to 6 o'clock with a 45° round canal knife, raising a tympanomeatal flap with the drum elevator. Fold the flap forwards to expose the middle ear cavity. A fine curette may be needed to remove the bone overlying the stapes. The chorda tympani nerve should be preserved if possible; occasionally it may be necessary to sacrifice it for access.

3. **Confirming the diagnosis and measuring**
   Use a slightly curved needle to palpate the ossicular chain and confirm stapes fixation. Gently touch the malleus handle and observe reduced movement of the incus and fixation of the stapes. Measurement of the distance from the footplate to the lenticular process of the incus is made using the measuring rod (approximately 4.5 mm).

6.1 The incudostapedial joint is separated with a joint knife.

6.2 Posterior crurotomy with KTP laser (incudostapedial joint and stapedius tendon are already divided).

6.3 Fenestration of the footplate.
4 Dislocating the incudostapedial joint (ISJ) and removal of the stapes superstructure
The ISJ is disarticulated using the joint knife (6.1), and the stapedial tendon is cut from the posterior crus with microscissors. Using the right-angled pick or KTP laser, the crura of the stapes are fractured and the superstructure is removed with cup forceps (6.2).

5 Fenestrating the stapes footplate
Fenestration of the footplate is performed with a Skeeter drill (0.6 mm diamond burr) or KTP laser. Use irrigation to prevent excessive heating of the Skeeter drill. Complete the final part of the fenestration using a 0.6 mm trephine. Fenestration should be in the posterior half of the footplate; this avoids the prosthesis contacting the saccule (6.3).

6 Positioning the prosthesis
Select the appropriate prosthesis and trim if necessary to match the measurement. Crocodile forceps are used to place the prosthesis carefully into the fenestra and to crimp the free end around the lenticular process of the incus (6.4). Check final positioning of the prosthesis by palpating the ossicular chain (6.5). A fat plug may be placed around the stapedotomy site.

7 Closure
Replace tympanomeatal flap. In the ear canal put either a small pack or just Tri-AdCortyl ointment.

**Surgeon’s tip**
A standard aural speculum can be fixed in place using a transparent adhesive drape, excising the drape over the lumen.

**Surgeon’s tip**
Curetting should be directed away from the ossicles to prevent accidental damage.

**Surgeon’s tip**
A KTP laser can be used to divide the stapes tendon, posterior crus of stapes, and to perform fenestration (with rosette technique), as well as to crimp the hook of some prostheses (e.g. SMart prosthesis).
Mastoidectomy and canalplasty

SURGICAL STEPS

1 Positioning the patient
2 Examination under the microscope
3 Elevating the tympanomeatal flap
4 Surgical approaches:
   – Postauricular
   – Endaural
5 Harvesting the temporalis fascia graft
6 Cortical mastoidectomy
7 Canalplasty
8 Posterior tympanotomy
9 Positioning the graft
10 Packing and closure

PROCEDURE

1 Positioning the patient
Position the patient on a head ring with the operating table head-up. Turn the patient’s head away from the operative side. Attach a facial nerve monitor and ensure it is working (7.1). Shave the hair over the incision site. Inject approximately 10 ml of local anaesthetic and adrenaline in the form of 0.5% lignocaine and 1/200,000 adrenaline. Prepare the skin with betadine, and drape the patient tightly with a head drape to hold the hair out of the operative field.

2 Examination under the microscope
Using the microscope, clean the ear canal and assess for perforation, attic defect, retraction pocket, and extent of cholesteatoma. Inject 1–2 ml of local anaesthetic in the form of 2% lignocaine with 1/80,000 adrenaline using a dental syringe. Inject slowly at the edge of hair-bearing skin from 12 o’clock to 6 o’clock.

3 Elevating the tympanomeatal flap
Using a 45° round canal knife, make incision 5–10 mm lateral to the annulus, extending from 12 o’clock to 6 o’clock. Use a Plester D-knife to make two longitudinal incisions. Use the round canal knife to elevate the tympanomeatal flap until the annulus is reached or the cholesteatoma sac encountered.

Lift the annulus out of the annular rim using a flat canal elevator to enter the middle ear space.

Elevate the annulus from 12 o’clock to 6 o’clock. Use a curved needle to assess the continuity of the ossicular chain. If the ossicular chain is intact, moving the malleus will cause movement of the long process of the incus as well as the stapes suprastructure. In order to remove disease involving the ossicular chain, dislocate the long process of incus from the stapes suprastructure. In most cases the long process of the incus will have already been eroded by disease.

Surgeon’s tip
The clock face used to describe the positions of the tympanic membrane or ear canal as shown in Figure 4.1.

7.1 Facial nerve monitor on right side.
4 Surgical approaches
Postauricular
Using a 10 blade, make a skin incision 0.5–1 cm behind the postauricular sulcus, from the inferior margin of the external auditory meatus inferiorly to the level of the zygomatic arch superiorly (as in 4.2). Continue the incision through the postauricular muscles to the level of the temporalis fascia superiorly. Dissect as far as the posterior edge of bony external auditory canal (7.2).

**Surgeon’s tip**
To avoid damage, do not allow the suction tip to touch the tympanomeatal flap. Always suction onto an instrument, or through cotton wool.

**Surgeon’s tip**
To avoid damage to the ossicular chain and chorda tympani, start elevating the annulus in the postero-inferior quadrant.

**Surgeon’s tip**
Holding the pinna between thumb and index finger, with the index finger in the external auditory meatus, retract the pinna anteriorly. Using a knife at 45° to the skull, dissect anteriorly in this plane, as far as the posterior edge of bony external auditory canal. This avoids damaging temporalis fascia or perforating the posterior external auditory canal skin.

Using a 15 blade, make a T-shaped incision (7.3). Elevate the periosteum with a Freer elevator, taking care not to tear the periosteum or external auditory canal skin, especially at the spine of Henle. Enter the ear canal lumen using an incision through external auditory canal skin (7.4). Quarter-inch ribbon gauze is passed through the incision and the two ends held in a clip, retracting skin and pinna anteriorly. Insert two self-retaining retractors.

7.2–7.4 Postauricular approach mastoidectomy.
Endaural

Using a 15 blade, make a skin incision between tragus and root of helix, and extend superiorly over the zygomatic arch as far as the temporalis fascia (as in 4.6). Take care to avoid damaging cartilage. Using a Lempert speculum, extend the incision deep through the periosteum from the level of the zygomatic arch superiorly into the roof of the ear canal for 5 mm. Insert two self-retaining retractors.

5 Harvesting the temporalis fascia graft

Lift the scalp with a Langenbeck retractor. Dissect plane above the temporalis fascia using scissors. Incise temporalis fascia, and separate fascia off muscle with a Freer elevator. Use nontoothed forceps and curved iris scissors to harvest the graft (size appropriate to the tympanic defect). Spread the graft out on a glass slide to dry.

6 Cortical mastoidectomy

Using a large cutting burr (size 6), mark the cortical mastoidectomy bony edges using as landmarks the root of the zygomatic arch and the spine of Henle, creating an inverted triangle down to the tip of the mastoid (7.5, 7.6). First remove the cortical bone before changing to a smaller burr (size 4) to remove the honeycomb structure of the mastoid cavity. Expose the tegmen tympani (cortical bone of the anterior cranial fossa floor).

Thin the bone over the lateral venous sinus, again using the drill parallel to the cortical bone. Drill antero-superiorly to expose the attic (7.7). Thin down the posterior bony canal wall, taking great care to avoid drilling through the cortical bone of the lateral semicircular canal. Having exposed the attic, identify the body of the incus. You have successfully completed the cortical mastoidectomy.

7.5 Cortical mastoidectomy.

7.6 Intraoperative photograph showing McEwan’s triangle dissected.

7.7 Mastoid cavity
7 Canalplasty
If the external auditory canal is very narrow or tortuous, a canalplasty may be required to provide access to the whole of the middle ear cavity and annulus. Bony spicules can be individually removed to improve access, but often a more thorough canalplasty is required. Use a Plester D-Knife to make longitudinal incisions in the external auditory canal skin at 12 o'clock and 6 o'clock, running laterally from the tympanomeatal flap to the junction of the bony and cartilaginous external auditory canal. Retract the flaps laterally and secure them under the self retainer, or insert a temporary stay suture.

Once the bone has been exposed, use a cutting burr size 2 or 3, to widen the external auditory canal. In order to avoid inadvertently opening the glenoid fossa and temporomandibular joint, remove bone anterosuperiorly and anteroinferiorly first, in a 'kidney-bean' shape. Then carefully drill the bridge of bone left between the two, making sure to leave a thin layer of bone over the fibres of the temporomandibular joint.

8 Posterior tympanotomy
Using a small (size 2) cutting burr carefully thin the posterior canal wall. Use the lateral semicircular canal and the body of the incus as landmarks (7.8). Start close to the incus and move inferiorly. The width of dissection is approximately 1 mm and the length 2–3 mm. When the bone is thinned adequately, the middle ear cavity can be entered medial to the annulus, at the level of the facial recess. You have successfully completed the posterior tympanotomy. All disease can now be removed.

Surgeon’s tip
To avoid perforating the tegmen, use the drill in a parallel direction to the cortical bone. Occasionally dura may be exposed, but as long as it is not breached, no further action is required.

Surgeon’s tip
On completion of the posterior tympanotomy, a 30° rigid scope can be inserted to assess for any residual disease.
9 Positioning the graft
Cut the graft to size. Holding the front edge of the graft in a pair of crocodile forceps, place underneath the tympanic membrane, ensuring the graft covers the defect. Place some pieces of sofradex-soaked absorbable gelatin sponge in the middle ear to support the graft. Replace the tympanomeatal flaps.

10 Packing and closure
Pack the deep ear canal with pieces of absorbable gelatin sponge and/or bismuth iodoform paraffin paste (BIPP). Mastoidectomy incisions are closed with 3/0 vicryl to periosteum and 4/0 prolene to skin. A pressure bandage of paraffin impregnated gauze such as Jelonet®, gauze, cotton wool, and crepe bandage is applied overnight.

**Surgeon’s tip**
Management of mastoiditis complicated by a subperiosteal abscess may require emergency insertion of a grommet and drainage of the abscess. Use the skin incision described above and cautiously perform a cortical mastoidectomy; the procedure is completed when the pus is released.

**Surgeon’s tip**
If a canalplasty has been performed, the ear canal pack may need to be replaced for a further 2–3 weeks at the first postoperative appointment, to prevent stenosis of the external auditory canal.
Cochlear implantation

SURGICAL STEPS

1 Positioning the patient
2 Postauricular incision
3 Cortical mastoidectomy
4 Posterior tympanotomy
5 Package bed
6 Cochleostomy
7 Implant insertion (+/− testing)
8 Closure

PROCEDURE

1 Positioning the patient
Position the operating table head-up. Turn the patient’s head away from the operative side. Attach a facial nerve monitor and ensure it is working (as shown in 7.1). Shave hair over the incision site. Inject approximately 10 ml of local anaesthetic and adrenaline in the form of 0.5% lignocaine and 1/200,000 adrenaline. Prepare the skin with betadine, and drape the patient tightly with a head drape to hold the hair out of the operative field. Use opsite dressing to hold the pinna anteriorly, sealing the external auditory canal from the surgical incision site.

2 Postauricular incision
Using a 10 blade, make a skin incision in the postauricular sulcus, from the inferior margin of the external auditory meatus inferiorly and then extending vertically upwards into the scalp, to just past the tip of the pinna (8.1). Continue the incision through the postauricular muscles to the depth of the periosteum inferiorly, and to the level of the temporalis fascia superiorly. Using a 15 blade, make a parallel incision in the periosteum, 1 cm posterior to the skin incision. Elevate the periosteum anteriorly with a Freer elevator, taking care not to tear the periosteum or external auditory canal skin, especially at the spine of Henle. Expose the external auditory canal roof.

3 Cortical mastoidectomy
Using a large cutting burr (size 6), mark the cortical mastoidectomy bony edges using as landmarks the root of the zygomatic arch and the spine of Henle, creating an inverted triangle down to the tip of the mastoid (see 7.5, 7.6). First remove the cortical bone before changing to a smaller burr (size 4) to remove the honeycomb structure of the mastoid cavity. Expose the tegmen tympani (cortical bone of the anterior cranial fossa floor).

Surgeon’s tip
To minimise the risk of infection, use the double glove technique to prepare and drape the patient, then discard the outer pair of gloves.
Drill antero-superiorly to expose the attic (see 7.8). Thin down the posterior bony canal wall, taking great care to avoid drilling through the cortical bone of the lateral semicircular canal. Having exposed the attic, identify the body of the incus. The cortical mastoidectomy for a cochlear implant can be less extensive than in middle ear disease cases, as long as the lateral semicircular canal and short process of incus are identified.

4 Posterior tympanotomy
Leaving a small bony incus bridge, drill the posterior tympanotomy with a 1.5 curved cutting burr (if available), or 2 mm then 1 mm standard straight burr. Start close to the incus and move inferiorly. The width of dissection is approximately 1 mm and the length 2–3 mm. When the bone is thinned adequately the middle ear cavity can be entered medial to the annulus. Saucerise the posterior tympanotomy to provide as much space as possible as shown in Figure 8.2.

5 Package bed
Use a Freer elevator to create a periosteal pocket for the processor. The pocket should be at 45° posterosuperior to the external auditory canal (8.3). Drill the package bed with a size 4 mm cutting burr, and use a 2 mm cutting burr to make a channel leading from the package bed to the cortical mastoidectomy. Some surgeons drill two suture holes to secure the package in place.

Surgeon’s tip
To avoid perforating the tegmen, use the drill in a parallel direction to the cortical bone. Occasionally the dura may be exposed, but as long as it is not breached, no further action is required.

Surgeon’s tip
Try not to breach the inner table of bone of the skull when drilling the package bed. In young children with very thin skulls, this may be impossible to avoid, in which case protect the underlying dura with a Freer’s sucker as you drill.

Surgeon’s tip
Some implants no longer require a package bed to be drilled, and the implant can be positioned directly underneath the periosteum.
6 Cochleostomy
Using a 1 mm curved diamond drill, perform the cochleostomy via the posterior tympanotomy. The cochleostomy should be performed anteroinferior to the round window (8.4). Continue drilling until the white colour of the endosteum is visualised. Try to leave the endosteum intact to minimise trauma to the cochlea – the ‘soft surgery’ technique.

7 Implant insertion (+/- testing)
Change your gloves to minimise any risk of device infection. Position the processor under the temporalis fascia in the bony well (if drilled). Incise the cochlear endosteum. Insert the electrode using the insertion device as far as marker point. Use fascia or muscle to plug the cochleostomy around the implant. Anchor the electrode wires at the posterior tympanotomy and mastoid cortex using bone wax.

8 Closure
Closure is in layers with 3/0 vicryl and 4/0 monocryl, followed by steri-strips. Perform neural response testing if required. Apply a head bandage.
Manipulation under anaesthesia of fractured nose (Closed reduction of acute nasal fracture)

**SURGICAL STEPS**

1. Assessing the deformity
2. Disimpacting and reducing the nasal bone fracture
3. Manipulating the septum if required
4. Dressing and packing if required

**PROCEDURE**

1. **Assessing the deformity**
   Assess the deformity by standing at the head of the bed and looking down the nasal bridge. Nasal anatomy is shown in Figure 9.1.

2. **Disimpacting and reducing the nasal bone fracture**
   Disimpact nasal bones by first pressing on the side of the depressed nasal bone. Place the balls of both thumbs at the base of the nasal bone and press medially. Once bones are mobile, manipulate them to midline, and close any open roof deformity (9.2). Use Walsham forceps to lift out nasal bones, if they have collapsed medially. Rubber tips on the external forcep protects the facial skin.

3. **Manipulating the septum if required**
   Use Asch forceps to manipulate minor septal deviations. Perform septoplasty in severe septal deviations (see 10 – Septoplasty).

4. **Dressing and packing if required**
   Insert intranasal packs to support excessively mobile nasal bones. Use elastoplast tape to skin over the nasal dorsum, or plaster-of-Paris if nasal bones are very mobile.

**Surgeon’s tip**

Unless septal deviation is very severe, it is better to wait a few months until all oedema has resolved.
Surgeon’s tip

Deformity is frequently due to excess cartilage anteriorly which must be excised, while maintaining tip support.
3 Incision and raising mucoperichondrial flaps

It is the senior author's practice always to perform a left hemitransfixion incision. Use a Killian's speculum to stabilise vestibular skin and septal mucosa (10.2). Using a 15 blade, make a vertical incision through the mucosa and perichondrium down to cartilage. This hemitransfixion incision should be along the anterior edge of the quadrilateral cartilage, i.e. the leading edge (10.3).

A shiny, bluish tinge characterises the cartilage, and shows that the subperichondrial plane has been reached. Using a Killian's speculum and Freer elevator, elevate the left mucoperichondrial flap as far as the osseocartilaginous junction, with the perpendicular plate of ethmoid posteriorly. J

Continue the dissection inferiorly onto vomer. Then dissect anteriorly, along the inferior border of the quadrilateral cartilage, working from posterior to anterior. Ensure that the maxillary crest is fully exposed (10.4 shows septal anatomy).

4 Mobilising the quadrilateral cartilage

Using a Freer elevator, dislocate the quadrilateral cartilage from the perpendicular plate of ethmoid and vomer posteriorly. Dislocate the quadrilateral cartilage from the maxillary crest inferiorly, using either a Freer elevator or hockey stick, leaving the anterior strut attached to the maxillary spine if possible to provide tip support.

5 Excising the perpendicular plate of ethmoid and vomerine spurs

With a Freer elevator, raise the mucoperiosteal flap posteriorly bilaterally and remove the anterior strip of bone to enable the cartilage to move freely. Resect any bony spurs causing functional obstruction using punch forceps, e.g. Jansen-Middleton forceps. ♦

Surgeon’s tip
It is easier to elevate the mucoperichondrial flap superiorly, as it is less adherent to cartilage here.
6 Correcting the cartilaginous deformity
Deliver the anterior edge of the quadrilateral cartilage through the hemitransfixion incision and, if the cartilage is deviated secondary to excess height, excise an inferior strip of quadrilateral cartilage with a 15 blade. Take care not to reduce the height of the quadrilateral cartilage anteriorly, otherwise tip support will be compromised. Excise any fracture lines (10.5).

7 Excising maxillary crest spurs
Use hammer and fishtail gouge to remove maxillary crest spurs (10.6).

8 Packing and closure
Reassess the septum and ensure there is no residual deformity. Check mucoperichondrial flaps are intact and that tip support is adequate. If the quadrilateral cartilage has been detached from the maxillary spine, use a 4/0 PDS suture to reattach the cartilage to the anterior nasal spine. Pass the needle through the quadrilateral cartilage and mucosa bilaterally, then pick up the periosteum of the maxillary crest on ipsilateral and then contralateral side, and tie.

   Close the incision with 4/0 vicryl rapide, and use a quilting suture to minimise risk of postoperative haematoma.

   The senior author does not routinely use nasal packs, but if excessive bleeding has been encountered packing will minimise the risk of postoperative haematoma.

10.5 Fracture lines in septum.

10.6 Excision of maxillary crest spur with fishtail gouge.

Surgeon’s tip
Take care to leave the keystone area intact, where the osseocartilaginous junction joins nasal bones.

Surgeon’s tip
Scoring the concave surface of the quadrilateral cartilage can improve minor deflections. Use a 15 blade to incise serially the perichondrium.
Surgery to inferior turbinates

SURGICAL STEPS

1 Positioning the patient
2 Examination of the nasal cavities
3a Submucosal diathermy
3b Linear diathermy
3c Outfracture
3d Turbinoplasty

PROCEDURE

1 Positioning the patient
Moffatt’s solution (Table 11.1), or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to procedure. Drape the patient with a head drape and position the operating table head-up.

2 Examination of the nasal cavities
Use a rigid nasendoscope to examine both nasal cavities.

3a Submucosal diathermy
Insert an Abbey monopolar diathermy needle submucosally along the length of the inferior turbinate, avoiding contact with the periosteum. Cauterise whilst slowly withdrawing the needle. Repeat the insertion and cautery two to three times (11.1, 11.2).

3b Linear diathermy
Apply an Abbey monopolar diathermy needle along the surface of the inferior turbinate. Cauterise while slowly withdrawing the needle. Repeat cautery two to three times.

Surgeon’s tip
A number of alternative modalities are available, including laser ablation and radiofrequency treatment, but these are beyond the scope of this book.

11.1 Diagram showing insertion of an Abbey needle along the whole length of the inferior turbinate.

11.2 Submucosal diathermy
3c Outfracture
Using a Hills elevator, apply pressure to the lateral aspect of the anterior end of the inferior turbinate and medialise the turbinate. Repeat the procedure four to five times along the length of the turbinate. Once the turbinate has been mobilised, gently use a Hills elevator to lateralise it (11.3, 11.4).

3d Turbinoplasty
Using a microdebrider or sickle knife, make an incision along the inferior border of the inferior turbinate. Use a Freer or a Cottle’s elevator to elevate the mucoperiosteum off the bone of the turbinate, and remove the bone with a Blakesley forceps. Reapproximate the edges, and pack with an absorbable haemostatic sheet such as Surgicel® – this can be removed in the outpatient clinic in 1 week – or a dissolvable dressing.

Table 11.1: MOFFATT’S SOLUTION

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ml solution containing:</td>
<td>Moffatt’s solution is usually prepared and instilled by the anaesthetist</td>
</tr>
<tr>
<td>• 1ml 1/1000 adrenaline</td>
<td>Other alternatives may be considered as it has a potential toxicity, particularly for cardiac patients</td>
</tr>
<tr>
<td>• 2 ml 10% cocaine</td>
<td>Alternatives include Otrivine (xylomatazoline) or adrenaline</td>
</tr>
<tr>
<td>• 2 ml 8.4% sodium bicarbonate</td>
<td></td>
</tr>
</tbody>
</table>

Surgeon’s tip
In order to prevent thermal injury to skin or mucosa, avoid any contact between the diathermy tip and other surgical instruments, and always use an insulated nasal speculum.

Surgeon’s tip
Apply antibiotic nasal cream to the nasal cavities at the end of the procedure. Nasal packing is not routinely required.
SURGICAL STEPS

1 Positioning the patient
2 Identifying the sphenopalatine artery (SPA)
3 Ligating the SPA

PROCEDURE

1 Positioning the patient
Moffatt’s solution, or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. Drape the patient with a head drape, keeping the eyes exposed. Position the operating table head-up.

2 Identifying the SPA
Remove packs only when the patient is anaesthetised and you are ready to start the procedure with all equipment available. Examine the relevant nostril with a 4 mm, 0° rigid nasal endoscope. Infiltrate 1–2 ml of 2% lignocaine with adrenaline 1/80,000 in the region of the posterior insertion of the middle turbinate. Using a 15 blade, make a 1 cm vertical mucosal incision along the lateral nasal wall, 1 cm posterior to the middle meatus (12.1).

Use a Freer elevator to elevate a mucosal flap of the lateral nasal wall as far as the crista ethmoidalis. Carefully continue elevation to expose the SPA and nerve. Curettage of crista ethmoidalis may be necessary.

3 Ligating the SPA
Ligate the SPA using vascular ligature clips (12.2). Endoscopic bipolar diathermy may also be used. Replace the mucoperiosteal flap.

Surgeon’s tip
Some surgeons advocate making a small middle meatal antrostomy to aid correct placement of the incision.

Surgeon’s tip
It is possible to perform a maxillary artery ligation if SPA ligation fails. This is beyond the scope of this book, and many surgeons would advocate embolisation of the maxillary artery or ligation of the external carotid artery in an emergency situation (see 19–External carotid artery ligation).
Anterior ethmoidal artery ligation

**SURGICAL STEPS**

1. Positioning the patient
2. Marking and local anaesthetic
3. Dissecting and identifying the anterior ethmoidal artery (AEA)
4. Ligating the AEA

**PROCEDURE**

1. **Positioning the patient**
   Moffatt’s solution, or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. Drape the patient with a head drape, keeping the eyes exposed. Position the operating table head-up.

2. **Marking and local anaesthetic**
   Mark a 2–3 cm curved incision midway between the inner canthus and nasal bridge – the classical Lynch incision. Inject local anaesthetic in the form of 2% lignocaine with 1/80,000 adrenaline using a dental syringe (13.1). 

   ![Marking a Lynch incision](image)

   **Surgeon’s tip**
   Perform tarsorrhaphy to protect the eye (13.2, 13.3).

   ![Performing tarsorrhaphy](image)

   ![Performing tarsorrhaphy](image)
3 Dissecting and identifying the AEA

Incise the skin down to the periosteum with a 15 blade. Use a Freer elevator to lift the periosteum laterally. Lateralise the lacrimal sac and expose the lacrimal bone and lamina papyracea. Use a malleable copper retractor to retract gently the periosteum and orbit contents laterally. Identify the AEA approximately 24 mm from the anterior lacrimal crest (13.4). °°

4 Ligating the AEA

Ligate the AEA using vessel ligature clips. Also use bipolar diathermy at a low setting to avoid damage to the optic nerve. Use a small corrugated drain, and 6.0 prolene to close the wound. °°°°

Surgeon’s tip

Mnemonic rule of 24–12–6 indicates the relation between anterior EA–posterior EA–optic nerve.

Surgeon’s tip

It is possible to perform a maxillary artery ligation if AEA ligation fails. This is beyond the scope of this book, and many surgeons would advocate embolisation of the maxillary artery or ligation of the external carotid artery in an emergency situation (see 19 – External carotid artery ligation).

13.4 Dissecting and identifying the anterior ethmoidal artery.
**SURGICAL STEPS**

1. Positioning the patient
2. Septoplasty if required
3. Uncinectomy
4. Middle meatal antrostomy
5. Anterior ethmoidectomy
6. Posterior ethmoidectomy
7. Sphenoidotomy
8. Frontal recess

**PROCEDURE**

1. **Positioning the patient**
   Moffatt's solution, or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. Drape the patient with a head drape, keeping the eyes exposed. Position the operating table head-up. Attach a 4 mm 0° Hopkins rod to a light source, camera, and stack system. Focus the camera on the nasal tip, and white balance the image against a swab. Place a wet swab on the patient’s forehead for cleaning the scope, and dip the tip of the scope in antifog solution. Apply two neuropatties with topical adrenaline, strength 1/1000 diluted with 5 ml normal saline in the middle meati bilaterally. Wait 2 minutes.

2. **Septoplasty if required**
   Septoplasty is completed if necessary for access to the middle meati (see 10 – Septoplasty).

3. **Uncinectomy**
   Remove the neuropatties from the middle meatus. Medialise the middle turbinate gently using a Freer elevator. Identify the uncinate process by palpating the lateral nasal wall with the Freer until you feel the bone of the uncinate process give way. Use an angled Freer or sickle knife to make a single incision from superior to inferior, detaching the uncinate process from the lateral nasal wall. Use Mackay forceps to detach the uncinate process from the lateral wall of the nose superiorly. Using straight Blakesley forceps, remove the uncinate process in its entirety (mucosa and bone) to expose the infundibulum (14.1). Place adrenaline-soaked neuropatties in the middle meatus to control bleeding, and repeat on the contralateral side.

**Surgeon's tip**

*Before you begin, have the CT scans available in the operating theatre, and take care to review the scans systematically and thoroughly to avoid any surprises during the procedure.*

**Surgeon’s tip**

*Place all tissue removed from the nasal cavity in a gallipot. Any floating tissue may signify fat, and the operation should be paused while operative progress and exact positioning are carefully checked.*

**Surgeon’s tip**

*Use cutting forceps to detach the uncinate process from the lateral nasal wall, to avoid avulsing bone and mucosa, which might cause a CSF leak from the anterior cranial fossa.*
4 Middle meatal antrostomy
Widen the opening into the maxillary sinus, using backbiting through-cutting forceps to widen the antrostomy anteriorly, and Mackay through-cutting forceps to widen it posteriorly.

5 Anterior ethmoidectomy
Identify ethmoid bulla and hiatus semilunaris (see anatomy in 14.2). Perforate and open the anterior wall of bulla and open the anterior ethmoid air cells using a curette or straight Blakesley forceps, and clear all bony partitions to expose the skull base. Laterally, beware of breaching the lamina papyracea. If you are in doubt, ballot the ipsilateral eye, and confirm that there is no sign of any movement along the lateral wall.

Surgeon’s tip
To avoid damage to the naso-lacrimal duct, do not cut through hard lacrimal bone when using the back-biting forceps.

Surgeon’s tip
Some surgeons advocate the Wigand or back to front technique. Identification of the MMA, followed by sphenoid sinus position, allow appreciation of the height of the skull base to aid safe posterior ethmoidectomy.

14.2 Anatomy of ethmoid bulla and hiatus semilunaris.
6 Posterior ethmoidectomy
If posterior ethmoidectomy is required, then approach this through the ground lamella. This is identified intraoperatively as a vertical sheet of bone at the junction of the anterior and posterior ethmoids. Using a curette or small sucker, perforate the ground lamella and confirm your position. You can now remove the remaining ground lamella and enter the posterior air cells and clear as necessary. Pack with adrenaline-soaked neuropatties, and repeat steps on the contralateral side.

7 Sphenoidotomy
Identify the posterior choana, and using a Ferguson sucker, walk up the posterior nasal wall, just medial to the midpoint of the choanal arch. After approximately 1 cm, you should identify the slit-like opening of the sphenoid ostium. Confirm your position by pushing the sucker tip through the ostium. Using a sphenoid punch, widen the ostium. Do not attempt to clear the contents of the sphenoid sinus without supervision, as the internal carotid artery and optic nerve lie in the lateral wall.

8 Frontal recess
Frontal recess surgery is not part of a routine FESS operation, and as such should only be undertaken with appropriate training and supervision.

Surgeon’s tip
When widening the sphenoid ostium, avoid straying too far inferiorly, where you may encounter the septal branch of the sphenopalatine artery.

Surgeon’s tip
Emergency sequelae of sinusitis such as orbital cellulitis with subperiosteal abscess, or orbital abscess, can also be treated endoscopically. Follow the steps as described, cautiously looking for the abscess cavity. It may be necessary to remove the lamina papyracea to release the pus. Use copious vasoconstrictors as the inflammation makes the procedure particularly difficult. If the abscess cannot be drained endoscopically it may be necessary to use a Lynch Howarth incision to drain the abscess via the external approach, as described in 13 – Anterior ethmoidal artery ligation.

Surgeon’s tip
In revision or complex cases, image guided navigation systems can provide invaluable real-time information, although obviously are no substitute for sound anatomical knowledge.
15 Septorhinoplasty

**SURGICAL STEPS**

1. Positioning the patient
2. Septoplasty
3. Intercartilagenous incisions
4. External/open approach
5. Sub-superficial musculoaponeurotic system (SMAS) dissection
6. Dehumping
7. Medial osteotomies
8. Lateral external osteotomies and infracture of nasal bones
9. Suturing and plaster

**PROCEDURE**

1. **Positioning the patient**
   Moffatt’s solution, or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. Drape the patient with a head drape, keeping the eyes exposed (15.1). Position the operating table head-up. Inject local anaesthetic in the form of 2% lignocaine with 1/80,000 adrenaline using a dental syringe; usually 4–5 cartridges are necessary. Inject local anaesthetic to:
   - The anterior 1/3 of septum bilaterally.
   - The intercartilagenous incision.
   - The nasal hump.
   - Nasal bones.

2. **Septoplasty**
   Septoplasty is completed (see 10 – Septoplasty) using a left hemitransfixion incision.

15.1 Positioning the patient.

15.2, 15.3 Intercartilaginous incisions.
3 Intercartilaginous incisions
Once septoplasty is completed, use an alar retractor to retract the alar rim (15.2) and a 15 blade to perform intercartilagenous incisions (15.3). The intercartilagenous incision should be connected to the hemitransfixion incision on the left side. On the right side, the incision should run along the septum down the superior 1/3 of the columella, posterior to the medial crura of the lower lateral cartilage.

4 External/open approach
Use an inverted V or W columella skin incision to expose the nose (15.4). Using the 15 blade cut through the columella skin, taking care to avoid damaging the medial crurae of the lower lateral cartilages. Expose the rest of the tip of the nose until you have completely exposed the lower lateral cartilages (15.5, 15.6).

5 Sub-SMAS dissection
Complete the sub-SMAS dissection using McIndoe scissors. Separate the bony and cartilaginous nasal bridge from the nasal skin dorsally. Laterally, dissect the skin from the nasal bones so the nasal hump is fully exposed. Complete the dissection by connecting intercartilagenous incisions anterior to the quadrilateral cartilage (15.7).

Surgeon’s tip
Place your columella incision midway along the columella length to avoid postoperative scar contracture.

Surgeon’s tip
Sub-SMAS dissection can also be completed using a 15 blade. Place an index finger on the surface of the nasal bridge. Trace a gentle circular movement of the 15 blade to avoid perforating the skin of the nose.
6 Dehumping

Use an Aufricht retractor to lift the skin of the nasal bridge and expose the cartilagenous and bony hump. Use a Howarth elevator to separate the procerus muscle from the upper part of the bony nasal hump. Assess the amount of bony and cartilagenous hump that needs to be excised. Use a 15 blade to incise the cartilagenous hump from anterior to posterior. Insert a flat, broad, 8–10 mm osteotome under the incised cartilagenous part of the hump, holding the osteotome in the right hand (15.8). Use the left index finger and thumb over the nasal skin to control the osteotome externally. Ask an assistant to tap, in a controlled manner, and stop when the osteotome has reached the superior limit of bony hump. Insert an Aufricht retractor and visualise the osteotomised hump. Use forceps to remove the hump under direct vision. Assess the cosmetic result externally; if necessary use nasal bone rasps to smooth the edge of nasal bones.

7 Medial osteotomies

Insert a 6–8 mm flat osteotome into the nasal fossa, parallel to the septum, and engage the blade at the anterior edge of the nasal bone, in the midline. Use the fingers of the left hand to guide the tip of the osteotome under the skin. Ask an assistant to tap until just before the blade reaches the glabellar cortical bone. Curve the blade laterally in the final few millimetres, so that the fracture line will meet subsequent lateral osteotomies (15.9).
8 Lateral external osteotomies and infracture of nasal bones
Use a 15 blade to make two stab incisions through the skin of the lateral wall of the nose, following natural skin creases (15.10), and use a swab to apply pressure to avoid bruising. Use a 2 mm osteotome to osteotomise the nasal bone bilaterally (15.11). Use a wet swab to perform infracture of nasal bones in a controlled manner. Assess the cosmetic result.

9 Suturing and plaster
Use undyed 4/0 vicryl to close septal and intercartilagenous incisions. Use 5/0 or 6/0 ethilon for the columella incision (15.12). Cover the skin of the nose with ½ inch steri-strips and apply a plaster-of-Paris splint (or thermoplasty as shown in 15.13).

Surgeon’s tip
The author advocates the use of 16 mg intravenous dexamethasone just before the end of the procedure to limit postoperative oedema.
16 Lateral rhinotomy and medial maxillectomy

SURGICAL STEPS

1. Positioning the patient
2. Lateral rhinotomy incision
3. Exposure of the bony framework:
   - Division of the trochlea
   - Exposure of the lacrimal sac
   - Exposure and mobilisation of the nasolacrimal duct
   - Division of anterior and posterior ethmoidal artery
   - Exposure of the infraorbital nerve
   - Elevation of the periosteum and nasal mucosa from the pyriform aperture
4. Osteotomies – removal of specimen
5. Haemostasis and closure

PROCEDURE

1. Positioning the patient
Moffatt’s solution, or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. Mark the skin incision and infiltrate with local anaesthetic in the form of 2% lignocaine with 1/80,000 adrenaline solution (16.1). Position the patient on a head ring on the operating table. Position the operating table head-up. Drape the patient with a head drape, leaving the eyes exposed and prepare the skin with betadine. Using 4/0 prolene, secure the upper and lower lid of the eye on the operative side by performing a tarsorrhaphy (16.2, 16.3).
2 Lateral rhinotomy incision
Make an incision using a 15 blade, starting in the midpoint between the inner canthus and the nasal dorsum, proceeding inferiorly along the nasolabial line and curving around the alar rim as far as the mucocutaneous junction (16.4).

3 Exposure of the bony framework
Using a Freer elevator, the periosteum is elevated from the maxillary bone, for 1 cm lateral to the nasomaxillary suture.

Division of the trochlea
Elevate the periosteum of the medial orbital wall, and divide the trochlea as close as possible to the bone.

Exposure of the lacrimal sac
Continue dissecting medially and mobilise the lacrimal sac from the medial orbital wall, taking care not to damage the sac and duct.

Exposure and mobilisation of the nasolacrimal duct
Inferiorly the nasolacrimal duct inserts in the nasolacrimal bony canal. Remove maxillary bone from the inferior part of the bony canal using a Kerrison punch. Mobilise and divide the proximal part of the nasolacrimal duct. Enter the maxillary sinus and visualise the posterior and lateral walls to assess the extent of disease (16.5).

Surgeon’s tip
The senior author advocates the use of 16 mg dexamethasone at the beginning of the procedure.

Surgeon’s tip
Use bipolar diathermy as well as ribbon gauze soaked in 1/1000 adrenaline for haemostasis.

Surgeon’s tip
Care should be taken to avoid elevating the periosteum too far laterally and damaging the infraorbital nerve.
Division of anterior and posterior ethmoidal artery
Dissect medially along the frontoethmoid suture for approximately 24 mm from the anterior lacrimal crest, and identify the anterior ethmoidal artery. Clip, ligate, or diathermy this vessel. If the tumour extends more posteriorly, continue dissecting a further 12 mm and ligate the posterior ethmoidal artery.

Exposure of the infraorbital nerve
On the anterior wall of the maxilla, dissect laterally as far as the infraorbital nerve, as it emerges under the inferior orbital rim, taking care not to injure the nerve.

Elevation of the periosteum and nasal mucosa from the pyriform aperture
At the rim of the pyriform aperture, elevate the mucoperiosteum medially, exposing the medial wall of the pyriform aperture.

4 Osteotomies – removal of a specimen
Resection is tailored to the size and extension of the tumour. The limits of the resection are:
- Superiorly – just below the skull base (identified by the frontoethmoid suture line on the medial orbital wall).
- Inferiorly – floor of the maxillary sinus, including the inferior turbinate.
- Laterally – infraorbital nerve.
Strong curved Mayo scissors are used for cutting through the inferior anterior wall of the maxilla, while an osteotome can be used to remove the more superior lateral parts of the bony wall.

5 Haemostasis and closure
Feed a silastic O’Donoghue stent through the upper and lower lacrimal punctae, and advance it into the nasolacrimal duct. Anchor the trochlea and inner canthal ligament to the periosteum using 3/0 vicryl sutures. Closure is performed in two layers, using 3/0 vicryl for the subcutaneous tissues and periosteum and 5/0 prolene for the skin of the face. Pack the maxillectomy cavity with Whitehead’s varnish ribbon gauze.

**Surgeon’s tip**
Care must be taken with dissection, as the optic nerve lies just 4–6 mm posterior to the posterior ethmoidal artery.

**Surgeon’s tip**
Medial maxillectomy can also be performed endoscopically; however, specialist training is advocated before embarking on this.
Maxillectomy

SURGICAL STEPS

1 Positioning the patient
2 Tarsorrhaphy
3 Weber Fergusson incision:
   – Skin incision
   – Intraoral incision
   – Skin flap elevation
4 Osteotomies
5 Packing and closure

PROCEDURE

1 Positioning the patient
   Position the operating table head-up. Place a head ring and sand bag under the patient’s shoulder. Inject approximately 10 ml of local anaesthetic in the form of 0.5% lignocaine and 1/200,000 adrenaline. Prepare the skin with betadine, and drape the patient with a head drape.

2 Tarsorrhaphy
   Using 4/0 prolene, secure the upper and lower lid of the eye on the operative side by performing a tarsorrhaphy (see 16 – Lateral rhinotomy and medial maxillectomy, 16.2, 16.3).

3 Weber Fergusson incision
   Skin incision
   Using a 15 blade, make an incision midway between the medial canthus and the top of the nasal bridge. Extend the incision laterally along the lower eyelid as far as the lateral canthus. The incision runs 2–3 mm below the level of the eyelash. Inferiorly, continue the incision along the side of the nose into the alar groove and medially as far as the midline. Divide the upper lip up to the vermilion border. To avoid unsightly scarring, curve the incision as it runs through the lip (17.1).

   Intraoral incision
   Intraorally, the incision divides into two parts, gingivobuccal and palatal. Using cutting diathermy, continue the gingivobuccal incision laterally along the gingivobuccal sulcus as far as the maxillary tuberosity. The palatal part of the incision extends between the incisor teeth in the midline, to the hard palate until the junction of the hard and soft palate where it turns laterally behind the maxillary tuberosity to meet the gingivobuccal incision (17.2).

Surgeon’s tip

Make sure your tarsorrhaphy is made on the tarsal plate of the upper and lower lid and not on the mucosal surface of the lid to avoid the feeling of ‘foreign body’ following the operation. Also remember to remove the stitch after the procedure.
Skin flap elevation
Elevate the skin of the face over the maxillary bone using a periosteal elevator. Divide the infraorbital nerve and vessels. Extend the dissection to the level of the zygomatic arch.

4 Osteotomies
Use a 2 mm drill burr to mark position of osteotomies on the surface of the maxilla (17.3). Starting laterally, the osteotomies extend from the zygomatic arch, below the infraorbital ridge, across the floor of the orbit to join the piriform aperture. The osteotomies continue inferiorly down the medial wall of the maxilla, detaching the middle turbinate and dividing the hard palate. Complete the osteotomies using an oscillating saw. Insert a curved osteotome behind the maxillary tuberosity and gently tap with a hammer whilst levering the maxilla forward, to detach it from the pterygoid plate.

Once the maxilla has been mobilised, complete the dissection with McIndoe scissors to divide the pterygoid muscles and any soft tissue.

5 Packing and closure
Prior to the operation, a temporary dental plate with prosthesis is made which is then inserted at the end of the procedure to obturate the defect. Use 4/0 vicryl and 5/0 prolene to close the skin. Drainage is not necessary.

Surgeon’s tip
Skin flap elevation can also be carried out via a midfacial degloving approach, as described in 20 – Midfacial degloving.

Surgeon’s tip
Take care not to allow your osteotome to damage the contents of the pterygoid fossa, especially the pterygoid venous plexus. If you encounter bleeding in the pterygoid fossa, insert a large adrenaline-soaked tonsil swab and wait until the bleeding has stopped.
Endoscopic dacryocystorhinostomy

SURGICAL STEPS
This procedure is usually performed jointly with Ophthalmology. It may be performed under general or local anaesthesia.

1 Positioning the patient
2 Inserting a lacrimal light probe
3 Creating a mucosal flap and exposing the lacrimal sac
4 Retrieving the light probe and inserting a stent

PROCEDURE

1 Positioning the patient
Moffatt’s solution, or an alternative, is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. If being performed under local anaesthesia, local anaesthetic is instilled to the eye and nose. Drape the patient with a head drape, keeping the eyes exposed. Position the operating table head-up. Inject local anaesthetic to the lateral wall of nose at an area of 1 cm × 1 cm anterior to the axilla of the middle turbinate in the form of 2% lignocaine with 1/80,000 adrenaline.

2 Inserting a lacrimal light probe
Insert a light probe via either superior or inferior canaliculus to the common canaliculus then into the lacrimal sac. This is easier if you stretch the eyelid laterally and follow the tract in a horizontal direction until the probe hits bone, and then turn the probe vertically downwards.

3 Creating a mucosal flap and exposing the lacrimal sac
The flap extends approximately 1 cm superior to the attachment of the middle turbinate and ends at the mid level of the uncinate process (18.1). Using a Freer elevator, peel the lacrimal bone off the lacrimal sac just anterior to the middle meatus. Remove the thin lacrimal bone. Use a dacryocystorhinostomy diamond burr to drill the frontal process of the maxillary bone that lies medially to the anterior 2/3 of the sac. Use a keratome to incise the lacrimal sac, making anteriorly and posteriorly based mucosal flaps (18.2).

4 Retrieving the light probe and inserting a stent
Remove the light probe and thread the metal ends of O’Donoghue tubes through the duct, taking care not to create a false passage. Remove the metal stents and make multiple knots in the tubes while taking care to leave a loose loop to avoid discomfort around the canaliculi.
**SURGICAL STEPS**

1. Positioning the patient
2. Incision and subplatysmal flaps
3. Identifying the carotid sheath
4. Identifying the external carotid artery
5. Haemostasis, drains, and closure

**PROCEDURE**

1. **Positioning the patient**
   Position the patient with a sandbag under the shoulders and head ring, and the operating table head-up. Use a marker pen to indicate the line of incision, 2–3 finger’s breadth below the mandible in a skin crease and extending over the sternocleidomastoid muscle (19.1). Infiltrate with local anaesthetic in the form of 2% lignocaine and 1/200,000 adrenaline.

2. **Incision and subplatysmal flaps**
   Using a 10 blade, incise through skin and platysma, preserving the great auricular nerve and external jugular vein in the posterior part of your incision. Ask your assistant to hold the skin flap under tension with catspaw retractors. Raise subplatysmal flaps, holding the blade parallel to platysma and staying directly on the under surface of the muscle to avoid damage to the marginal mandibular nerve, which will lie deep to the flap (as in 35 – Neck dissection, 35.2). Identify the anterior border of the sternocleidomastoid muscle.

3. **Identifying the carotid sheath**
   Dissect along the anterior border of the sternocleidomastoid, while your assistant retract the muscle posteriorly. Identify the carotid sheath, and then the common carotid artery. Put vascular slings around the common carotid for safety.

**Surgeon’s tip**

*If bradycardia occurs when dissecting around the carotid bulb, inject 1% lignocaine with adrenaline into the vessel wall with a 23 gauge needle.*
4 Identifying the external carotid artery
Carefully dissect along the common carotid artery superiorly, towards the bifurcation, taking care not to damage the vessel. Look out for the hypoglossal nerve and avoid damaging it. Identify the carotid bifurcation, and subsequently the external carotid artery, which usually lies anterior and superficial to the internal carotid artery (19.2). You MUST identify the superior thyroid artery branching off the external carotid to be certain it is the correct vessel, and preferably the first two branches. Place two 0 silk ties around the external carotid artery, but do not divide the vessel.

5 Haemostasis, drains, and closure
Remove the vascular slings and ensure haemostasis; there is no need for a drain. Use 2/0 vicryl to close the platysma and deep subcutaneous layer. Apply skin staples and a transparent dressing such as Tegaderm®.
SURGICAL STEPS

1 Positioning the patient
2 Incisions – intraoral and intranasal
3 Exposure of the midface
4 Osteotomies and excision of the tumour
5 Closure

PROCEDURE

1 Positioning the patient
Moffatt’s solution is applied in both nasal fossae of the anaesthetised patient 10 minutes prior to the procedure. Drape the patient with a head drape, keeping the eyes and oral cavity exposed (see 15.1). Position the operating table head-up. Inject local anaesthetic in the form of 2% lignocaine with 1/80,000 adrenaline using a dental syringe; usually 4–5 cartridges are necessary. Inject local anaesthetic to the:
- Anterior 1/3 of septum bilaterally.
- Intercartilagenous incision.
- Sublabial mucosa.

2 Incisions – intraoral and intranasal
Start with the intraoral incision. Using a 15 blade, incise sublabial mucosa down to the bone of the maxilla (20.1). Remember you can use the same incision for the Caldwell Luc approach to the maxillary sinus.

The intranasal incisions are as for a septrhinoplasty (see 15 – Septorhinoplasty). Perform a full transfixion incision, then use the alar retractor to retract the alar rim, and a 15 blade to perform intercartilagenous incisions. The intercartilagenous incision should be connected to the transfixion incision bilaterally. Continue the lateral end of the intercartilaginous incision to the floor of the nose and connect it with the transfixion incision behind the medial crura.

3 Exposure of the midface
A periosteal elevator is used to elevate mucosa and skin from both sides of the maxilla and the intranasal incisions are connected. Use McIndoe scissors to elevate the skin of the nose from the lower lateral and upper lateral cartilages, and nasal bones bilaterally. Use small Langenbeck retractors to retract the upper lip superiorly and use a periosteal elevator to separate the buccal mucosa from the anterior wall of the maxilla bilaterally as far as the infraorbital margin (20.2).

4 Osteotomies and excision of the tumour
To expose the tumour, follow the principles of medial maxillectomy/lateral rhinotomy as described in 16 – Lateral rhinotomy and medial maxillectomy. Excise the tumour, ensuring meticulous haemostasis and pack the nose and tumour cavity with a bismuth iodoform paraffin paste pack (BIPP).

5 Closure
Reposition the skin and use 4.0 vicryl to close both the intranasal and intraoral incisions.
Surgeon’s tip
Leave a cuff of mucosa on the maxilla to facilitate easier suturing of the intraoral incision at the end of the procedure.

Surgeon’s tip
Take extra care to avoid damage to the infraorbital nerve as it exits the infraorbital foramen bilaterally.

Surgeon’s tip
16 mg of dexamethasone is used to reduce postoperative swelling.

20.1 Sublabial incision.

20.2 Exposure of the midface.
PROCEDURAL STEPS

1 Equipment preparation
2 Fine needle aspirate
3 Slide preparation

Equipment required:
• 20 ml syringe
• Green – 21 gauge needle
• Syringe mount
• Alcohol wipe
• Cotton wool
• Plaster
• 4 glass slides
• Slide carrier box
• Pencil
• Specimen pot with formalin

PROCEDURE

1 Equipment preparation
Label glass slides with the patient’s details using pencil. Label the specimen pot. Load syringe and needle into mount if using one.

2 Fine needle aspirate
Clean the skin with an alcohol wipe. Fix the mass between thumb and index finger. Insert the needle into the middle of the mass, and fully withdraw the plunger. Sample tissue by moving the needle tip around a few millimetres within the mass (21.1). Withdraw the needle, keeping the syringe plunger fully withdrawn. There is no need to repeat the procedure unless the first sample is contaminated with significant amounts of blood. If a separate specimen is required for microbiology, repeat the sampling technique with a second syringe and needle. Ensure haemostasis.

3 Slide preparation
Expel the contents of the syringe onto a glass slide, making sure the bevel of the needle is facing down, and spread the resulting specimen between two slides. Repeat with a second slide. Allow the four slides to dry before placing in the slide box and sealing the lid. Draw preservative solution into syringe and wash the contents back into the specimen pot. If required, also send samples for microbiology.
SURGICAL STEPS

1 Positioning the patient
2 Incision
3 Excisional and incisional lymph node biopsy
4 Haemostasis and closure
5 Sample preparation

PROCEDURE

1 Positioning the patient

Lymph node biopsy or excision may be performed under general or local anaesthetic. Position the operating table head-up. Turn the patient’s head away from the operative side. Mark the incision over the lymph node, making use of relaxed skin tension lines, taking care to avoid the course of superficial nerves. Inject 10 ml 1% lignocaine with 1/200,000 adrenaline. Prepare the skin with betadine and drape the patient with a head drape (22.1, 22.2).

Surgeon’s tip

The lymph node to be biopsied should be marked preoperatively (22.1). If more than one lymph node is palpable, consider other factors which may make the biopsy easier, e.g. depth of lymph node, course of adjacent nerves, in particular the marginal mandibular branch of the facial nerve, accessory nerve, and great auricular nerve.
2 Incision
Incise skin, subcutaneous fat and platysma with a 10 blade. Palpate the node to localise it, and using McIndoe scissors and nontoothed forceps, gently dissect until you reach the surface of the lymph node. Retract the sternocleidomastoid muscle if necessary. A small self-retainer may be used (22.3).

3 Excisional and incisional lymph node biopsy
If possible, excise the whole lymph node (22.4). Using McIndoe scissors, dissect close to the surface of the lymph node to avoid damaging surrounding structures. Use diathermy to the vascular pedicle. If excision of the node is impossible, use cutting diathermy to remove a wedge of tissue.

4 Haemostasis and closure
Ensure haemostasis. Occasionally a suction drain may be necessary. Close deep cervical fascia and platysma with 2/0 vicryl, and use 3/0 prolene or staples for skin (22.5).

5 Sample preparation
The specimen should be divided into dry and formalin samples as required; be guided by instructions and preferences from your local histopathology and haematology departments. Microbiology samples may also be provided at this time.

Surgeon’s tip
To preserve the architecture of the lymph node, avoid handling the tissue directly. Use Allis forceps or nontoothed forceps on the lymph node capsule to prevent tissue damage.
Tonsillectomy and adenoidectomy

Tonsillectomy

**SURGICAL STEPS**

1. **Positioning the patient**
   Position the patient’s head close to the end of the operating table. Place a sandbag under the patient’s shoulders to extend the neck. Drape the patient’s head, leaving the nose and mouth exposed.

2. **Inserting a Boyle–Davis gag**
   Ensure that the endotracheal tube is secured in the midline. Inspect the oral cavity for loose or damaged teeth. Select an appropriately-sized tongue depressor. Hold the Boyle–Davis gag with your right hand and open the patient’s mouth using the index finger and thumb of the left hand. Insert the Boyle–Davis gag along the endotracheal tube and secure the tooth guard over the upper incisors. The endotracheal tube should rest in the groove of the tongue depressor and the tongue should lie in the midline. Gently open the Boyle–Davis gag taking care to avoid injury to the lips. Position the Boyle–Davis gag on Draffin rods to achieve a good view of the tonsils, and suction any secretions from the oral cavity (23.1).

**Surgeon’s tip**

If the patient is edentulous, use a gauze swab over the upper gum to protect it from damage and to anchor the gag.

**Surgeon’s tip**

If operating on a patient with Down’s syndrome, take care with neck positioning as there is a higher incidence of atlantoaxial instability.
3 Dissecting the tonsils

Using tonsillar forceps (Dennis Brown) retract the tonsil medially. Use scissors to make a curved mucosal incision approximately 2 mm lateral to the edge of the anterior tonsillar pillar at the level of the upper tonsillar pole (23.2). Extend the incision inferiorly towards the tongue base and medially towards the uvula, taking care not to tear it. Using scissor dissection, identify the superior tonsillar pole, and retract the superior pole medially and inferiorly with tonsillar forceps. Use a Gwynne Evans dissector to dissect in a plane between the tonsillar capsule and the pharyngeal wall, avoiding trauma to the muscles of the pharyngeal wall. Injury to pharyngeal muscles causes increased risk of bleeding and postoperative pain.

4 Haemostasis

Use a curved Negus forceps to clamp the lower tonsillar pole and a 2/0 vicryl tie to ligate it. Ligate bleeding points using straight Negus forceps and ties (23.3). Pack the tonsillar fossae with a tonsillar swab while continuing with the contralateral side. This will usually control minor bleeding.

Remove tonsillar swabs and check for bleeding. Ensure haemostasis is achieved before removing the Boyle–Davis gag.

Suction any blood from the postnasal space using a fine suction catheter passed through the nose. Relax the Boyle–Davis gag for 3 minutes. Ensure there is no bleeding. Repeat haemostasis, if necessary. Remove the mouth gag, taking care not to displace the endotracheal tube.
Adenoidectomy

**SURGICAL STEPS**

1. **Positioning the patient**
   Position the patient’s head close to the end of the operating table. Place the patient flat on the table. Drape the patient’s head leaving the nose and mouth exposed.

2. **Inserting a Boyle–Davis gag**
   As for tonsillectomy.

3. **Suction diathermy adenoidectomy**
   Retract the soft palate using fine suction catheters passed through the nose (23.4). Using a laryngeal mirror, inspect the postnasal space.

   Use the suction diathermy wand to ablate the adenoidal tissue, under direct vision with the mirror (23.5). Avoid diathermy to the lateral wall as this causes injury to Eustachian tube orifices and potential scarring. Aim to see clearly the vomer at the end of the procedure. Use a wet tonsil swab to clear any debris and dissipate the heat, and after removal ensure the postnasal space is dry with the mirror.

**Surgeon’s tip**

Avoid overextension of the neck, as this causes increased risk of damage to posterior pharyngeal wall structures.

**Surgeon’s tip**

Ensure the uvula is not bifid, and palpate the palate to exclude anatomical abnormalities such as submucosal cleft palate.

**Surgeon’s tip**

Antibiotics are advised following suction diathermy adenoidectomy, to avoid an infection in the sloughy healing bed and halitosis.

**Surgeon’s tip**

A curette can be used as an alternative method for adenoidectomy.
Uvulopalatoplasty

SURGICAL STEPS

1. Positioning the patient
2. Inserting a Boyle–Davis gag and local anaesthetic and adrenaline infiltration
3. Dissection
4. Haemostasis

PROCEDURE

1. Positioning the patient
   Position the patient’s head close to the end of the operating table. Place a sandbag under the patient’s shoulders to extend the neck. Drape the patient’s head leaving the nose and mouth exposed.

2. Inserting a Boyle–Davis gag and local anaesthetic and adrenaline infiltration
   Ensure that the endotracheal tube is secured in the midline. Inspect the oral cavity for loose or damaged teeth. Select an appropriately-sized tongue depressor. Hold the Boyle–Davis gag with your right hand and open the patient’s mouth using the index finger and thumb of your left hand. Insert the Boyle–Davis gag along the endotracheal tube and secure the tooth guard over the upper incisors. The endotracheal tube should rest in the groove of the tongue depressor and the tongue should lie in the midline.

   Gently open the Boyle–Davis gag taking care to avoid injury to the lips. Position the Boyle–Davis gag on Draffin rods (24.1) to achieve a good view of the palate and tonsils. Alternatively, a Mayo stand can be used. Suction any secretions from the oral cavity. Inject local anaesthetic and adrenaline (2 dental cartridges of 2% lignocaine and 1/80,000 adrenaline) to the palate.

3. Dissection
   If the tonsils are present, they are removed (see 23 – Tonsillectomy and adenoidectomy). Palatal resection can be performed with cutting diathermy, CO₂, Nd-YAG, or KTP laser. If using laser, routine laser precautions must be taken and the face, oropharynx, and nasopharynx should be protected with wet swabs. (See 29 – Microlaryngoscopy and laser use, for more details of laser safety.)

   Palpate the junction of the hard and soft palate. Using diathermy or laser, mark the superior limit of your dissection by measuring 25% of the length of the soft palate on either side of the uvula (24.2). Hold the palatal tissue under tension with Dennis Brown forceps. Excise a wedge of soft palate up to the marked point, including a strip of anterior tonsillar pillar. Trim half the length of the uvula (24.3, 24.4).
Many variations on the basic technique for dissection are described. The authors use a variation of the Kamani technique.

The uvula arteries may retract and cause troublesome bleeding during dissection of the palate. Avoid this by initially dissecting the palatal mucosa, and then use monopolar diathermy to cauterise tissue in the region of the uvula artery.

4 Haemostasis

Ensure haemostasis and suture mucosal edges of uvula with 2/0 vicryl. Suction any blood from the postnasal space using a fine suction catheter passed through the nose. Remove the Boyle–Davis gag, taking care not to displace the endotracheal tube.
Adult elective tracheostomy

SURGICAL STEPS

1 Positioning the patient
2 Marking and local anaesthetic
3 Incision
4 Separating the strap muscles
5 Dividing the thyroid isthmus
6 Checking the equipment
7 Tracheotomy and insertion of the tube
8 Securing the tube, closure, and dressing

PROCEDURE

1 Positioning the patient
Position the patient’s head close to the end of the operating table on a head ring. Place a sandbag under the patient’s shoulders to extend the neck. Position the operating table head-up. Ensure an endotracheal tube is positioned superiorly and that the anaesthetist has access to it. Prepare the skin with aqueous betadine from chin superiorly to nipples inferiorly, and tie a head drape.

2 Marking and local anaesthetic
Mark a 5 cm transverse skin crease incision midway between the sternal notch and cricoid ring. Inject 20 ml of local anaesthetic in the form of 0.5% lignocaine with 1/200,000 adrenaline (25.1).

3 Incision
Using a 10 blade, incise skin, subcutaneous fat, and platysma, until you reach the anterior jugular veins. Divide and ligate the anterior jugular veins with 2/0 vicryl. Continue dissecting until you reach the level of strap muscles (25.2). Apply a self-retainer.

Surgeon’s tip
Always assess a patient’s neck preoperatively, and consider any factors which may affect ease of access to trachea:
• Obesity.
• Limited neck extension.
• Short neck.
• Previous neck surgery or radiotherapy.

Surgeon’s tip
In obese patients, use a tape passing round the chin up to the head of the table, to lift redundant skin and fat out of the operative field.
4 Separating the strap muscles
Separate the strap muscles in the midline using McIndoe scissors. Using a Lahey swab, expose the thyroid isthmus. Insert two Langenbeck retractors under the sternothyroid muscle (25.3).

5 Dividing the thyroid isthmus
Using a heavy clip, separate the isthmus of thyroid from the underlying trachea. Insert clips and divide the isthmus as shown (25.4–25.6). Transfix the isthmus with 2/0 vicryl.

Surgeon’s tip
Tracheostomy may occasionally need to be performed under local anaesthetic (LA) in an urgent clinical setting. Initially instil LA and adrenaline into the skin and subcutaneous tissues, and infiltrate into the deeper tissues as you progress. Before tracheal fenestration inject LA into the trachea.

Surgeon’s tip
It is the authors’ practice to divide the thyroid isthmus using monopolar cutting diathermy.

25.3 Separating the strap muscles.
25.4–25.6 Dividing the thyroid isthmus.
6 Checking the equipment
Check the tracheostomy tube size is correct and test the cuff with 20 ml air or saline; check suction is available. Insert the obturator and apply aqueous gel to the tip. If a double lumen tracheostomy is to be used, ensure that a nonfenestrated inner tube is available. Have spare tracheostomy tubes, tracheal dilators, and suction available.

7 Tracheotomy and insertion of the tube
Warn the anaesthetist that you are ready to perform the tracheotomy. Using a new 11 blade, make a fenestration in the trachea, between the second and third tracheal rings (25.7, 25.8). Use heavy forceps to hold the tracheal tissue. Ask the anaesthetist to slowly withdraw the endotracheal tube, until the tip is only just visible. Suction the secretions. Insert the tracheostomy tube and replace the obturator with the nonfenestrated inner tube. Inflate the cuff. Check the patient is adequately ventilated.

8 Securing the tube, closure, and dressing
Remove retractors and self-retainers and check haemostasis. Loosely close skin with 2/0 prolene. Secure the tracheostomy tube with tapes and insert lyofoam dressing. Check tapes are tight – it should be possible to insert two fingers between the tapes and skin when the neck has been returned to neutral position.
Paediatric elective tracheostomy

**Details differing from adults:**
- If you are unable to palpate the cricoid, feel for the hyoid bone.
- No local anaesthetic is required.
- De-fat the neck with a cutting diathermy needle.
- Separate strap muscles with a cutting diathermy needle.
- Divide the thyroid isthmus with bipolar diathermy.
- Insert two stay sutures from 2nd to 4th tracheal rings to control the tracheotomy slit: use prolene 4/0, clip the two loose suture ends and cut off the needle (25.10).
- Vertical incision in tracheal rings 2–4.

Emergency tracheostomy

Emergency tracheostomies are usually performed as a life-saving procedure. Make a longitudinal midline incision, using the fingers of the left hand to retract tissues, and palpate the trachea. Continue with an incision until the trachea is reached, and then make a vertical slit in the tracheal wall. Perform haemostasis after the airway has been secured.
Diagnostic procedures in the upper aerodigestive tract

Direct laryngoscopy (DL)

SURGICAL STEPS

1 Range of laryngoscopes
2 Assembling the equipment
3 Positioning the patient
4 Inserting the scope
5 Manipulation of the larynx
6 Biopsy or therapeutic procedure

PROCEDURE

1 Range of laryngoscopes
Choose an appropriate laryngoscope from a range of scopes with different shapes, lengths, and luminal diameters to allow visualisation of all aspects of the larynx in all patients (26.1–26.3).

2 Assembling the equipment
You may need to use a single or a double light carrier, depending on the scope. Some laryngoscopes have a sliding blade which is used to allow large instruments or endotracheal tubes to be passed into the larynx. Assemble the laryngoscope and light carrier prior to laryngoscopy.

3 Positioning the patient
Position the patient supine on the operating table with a pillow under the shoulders, in the 'sniffing the morning air' position with the neck flexed towards the chest, and the head extended on the neck (26.4).

Surgeon’s tip
Discuss with the anaesthetist the choice of endotracheal tube (south facing RAE or microlaryngoscopy tube) and the side on which the tube should be secured.

Surgeon’s tip
The funnel-shaped designs, e.g. bouchayer, allow easier access for instruments and greater illumination with the microscope light.
4 Inserting the scope
Protect the upper teeth with a mouth guard or a wet swab in edentulous patients. Lubricate the scope with a water-based gel.

Using your dominant hand, introduce the endoscope into the mouth, in the direction of the posterior pharyngeal wall. Using the other hand, keep the mouth open and protect the lips from damage (26.5, 26.6).

Advance the laryngoscope to the pharynx and uvula, being careful not to dislodge the endotracheal tube. Angle the scope to left and right and examine the tonsil fossae. Lift the scope as it is advanced in the midline pushing the tongue base up, with the endotracheal tube below the scope. Follow the endotracheal tube and advance the scope until you see the epiglottis. Examine the valleculae. Advance the scope under the epiglottis into the laryngeal inlet. Examine the supraglottic larynx, aryepiglottic folds, the infrahyoid laryngeal surface of the epiglottis, and the ventricular bands or false cords. Ensure you have a clear view of the whole of the larynx, vocal cords, and the anterior commissure.

5 Manipulation of the larynx
Use external movement of the laryngeal framework to visualise all recesses of the larynx. Use ‘cricoid pressure’ to achieve a view of the anterior commissure.

Surgeon’s tip
Open the lower jaw by using the thumb to push it away from you, while simultaneously using the index and middle fingers to push the upper jaw. Avoid rotating the scope in the mouth or leaning on the dentition as a fulcrum. Use the thumb of the nondominant hand under the scope to prevent damage to the teeth.

Surgeon’s tip
A different scope may be needed to view the anterior commissure.
Direct pharyngoscopy (DP)

SURGICAL STEPS

1. Equipment and assembly
2. Positioning the patient
3. Inserting the scope
4. Manipulation of the pharynx
5. Biopsy or therapeutic procedure

PROCEDURE

1. Equipment and assembly
The pharyngoscope has a longer barrel than the laryngoscope and the upper or superior blade is longer (26.9). Assemble the pharyngoscope and double light carrier prior to pharyngoscopy.

2. Positioning the patient
Position as for a direct laryngoscopy. Further extension may be necessary to straighten the cervical oesophagus.

3. Inserting the scope
Protect the upper teeth with a mouth guard or a wet swab in edentulous patients. Lubricate the scope with a water-based gel. Insert the scope as in laryngoscopy. Follow the posterior pharyngeal wall further down the oropharynx toward the posterior hypopharyngeal wall, until you can see the postcricoid mucosa. The endotracheal tube should be above the scope at this point.

4. Manipulation of the pharynx
Sweep the tip of the scope to one side and inspect the piriform fossa. Repeat on the other side. Now use the scope tip to lift the larynx forward and inspect the postcricoid mucosa as far down as cricopharyngeus muscle.
5 Biopsy or therapeutic procedure
Hold the pharyngoscope with your nondominant hand and take biopsies using the dominant hand, with long biopsy forceps or larger punch forceps. At the end of the procedure, withdraw the pharyngoscope, taking care not to dislodge the endotracheal tube. Palpate the tongue base and tonsil areas for any submucosal masses, and also palpate the neck for lymph nodes to complete the clinical staging.

Direct oesophagoscopy (DO)

SURGICAL STEPS

1 Range of oesophagoscopes
Oesophagoscopes are all similar shaped but have differing lengths and diameters. All oesophagoscopes have graduated markings indicating the distance of the tip of the oesophagoscope from the upper incisors (26.10, 26.11).

2 Equipment and assembly
Assemble the scope and light carrier. The light carrier may be single or double pronged or attached to a prism at the proximal end of the scope.

Surgeon's tip
Following the posterior pharyngeal wall can risk dislocating the arytenoids; an alternative technique is to follow the piriform fossa on one side towards the midline.
3 Positioning the patient
Position the patient supine on the operating table with a pillow under the shoulders in the ‘sword swallowers’ position. (26.12)

4 Inserting the scope
Protect the upper teeth with a mouth guard or a wet swab in edentulous patients. Lubricate the scope with a water-based gel. Insert the scope as in pharyngoscopy. Identify the posterior pharyngeal wall and pass the scope down to the posterior hypopharyngeal mucosa. Lift the tip of the scope anteriorly to displace the larynx anteriorly. Gently advance the scope until you see the puckered pit of cricopharyngeus muscle, which is closed at rest. In order to pass the scope through the cricopharyngeus in a paralysed patient, apply gentle pressure with the tip of the scope.

Visualise the lumen of the oesophagus. Advance the scope further, aiming for the centre of the oesophageal lumen, to avoid trauma to the oesophageal mucosa. Continue to advance the scope as far as is necessary, depending on the clinical indication. Examine the mucosa as you withdraw the scope.

5 Biopsy or therapeutic procedure
Hold the oesophagoscope with your nondominant hand and take biopsies using the dominant hand. At the end of the procedure, withdraw the oesophagoscope, taking care not to dislodge the endotracheal tube. 😎
Direct tracheobronchoscopy

**SURGICAL STEPS**

1. **Range of bronchoscopes**
   The bronchoscope is similar in shape to the oesophagoscope but has a narrower diameter with a beaked lip, and side holes to allow ventilation.

2. **Equipment and assembly**
   Assemble the scope and light carrier.

3. **Positioning the patient**
   Position the patient supine on the operating table with a pillow under the shoulders in the ‘sniffing the morning air’ position.

4. **Inserting the scope**
   Protect the upper teeth with a mouth guard or a wet swab in edentulous patients. Lubricate the scope with a water-based gel. Insert the scope as in laryngoscopy. Pass the scope into the laryngeal inlet to view the supraglottis. Attach an anaesthetic ventilation tube to the ventilation port of the bronchoscope. If the patient is intubated, ask the anaesthetist to withdraw the endotracheal tube, so that the tip lies in the supraglottis. Turn the scope through 90° to allow the thinnest part of the beak to pass through the vocal cords first. Aim the bevelled end of the scope toward the ipsilateral vocal cord to pass through the glottis; once into the subglottis, return the scope to the midline. Confirm with the anaesthetist that the patient is ventilating satisfactorily.

   Advance the scope and inspect the subglottis. Inspection can be done under direct vision or using a 0° Hopkins rod. Now advance into the trachea and inspect the tracheal wall all the way down to the carina. Pass the scope into the right main bronchus, and roll the head to the left to obtain a full view of the second division of the bronchi. Withdraw the scope and rotate the head to the right to enter the left main bronchus down to the second division.

5. **Biopsy or therapeutic procedure**
   Hold the bronchoscope with your nondominant hand and take biopsies or remove foreign bodies using the dominant hand. Withdraw the scope gently, inspecting the mucosa to ensure that you have not caused any trauma to the mucosa.

   Disconnect the anaesthetic ventilation tube and inform the anaesthetist, who will re-establish ventilation.

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**Surgeon’s tip**

The left main bronchus is much harder to visualise than the right because it is more horizontally positioned.

**Surgeon’s tip**

There is a variety of forceps for removing foreign bodies, e.g. coin-removing forceps have serrated tips to grasp the coin.
Paediatric microlaryngoscopy and bronchoscopy (MLB) foreign body removal

SURGICAL STEPS

1  Range of laryngoscopes and bronchoscopes
2  Positioning the patient
3  Inserting the scope
4  Laryngoscopy and palpation of the larynx
5  Tracheobronchoscopy
6  Removal of foreign bodies using the ventilating bronchoscope
7  Dynamic assessment

PROCEDURE

1  Range of laryngoscopes and bronchoscopes
   The following equipment should be available, and the surgeon must be familiar with assembling the instruments (27.1–27.3):
   • Benjamin and Lindholm laryngoscopes with light source.
   • Ventilating bronchoscopes in a variety of diameters with Storz–Hopkins telescopes.
   • Laryngeal probe.
   • Spaghetti suckers.
   • Foreign body forceps, e.g. peanut forceps and coin forceps.

2  Positioning the patient
   The anaesthetised child is placed on the operating table with a small sandbag under the shoulders but without a head ring, due to the relatively large size of the occiput. ☞

27.1 Paediatric laryngoscopes.

27.2 Foreign body optical forceps.
3 Inserting the scope
Use a wet gauze or tooth guard to protect the upper teeth and gums. Insert the lubricated laryngoscope into the oropharynx, and follow the nasotracheal tube, if one is in situ, until you reach the epiglottis. Assess the shape of the epiglottis, particularly looking for an infantile or omega-shaped epiglottis. With the tip of the scope still in the vallecula, lift the epiglottis to obtain a panoramic view of the laryngeal inlet (27.4). Secure the laryngoscope on rigid suspension and bring in the microscope. Withdraw the tip of the nasotracheal tube into the pharynx.

4 Laryngoscopy and palpation of the larynx
Assess the larynx, including subglottis, for anatomical abnormalities. Use the laryngeal probe to palpate the interarytenoid mucosa and exclude a laryngeal cleft. The probe is also used to assess mobility of the cricoarytenoid joint by moving the joint medially.

**Surgeon’s tip**
Depending on the experience of the anaesthetic and surgical team, and the likely pathology, several different anaesthetic techniques are available. Options include nasotracheal intubation, a laryngeal mask, or face mask which is then removed and the ventilating bronchoscope inserted. The vocal cords are sprayed with local anaesthetic to avoid laryngeal spasm, and the child is examined while breathing spontaneously. Pressure ventilation should be avoided as it may dislodge a foreign body further distally.
5 Tracheobronchoscopy
Remove the microscope, and insert a 0° Storz–Hopkins telescope through the lumen of the laryngoscope, to assess the subglottis and lower trachea as far as the carina. If a tracheostomy is in situ, remove it before inspecting the lower part of the trachea.

6 Removal of foreign bodies using the ventilating bronchoscope
Remove the laryngoscope, and insert the ventilating bronchoscope using an anaesthetic laryngoscope to lift the tongue base and epiglottis. Pass the bronchoscope through the vocal cords by rotating it through 90°. Attach the suction and anaesthetic ventilation tube. Advance the tip of the bronchoscope to the carina, and rotate the head gently to the opposite side to improve access to the main bronchi. Reverse the procedure for the other side. If a foreign body is present, use optical forceps or suction to withdraw it into the lumen of the scope. Then withdraw the scope and forceps together with the foreign body.

7 Dynamic assessment
As the anaesthetic begins to wear off, insert the 0° Storz–Hopkins telescope into the laryngeal inlet, using the anaesthetic laryngoscope as before. Assess movement of the vocal cords for a unilateral/bilateral cord palsy.

Surgeon’s tip
Before using the ventilating bronchoscope, choose the appropriately-sized instrument for the size and weight of the child, and familiarise yourself with its assembly and various attachments.
Vocal fold injection

**SURGICAL STEPS**

1. **Positioning the patient**
2. **Microlaryngoscopy**
3. **Injecting the vocal cord**

**PROCEDURE**

1. **Positioning the patient**
   Position the patient supine on the operating table with a pillow under the shoulders in the ‘sniffing the morning air’ position (see 26.4).

2. **Microlaryngoscopy**
   Insert the laryngoscope into the larynx. Ensure you have a full view of the vocal folds. Stabilise the scope on a suspension jack. Position the microscope, checking that the focal length is 400 mm (28.1).

3. **Injecting the vocal cord**
   Insert the needle into the superior surface of the vocal fold at the level of the tip of the vocal process, 2 mm from the free edge of the vocal fold, lateral to the vocal ligament. Inject 0.1–0.2 ml of bioplastique or other injectable material. A second injection of 0.1 ml bioplastique is injected at the midpoint of the vocal fold, and a third at the anterior end (28.2). Further injections may be necessary to achieve the desired position.

**Surgeon’s tip**
Jet ventilation is required for vocal fold injection. Complications of jet ventilation include pneumothorax, pneumoperitoneum, and pneumomediastinum, so it is essential not to occlude the outflow of air under any circumstances. Ensure you and your anaesthetist are familiar with the equipment and settings before the start of the procedure.

**Surgeon’s tip**
A number of injectable materials are available, including bioplastique, Radiesse gel®, collagen, and hyaluronic acid. Choice is guided by local policy or surgeon’s experience/preference.

**Surgeon’s tip**
The senior author advocates the use of 16 mg of dexamethasone intraoperatively.
Laryngeal framework surgery: Isshiki thyroplasty Type I

**SURGICAL STEPS**

1. **Positioning the patient**
   The procedure is performed under local anaesthetic. Oxygen is delivered via nasal prongs. Mark the incision and inject local anaesthetic in the form of 1% lignocaine and 1/200,000 adrenaline. Drape the patient’s head, leaving the face fully exposed.

2. **Incision**
   Using a 10 blade, make a horizontal incision at the midpoint between the superior and inferior border of the thyroid cartilage. Extend the incision laterally to the anterior border of the ipsilateral sternomastoid muscle, and medially 1 cm across the midline. Using cutting diathermy, divide the sternohyoid muscle. Insert a self-retainer retractor. Elevate the thyrohyoid muscle from the thyroid lamina using a periosteal elevator, exposing the perichondrium.

3. **Marking the thyroid cartilage**
   Mark a line on the thyroid cartilage, parallel to the inferior border at its vertical midpoint. Using a sterile ruler, mark a point 7 mm from the anterior border in females, and 9 mm in males. This is the critical point (28.3). Mark out a window from this reference point, as shown in the diagram (28.4).

4. **Thyroid cartilage window and prosthesis insertion**

5. **Haemostasis, drains, and closure**

**PROCEDURE**

1. **Positioning the patient**
   The procedure is performed under local anaesthetic. Oxygen is delivered via nasal prongs. Mark the incision and inject local anaesthetic in the form of 1% lignocaine and 1/200,000 adrenaline. Drape the patient’s head, leaving the face fully exposed.

2. **Incision**
   Using a 10 blade, make a horizontal incision at the midpoint between the superior and inferior border of the thyroid cartilage. Extend the incision laterally to the anterior border of the ipsilateral sternomastoid muscle, and medially 1 cm across the midline. Using cutting diathermy, divide the sternohyoid muscle. Insert a self-retainer retractor. Elevate the thyrohyoid muscle from the thyroid lamina using a periosteal elevator, exposing the perichondrium.

3. **Marking the thyroid cartilage**
   Mark a line on the thyroid cartilage, parallel to the inferior border at its vertical midpoint. Using a sterile ruler, mark a point 7 mm from the anterior border in females, and 9 mm in males. This is the critical point (28.3). Mark out a window from this reference point, as shown in the diagram (28.4).
4 Thyroid cartilage window and prosthesis insertion
Using an Osteon drill with a 2 mm diamond burr, drill out the cartilage window, as deep as the perichondrium of the medial surface of the thyroid cartilage. Use a periosteal elevator to free and gently medialise the perichondrium from the edges of the cartilage window. Insert the prosthesis; several types of implant are available – silastic, Gore-tex®, and titanium implants. The prosthesis will need to be shaped according to the patient’s anatomy and degree of medialisation required.

Secure the implant in position with 2/0 prolene. Ask the patient to phonate and assess the improvement in voice. Rarely, minor readjustment of the implant may be required. Assess position via flexible nasendoscopy.

5 Haemostasis, drains, and closure
A size 8 FG vacuum drain may be used if necessary. Use 3/0 vicryl to repair the sternohyoid muscle and for deep subcutaneous suture. Close the skin with skin staples.

🏃 Surgeon’s tip ⏃
Take extra care to avoid perforating the perichondrium on the medial surface of the thyroid cartilage.

🏃 Surgeon’s tip ⏃
The senior author advocates the use of 16 mg of dexamethasone intraoperatively.
Microlaryngoscopy and laser use

Microlaryngoscopy

SURGICAL STEPS

1 Range of laryngoscopes
2 Equipment assembly
3 Positioning the patient
4 Inserting the scope and jet ventilation
5 Manipulation of the larynx
6 Biopsy or therapeutic procedure, including laser

PROCEDURE

1 Range of laryngoscopes
Choose an appropriate laryngoscope (see 26 – Diagnostic procedures in the upper aerodigestive tract: Direct laryngoscopy).

2 Equipment assembly
Ensure that if you will be using jet ventilation, the equipment is ready and has been checked by the anaesthetist. If you do not have access to jet ventilation, ask the anaesthetist to intubate with a size 5 microlaryngoscopy tube. If you are planning to use the laser, ensure that the anaesthetist inserts a laser resistant microlaryngoscopy tube. Make sure the microscope focal length is set to 400 mm.

3 Positioning the patient
Position the patient supine on the operating table with a pillow under the shoulders, in the ‘sniffing the morning air’ position (see 26.4) with the neck flexed towards the chest, and the head extended on the neck.

4 Inserting the scope and jet ventilation
Protect the upper teeth with a mouth guard or a wet swab in edentulous patients. Lubricate the scope with a water-based gel. Using your dominant hand, introduce the endoscope into the mouth in the direction of the posterior pharyngeal wall, as for direct laryngoscopy. When you have a full view of the vocal folds, ask your assistant to attach the suspension apparatus, and secure the scope in the right position before bringing in the microscope (29.1); see also 28.1.
Confirm with the anaesthetist that the patient is ventilating satisfactorily. At the end of the procedure, before the scope is withdrawn from the larynx, turn off the jet ventilator, and allow the anaesthetist to re-establish ventilation. (See 27 – Paediatric microlaryngoscopy and bronchoscopy (MLB) foreign body removal, and 28 – Phonosurgery, for pitfalls with jet ventilation.)

5 Manipulation of the larynx
Use external movement of the laryngeal framework to visualise all recesses of the larynx. Use ‘cricoid pressure’ to achieve a view of the anterior commissure.
6 Biopsy or therapeutic procedure, including laser

To view the laryngeal saccule, ventricle, and subglottic undersurface of the vocal fold, use 0° and 90° Hopkins endoscope rods.

The assistant should guide the instrument tips into the laryngoscope lumen while you continue looking down the microscope. Grip the instruments lightly, and use small movements of your fingers rather than the whole hand to achieve precise movement of the instruments. Using grasping forceps in one hand and curved scissors in the other, remove the lesion. Use an adrenaline-soaked neuropattie to achieve haemostasis.

At the end of the procedure, remove the suspension apparatus and withdraw the laryngoscope, taking care not to dislodge the endotracheal tube if in situ.

Laser use in endoscopic procedures

Laser safety
The operating surgeon is responsible for laser safety. Before starting, you should check that:
• The doors to theatre are locked.
• All staff are wearing laser goggles.
• If appropriate, a laser-safe endotracheal tube is used.
• Wet swabs are placed over the patient’s exposed skin.
• A jug of water is available to extinguish a laser fire.

Laser equipment
CO₂ laser may either be attached to the microscope and controlled via a laser micromanipulator (29.2), or delivered via a hand piece.

KTP laser is more commonly used in the nose and ear. It is delivered via a fibreoptic cable; take care not to damage the cable when setting up the hand piece. The end of the cable should be cut at right angles using the cable cutter, to produce a sharp point for safe and accurate delivery.
Endoscopic approach and stapling of the pharyngeal pouch

SURGICAL STEPS

1 Positioning the patient
2 Inserting the pharyngeal diverticulum scope
3 Inspecting the pouch
4 Stapling the pouch

PROCEDURE

1 Positioning the patient
Position the patient in a supine position with a sandbag or pillow under the shoulders in the ‘sword swallowers’ position. Apply a head drape with the patient’s mouth exposed. Protect the upper teeth with a mouth guard or a wet swab in edentulous patients.

2 Inserting the pharyngeal diverticulum scope
Lubricate the bivalved pharyngeal diverticulum scope (Weerda laryngoscope) with a water-based gel (30.1). Using your dominant hand, introduce the endoscope into the mouth, in the direction of the posterior pharyngeal wall. Using the other hand, keep the mouth open and protect the lips from damage.

Advance the pharyngoscope to the pharynx and uvula, being careful not to dislodge the endotracheal tube. Identify the posterior pharyngeal wall and pass the scope down to the posterior hypopharyngeal mucosa. Lift the tip of the scope to displace the larynx anteriorly.

Identify the piriform sinus and then the opening of the oesophagus. Using a long, rigid suction tube, identify the opening of the pharyngeal pouch. Then place the anterior blade of the scope into the oesophagus and the posterior blade into the pouch. Open the two blades to expose the anterior wall of the pharyngeal pouch. Take extra care not to perforate or damage the mucosal surface of the pharyngeal pouch. Excess bleeding may make the procedure more difficult. Secure the diverticulum scope in position with a suspension device (30.2).
3 Inspecting the pouch
Use a 0° Hopkins rod to inspect the mucosa of the pouch, and exclude a rare malignancy.

4 Stapling the pouch
Before inserting the staple into the pouch, read the instructions carefully, and familiarise yourself with the use of the gun. Insert the staple gun and engage it onto the anterior wall of the pouch between the pouch and the oesophagus. Fire the gun, taking care to hold it steady, and then release the blades. Remove the gun and assess the result. Carefully inspect the mucosa of the pouch as well as the oesophagus for any tears or perforations before removing the diverticulum scope.

Open excision of the pharyngeal pouch and cricopharyngeal myotomy

**SURGICAL STEPS**

1 Positioning the patient
2 Inserting the pharyngeal diverticulum scope
3 Inserting the bougie and packing the pharyngeal pouch
4 Skin incision and approach
5 Identifying and mobilising the pharyngeal pouch
6 Cricopharyngeal myotomy
7 Excision of the pharyngeal pouch and repair of the pharyngeal wall
8 Haemostasis and closure

**PROCEDURE**

1 Positioning the patient
Place the patient supine on the operating table with a sandbag under the shoulders and a head ring. Mark the incision, which lies on the anterior border of the sternocleidomastoid muscle, from 1 cm superior to the sternoclavicular joint inferiorly, to the level of the hyoid bone. Inject local anaesthetic in the form of 1% lignocaine and 1/80,000 adrenaline along the site of the incision. Drape the head and neck, leaving the mouth exposed.

2 Inserting the pharyngeal diverticulum scope
Insert a normal pharyngoscope into the cervical oesophagus, as described for the endoscopic procedure.

3 Inserting the bougie and packing the pharyngeal pouch
Insert a 32 French gauge bougie into the oesophagus, followed by a nasogastric tube. Identify the opening of the pharyngeal pouch posteriorly, and pack the pouch with 1 inch ribbon gauze. Remove the pharyngeal diverticulum scope.
4 Skin incision and approach
Incise skin, subcutaneous fat and platysma with a 10 blade. Identify the carotid sheath and gently retract it laterally. Divide the tendon of omohyoid muscle with cutting diathermy and identify the left thyroid lobe medially. Identify and divide the middle thyroid vein. Ask your assistant to rotate the laryngeal skeleton medially, exposing the posterior aspect of the pharynx, and the pharyngeal pouch.

5 Identifying and mobilising the pharyngeal pouch
Carefully separate the mucosa of the pharyngeal pouch from the posterior pharyngeal wall using a gauze pledget. Grasp the pouch with a pair of Babcock forceps, and remove the ribbon gauze pack through the mouth. Starting from the tip of the pouch, carefully dissect the mucosa of the pouch from the pharyngeal wall. Continue superiorly until you reach the neck of the pouch, at the superior end of cricopharyngeus muscle.

6 Cricopharyngeal myotomy
Using a 15 blade, carefully divide the fibres of the cricopharyngeus muscle vertically along its postero-lateral aspect. Great care should be taken to avoid cutting through the oesophageal mucosa (30.3).

7 Excision of the pharyngeal pouch and repair of the pharyngeal wall
Divide the pouch at its neck and using a continuous 3/0 vicryl repair the pharyngeal mucosa with a purse-string suture. Repair the defect in the thyropharyngeus muscle with the same suture (30.4).

8 Haemostasis and closure
Ensure haemostasis and insert a size 12 suction drain. Use 2/0 vicryl to close the platysma and deep subcutaneous layer. Apply skin staples and transparent dressing such as Tegaderm®. Do not forget to remove the bougie at the end of the procedure, but leave the nasogastric tube in situ.
Submandibular gland excision

SURGICAL STEPS

1. Positioning the patient
2. Incision and raising the flap
3. Dissection of the floor of the submandibular triangle
4. Excision of the submandibular gland
5. Drainage, closure, and dressing

PROCEDURE

1. Positioning the patient
   Position the patient on the operating table head-up with a sandbag under the shoulders and a head ring. Mark a transverse skin crease incision with a sterile marker pen (31.1). Inject local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline.

2. Incision and raising the flap
   Using a 10 blade, incise the skin and platysma. Continue the dissection onto the inferior border of the submandibular gland. Then use McIndoe scissors to dissect underneath the capsule of the submandibular gland as far as its superior border.

Surgeon’s tip
To avoid damaging the marginal mandibular branch of the facial nerve, keep the incision at least 2 fingers’ breadth below the mandibular border (31.1).

Surgeon’s tip
Incising straight onto the capsule of the submandibular gland and then raising the flap underneath the capsule of the gland protects the marginal mandibular nerve (MMN) which lies in the flap. Alternatively, ligating the facial vein and retracting the vein and surrounding tissue superiorly will also protect the MMN.

Surgeon’s tip
If excising a malignant tumour, dissect in an extracapsular fashion to ensure adequate oncological clearance.
3 Dissection of the floor of the submandibular triangle
Using Allis forceps to grasp the gland, retract it posteriorly. Retract the mylohyoid muscle anterosuperiorly with a Langenbeck retractor and expose the floor of the submandibular triangle (31.2).

4 Excision of the submandibular gland
Using a Lahey swab, identify the lingual nerve and submandibular ganglion in the floor of the submandibular triangle, and free the gland from the ganglion using bipolar diathermy and McIndoe scissors. The hypoglossal nerve may be seen lying more medially in the floor of the submandibular triangle, deep to the anterior belly of the digastric. Identify the submandibular duct and divide and ligate it with 2/0 vicryl.

5 Drainage, closure, and dressing
Insert a size 8 FG vacuum drain into the cavity and suture in place. Close the platysma and deep subcutaneous layer with 2/0 vicryl, and 3/0 prolene to skin.

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**Surgeon’s tip**
Mylohyoid is identified by the direction of its fibres, which run obliquely from anterior to posterior.

**Surgeon’s tip**
The facial artery and vein loop around the posterior border of the gland and should be treated with caution as they bleed briskly if cut! Preserve them if possible by dissecting off the gland capsule, or alternatively divide and ligate them.
Superficial parotidectomy

**SURGICAL STEPS**

1. Positioning the patient
2. Facial nerve monitor positioning and draping
3. Skin incision
4. Facial nerve identification
5. Superficial parotidectomy
6. Sternomastoid flap reconstruction
7. Closure and dressing

**PROCEDURE**

1. **Positioning the patient**
   Position the patient on the operating table head-up, with a sandbag under the shoulders and a head ring. Mark the incision with a sterile marker pen. The senior author advocates the use of a face-lift incision for superficial parotidectomy (32.1). The modified Blair incision is the alternative incision more commonly used (32.2). Inject local anaesthetic and adrenaline in the form of 0.5% lignocaine and 1/200,000 adrenaline.

2. **Facial nerve monitor positioning and draping**
   Apply the facial nerve monitor (see 7.1). Prepare the skin with aqueous betadine. Drape the patient’s head leaving the face exposed.

3. **Skin incision**
   Using a 15 blade, incise the skin and raise the skin flap. Dissect the superficial musculo-aponeurotic system (SMAS) layer as shown (32.3). Expose the capsule of the parotid gland and the anterior border of the sternomastoid muscle.

   Continue dissection 0.5 cm beyond the anterior margin of the parotid tumour. Use 2.0 silk to retract the skin flap anteriorly. Use damp swabs to protect the skin flaps.

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32.1 Face-lift incision for superficial parotidectomy.

32.2 Modified Blair incision.

32.3 Superficial musculo-aponeurotic system incision.
4 Facial nerve identification
Using 15 blade or iris pointed scissors, dissect the anterior margin of the sternomastoid muscle superiorly, as far as the mastoid process. Expose the perichondrium of tragus and the anterior wall of the external auditory canal and connect the incisions. Dissect medially to the anterior border of the sternomastoid muscle until the posterior belly of the digastric muscle is identified.

Dissect the loose connective tissue between the parotid gland and mastoid bone using a mosquito clip until you identify the tympano-mastoid suture.

A small amount of fat separates the facial nerve from the mastoid bone. Using a mosquito clip, expose the facial nerve (32.4, 32.5).

5 Superficial parotidectomy
Using a mosquito clip, follow the main trunk of the facial nerve and its two main divisions. Insert the mosquito clip parallel to the direction of the nerve. Lift the parotid gland away from the nerve and cut between the tips of the mosquito clip with a 15 blade. Repeat this technique as you follow the main trunk of the facial nerve and its branches. Remove the superficial part of the parotid gland which contains the tumour (32.6, 32.7).

Use bipolar diathermy for haemostasis, but avoid manipulating the facial nerve.

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**Surgeon’s tip**
Always remember that the facial nerve will be found at the same depth as the insertion of the posterior belly of digastric muscle.

**Surgeon’s tip**
If unable to identify the facial nerve, alternative techniques include identifying the distal branches and tracing in a retrograde fashion back to the main nerve trunk, or performing a mastoidectomy and tracing the nerve upwards.

**Surgeon’s tip**
The authors advocate the technique of partial superficial parotidectomy for benign disease. In this technique, the tumour is removed with a 1 cm cuff of normal parotid tissue, rather than removing the whole superficial lobe, as traditionally described.

**Surgeon’s tip**
Always use the mosquito clip in a direction parallel to the direction of the facial nerve to avoid injury to the nerve.
6 **Sternomastoid flap reconstruction**

Fill the parotid gland defect using a superiorly-based sternomastoid pedicle muscle flap. Use iris scissors to expose the superficial aspect of sternomastoid muscle. Then create a flap using bipolar cutting diathermy. Stitch the distal end of the pedicled flap into the parotid defect using 3/0 vicryl.

7 **Closure and dressing**

A small vacuum drain is inserted superficial to the sternomastoid flap. Close the preauricular skin incision with 5/0 prolene (32.8). Use skin clips to close postauricular and hairline incisions. Place a piece of cotton wool in the external auditory meatus, a paraffin-impregnated dressing such as Jelonet® dressing over the incision, and apply a head bandage.

/value added

**Surgeon’s tip**

Using a sternomastoid flap to fill the parotid defect improves the cosmetic outcome and reduces the incidence of Frey’s syndrome.

/value added

**Surgeon’s tip**

The author advocates the use of 16 mg intravenous dexamethasone just before the end of the procedure to limit postoperative oedema.
Thyroglossal cyst excision (Sistrunk’s procedure)

SURGICAL STEPS

1 Positioning the patient
2 Incision
3 Mobilising the cyst and central neck dissection
4 Excision of the body of the hyoid bone
5 Haemostasis, drain, and closure

PROCEDURE

1 Positioning the patient
Position the patient on the operating table head-up, with a sandbag under the shoulders and a head ring. Mark the incision with a sterile marker pen and inject 2% lignocaine with 1/80,000 adrenaline using a dental syringe.

2 Incision
Using a 10 blade, make a transverse skin crease incision at the upper margin of the cyst. Incise the skin and subcutaneous fat. Divide and ligate the anterior jugular veins if necessary.

3 Mobilising the cyst and central neck dissection
Using McIndoe scissors and nontoothed forceps, dissect the cyst from surrounding tissues, taking care not to rupture the capsule of the cyst. Superiorly follow the thyroglossal duct up to the level of the body of the hyoid.

4 Excision of the body of the hyoid bone
Mobilise the body of the hyoid bone from its muscle attachments using cutting diathermy. Take care not to damage the thyrohyoid membrane which lies underneath the body of the hyoid bone. Grasp the central portion of the hyoid bone using Allis forceps. Separate the middle third of the hyoid bone using bone cutters (33.1).

Place your index finger in the oral cavity and palpate the tongue base, pushing the tissues of the tongue base forwards (33.2). Using cutting diathermy, continue dissection superiorly, up to the level of the foramen caecum, removing a core of tongue musculature. Take care not to breach the oral mucosa.

5 Haemostasis, drain, and closure
Following haemostasis, insert a size 10 FG vacuum drain. Close the skin in two layers using 3/0 vicryl and 4/0 prolene.
**Surgeon's tip**
The senior author advocates resection of the whole anterior compartment of the neck from the level of the cyst to the body of the hyoid bone. This prevents the possibility of leaving any branches of the duct behind which may then lead to a recurrence.

**Surgeon's tip**
Occasionally, the thyroglossal duct can extend onto the mucosal surface of the tongue base, or your dissection may breach the oral mucosa. If this occurs, it is important to repair the defect to avoid development of an orocutaneous fistula.
Thyroidectomy

Surgical Steps

1. Positioning the patient and incision
2. Elevation of flaps
3. Mobilising the upper pole and localising the carotid gutter
4. Mobilising the lower pole and identifying the inferior parathyroid gland
5. Identifying the recurrent laryngeal nerve (RLN)
6. Division of Berry’s ligament
7. Haemostasis and closure

Procedure

1. Positioning the patient and incision
   Mark the skin crease incision with the patient sitting up in the anaesthetic room. Ensure the anaesthetist uses a RLN monitor endotracheal tube, and that correct positioning of the tube is confirmed. Position the patient on the operating table head-up, with a sandbag under the shoulders and a head ring. Infiltrate the skin with local anaesthetic in the form of 1% lignocaine with 1/200,000 adrenaline. Drape the patient with a head drape and side and body towels.

2. Elevation of flaps
   Using a 10 blade incise the skin and platysma. Divide and ligate the anterior jugular veins if necessary. Elevate the subplatysmal flaps, superiorly to the level of thyroid cartilage and inferiorly to the suprasternal notch. Insert a Jolls retractor. Using McIndoe scissors and forceps, divide the deep investing layer of cervical fascia and strap muscles in the midline. The strap muscles should be preserved, unless access is restricted.

3. Mobilising the upper pole and localising the carotid gutter
   Identify the carotid gutter and ligate the middle thyroid vein. The gutter is carefully dissected to avoid a non-recurrent laryngeal nerve, seen in 1% of cases, on the right side. Mobilise the upper pole, by applying traction on the strap muscles and the carotid sheath using Langenbeck retractors. Place an Allis retractor on the superior pole and retract it downwards and laterally to identify the external branch of superior laryngeal nerve (EBSLN) (34.1, 34.2). Inspect the posterior surface of the thyroid and identify the superior parathyroid gland (SPT), usually at the level of the cricothyroid junction (34.3).
Surgeon’s tip
Division of the sternothyroid muscle superiorly close to its insertion to the thyroid cartilage is often a useful manoeuvre to allow greater exposure of the superior pole and identification of the external laryngeal nerve.

Surgeon’s tip
To avoid damage to the EBSLN be familiar with its course. Identify it within Joll’s triangle and confirm its position with a nerve stimulator.

34.1 Dissection of the superior pole. (EBSLN: external branch of superior laryngeal nerve)

34.2 Dissection of left superior pole.

34.3 Identification of the superior parathyroid gland.
4 Mobilising the lower pole and identifying the inferior parathyroid gland

Identify the trachea below the isthmus in the midline and continue dissection through fascia to free the lower pole. Identify and ligate the inferior thyroid vein close to the gland. Inspect the posterior surface of the thyroid and identify the inferior parathyroid gland. When identified, gently peel back and preserve the gland.

5 Identifying the RLN

Identify the nerve in the tracheo-oesophageal groove by careful dissection with a mosquito clip. Trace the nerve from below the gland to its entry into the larynx on both sides. Full dissection of the nerve is not required. It should not be ‘skeletonised’.

Surgeon’s tip

Aim to identify all the parathyroid glands. Perform extracapsular dissection to preserve the blood supply.

Surgeon’s tip

The right RLN is often more superficial than the left. The nerve may be displaced postero-laterally by Zuckerkandl’s tubercle, a posterolateral protrusion of thyroid tissue. On the right side, the nerve approaches the gland more obliquely.

Surgeon’s tip

The RLN is best identified low down. Here it forms one side of Beahr’s triangle. Beahr’s triangle is bounded by the RLN, inferior thyroid artery (ITA), and common carotid artery (34.4).

Surgeon’s tip

The right RLN is often more superficial than the left. The nerve may be displaced postero-laterally by Zuckerkandl’s tubercle, a posterolateral protrusion of thyroid tissue. On the right side, the nerve approaches the gland more obliquely.

Surgeon’s tip

The RLN is best identified low down. Here it forms one side of Beahr’s triangle. Beahr’s triangle is bounded by the RLN, inferior thyroid artery (ITA), and common carotid artery (34.4).
6 Division of Berry's ligament
Once you have identified the RLN, divide Berry's ligament. The lobe and isthmus are removed. In a hemithyroidectomy, the contralateral lobe is transfixed using 2/0 vicryl. For a total thyroidectomy, repeat the procedure on the contralateral side. Place an adrenaline (1/1,000)-soaked tonsil swab in the wound, while you dissect the other side.

7 Haemostasis and closure
Ensure adequate haemostasis is achieved with a Valsalva manoeuvre and check the RLN and EBSLN. Place an absorbable haemostatic agent such as Surgicel® or Tisseel® in the thyroid bed. It is not the author’s routine practice to insert drains. Close the strap muscles and platysma using 3/0 biosyn. Close skin with a 3/0 vicryl rapide suture and liquid skin adhesive such as Dermabond®. No dressing is applied to the incision.

34.5 Right and left recurrent laryngeal nerves, posterior view.

34.6 Left recurrent laryngeal nerve (arrow).

34.7 Right recurrent laryngeal nerve (arrow).
Neck dissection is divided into different types depending on which lymph nodes are dissected. Table 35.1 shows the terminology used for these procedures. The technique used for a modified radical neck dissection type III (levels I–V) is described.

Modified radical neck dissection type III

**SURGICAL STEPS**

1. Positioning the patient
2. Incision and subplatysmal flaps
3. Level I
4. Identifying XI
5. Level V
6. Levels II, III, IV
7. Haemostasis, drains, and closure
8. Orientating the specimen

**PROCEDURE**

1. **Positioning the patient**
   Position the patient with a sandbag under the shoulders and a head ring, and the operating table head-up. Use a marker pen to indicate the line of incision, which should run from the mastoid tip to the thyroid cartilage – the most commonly used incision is shown (35.1). An inferior limb will be required if level V is to be dissected. Ensure that the trifurcation of the incision does not overlie the carotid sheath. Infiltrate with 20 ml of local anaesthetic in the form of 1% lignocaine with 1/200,000 adrenaline.

2. **Incision and subplatysmal flaps**
   Using a 10 blade, incise through the skin and platysma, preserving the great auricular nerve and external jugular vein in the posterior part of the

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**Table 35.1: DEFINITIONS OF NECK DISSECTION**

<table>
<thead>
<tr>
<th>Type of neck dissection</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Removal of all lymph node groups (levels I–V) with preservation of spinal accessory nerve (XI)</td>
</tr>
<tr>
<td>Type 2</td>
<td>Removal of all lymph node groups (levels I–V) with preservation of XI and the internal jugular vein</td>
</tr>
<tr>
<td>Type 3</td>
<td>Removal of all lymph node groups (levels I–V) with preservation of XI, internal jugular vein and the sternocleidomastoid muscle</td>
</tr>
<tr>
<td>Supraomohyoid</td>
<td>Levels I–III</td>
</tr>
<tr>
<td>Antero-lateral</td>
<td>Levels I–IV</td>
</tr>
<tr>
<td>Lateral</td>
<td>Levels II–IV</td>
</tr>
<tr>
<td>Postero-lateral</td>
<td>II–V and also postauricular and suboccipital lymph nodes</td>
</tr>
<tr>
<td>Anterior/central</td>
<td>VI</td>
</tr>
<tr>
<td>Superior mediastinum</td>
<td>VII</td>
</tr>
</tbody>
</table>

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*Marking the incision.*
incision. Ask your assistant to hold the skin flap under tension with catspaw retractors. Raise subplatysmal flaps, holding the blade parallel to the platysma and staying directly on the under surface of the muscle to avoid damage to the marginal mandibular nerve, which will lie deep to the flap (35.2).

Raise the flap superiorly as far as the border of the mandible. Raise the flap posteriorly as far as the sternocleidomastoid muscle. Use a stay suture to hold flaps in position and damp swabs to protect the flap (35.3).

If dissection of level V is required, dissection of the posterior skin flap should be extended as far as the trapezius muscle. When dissecting the skin flap posterior to the sternocleidomastoid, use your hand to hold the flap, and angle the knife parallel to the flap to protect XI, which runs very superficially in the roof of the posterior triangle (35.4).

**Surgeon’s tip**

If exploring the neck for a deep space neck abscess, make an incision along the anterior border of the sternomastoid, and use blunt finger dissection to retract the sternomastoid and carotid sheath laterally, and thyroid and thyroid vessels medially, thus exposing the abscess and allowing drainage.

### 3 Level I

Identify the submandibular gland and marginal mandibular nerve running over its surface. Using a 15 blade, make an incision 2 fingers’ breadth below the mandible through the fascia of the submandibular gland at its inferior edge, preserving the capsule to ensure oncological clearance. Elevate the fascia, again preserving the capsule, from the lateral aspect of the gland until you reach the superior edge. Beware of bleeding from the facial vein and artery.
Divide and ligate the facial vein with 2/0 vicryl. If possible, preserve the facial artery, in case it is required for microvascular anastomosis. Retract the mylohyoid anteriorly to expose the deep part of the submandibular gland, lingual nerve, submandibular ganglion, and submandibular duct. Ligate the submandibular duct and dissect the deep part of submandibular gland from the floor of the submandibular triangle.

Identify the anterior belly of digastric, and using DeBakey forceps and McIndoe scissors dissect forwards along the surface of the muscle until you reach the submental triangle in the midline. Using Allis forceps retract fibrofatty tissue off the submental triangle, and continue the dissection inferorly towards the thyroid cartilage, staying in the midline.

Using DeBakey forceps and McIndoe scissors dissect posteriorly along the surface of the posterior belly of digastric until you reach the mastoid tip.

4 Identifying XI
Insert Langenbeck retractors, and retract the sternocleidomastoid muscle posteriorly and the posterior belly of digastric superiorly. Using a mosquito clip held parallel to the direction of the carotid sheath, gently divide the loose areolar tissue overlying the cranial nerves and carotid sheath as they exit the skull base. First identify the internal jugular vein (IJV), and the upper sternomastoid branch of the occipital artery which lies on its surface. Divide and ligate this small artery to avoid troublesome bleeding. Immediately below the upper sternomastoid artery, and lying on the lateral surface of the IJV, identify XI, and confirm this with a nerve stimulator.

Surgeon’s tip
The muscles of the floor of the mouth and strap muscles should be skeletonised during your dissection, to ensure that all the lymph nodes have been removed (35.5).

Surgeon’s tip
By dissecting along the surface of the bellies of digastric, you avoid damaging the carotid sheath, XI, and XII which lie deep to the muscle.
5 Level V
Just below the upper sternomastoid branch of the occipital artery, XI enters the sternomastoid muscle. Using a mosquito clip, follow the nerve through the body of the muscle until it divides into two branches, supplying the sternomastoid and trapezius. Follow the trapezius branch of XI as it leaves the posterior margin of the sternocleidomastoid muscle, approximately 1 cm below the great auricular nerve. Skeletonise the nerve as it traverses the roof of the posterior triangle. Use a mosquito clip to lift fibrofatty tissue off the nerve before dividing it, remembering that the course of the nerve becomes more superficial as it passes posteriorly. Hold the nerve out of the dissection field with a nerve sling.

Starting at the superior apex, clear the contents of the posterior triangle as far as the prevertebral fascia medially. Use Allis forceps to retract the fibrofatty tissue anteriorly, and skeletonise the prevertebral fascia using McIndoe scissors. Continue posteriorly as far as the anterior border of the trapezius. Inferiorly, the limit of the dissection lies at the superior edge of the clavicle. In order to prevent bleeding from the supraclavicular and transverse cervical vessels, use a large clip to divide and ligate the fibrofatty tissue of the inferior portion of level V in segments.

Continue dissecting anteriorly until you reach the carotid sheath (35.6).  

6 Levels II, III, IV
Use a 15 blade to incise the fascia of the anterior border of the sternocleidomastoid muscle along its full length. Using Allis forceps, lift the fascia anteriorly and dissect it from the muscle fibres, until the underlying carotid sheath is fully exposed.

Using a 15 blade, dissect from the thyroid cartilage down to the sternal notch in the midline, and reflect fibrofatty tissue posteriorly. Identify the tendon of the omohyoid muscle where it crosses the IJV and divide using cutting diathermy.

Surgeon’s tip
The thoracic duct on the left, phrenic nerve, and brachial plexus lie deep to the prevertebral fascia and are protected from injury. Dissection deep to the prevertebral fascia is not normally necessary unless disease invades the fascia.
Using McIndoe scissors, carefully open the anterior surface of the carotid sheath over the IJV, to avoid damaging X, which lies posteriorly. Open the carotid sheath along its whole length, ligating branches of IJV with 2/0 vicryl. Superiorly, just below the posterior belly of the digastric muscle, identify and preserve XII as it lies medially to IJV.

Join levels I, II, III, and IV with level V underneath the sternomastoid muscle, keeping the specimen en bloc (35.7, 35.8).

7 Haemostasis, drains, and closure
Insert two size 16 drains, ensuring that they do not overlie the carotid sheath, and put the drains on suction while closing the wound. Use 2/0 vicryl to close the platysma and deep subcutaneous layer. Apply skin staples and a transparent dressing such as Tegaderm®.

8 Orientating the specimen
Using 16 G needles, pin the specimen onto a cork board, clearly marking levels of dissection. Alternatively, divide the specimen into separate levels, as agreed with your histology department.

Surgeon’s tip
Level II is divided into IIa and IIb by the accessory nerve. It is important to include level IIb (which lies between the accessory nerve and skull base) in your dissection, as this is a common area for recurrent disease.
SURGICAL STEPS

1. Positioning the patient
2. Confirming the diagnosis and stage
3. Incision and subplatysmal flaps
4. Dividing the strap muscles
5. Hemithyroidectomy
6. Dividing the suprahypophyseal muscles
7. Mobilising the larynx
8. Tracheostomy
9. Entering the pharynx
10. Laryngectomy
11. Cricopharyngeal myotomy
12. Primary tracheoesophageal puncture, speaking valve, and stomagastric tube
13. Closure of the neopharynx
14. Haemostasis, stomaplasty, and closure

PROCEDURE

1. Positioning the patient
Position the patient with a sandbag under the shoulders and a head ring, and the operating table head-up. Use a marker pen to indicate the line of incision, a Gluck Sorenson incision (36.1). Infiltrate with 20 ml of local anaesthetic in the form of 1% lignocaine with 1/200,000 adrenaline.

2. Confirming the diagnosis and stage
Perform direct laryngoscopy to confirm the diagnosis, site, and stage of the tumour.

Surgeon’s tip

If the laryngectomy is being performed with bilateral neck dissection, then the incision should run from the mastoid tip on one side, through the midline at a point half way between the cricoid and sternal notch, to the mastoid tip on the contralateral side (36.1, 36.2). The neck dissection should be performed at the beginning of the procedure (see 35 – Neck dissection). If the laryngectomy is being performed without a neck dissection, the incision is smaller, and runs to the anterior border of sternocleidomastoid on each side, 2 cm below the angle of the mandible.

36.1 Gluck Sorenson incision.
36.2 Incision for bilateral neck dissection.
36.3 Dividing the sternohyoid and sternothyroid muscles.

**Surgeon’s tip**
When mobilising the thyroid lobe which is to be preserved, take care not to traumatisate the superior and inferior pedicles which supply the parathyroid glands.

3 Incision and subplatysmal flaps
Using a 10 blade, incise the skin, subcutaneous fat, and platysma. Ask your assistant to hold the superior skin flap under tension with catspaw retractors. Raise the subplatysmal flap holding the blade parallel to the platysma and staying directly on the undersurface of the muscle, to avoid damage to the marginal mandibular nerve and the anterior jugular veins which lie deep to the flap. Use 2/0 prolene stay sutures to hold the flaps in position, and damp swabs to protect the flaps.

4 Dividing the strap muscles
Using cutting diathermy, divide the sternohyoid and sternothyroid muscles at the level of the thyroid gland (36.3). Divide the omohyoid at its tendon.

5 Hemithyroidectomy
Hemithyroidectomy should be performed on the side of the tumour; where possible the contralateral thyroid lobe should be preserved. Divide the thyroid isthmus (see 34 – Thyroidectomy) and ligate the middle thyroid vein on the affected side. Identify and ligate the inferior and superior pedicles. Divide the recurrent laryngeal nerve. Leave the hemithyroid attached to the trachea, and remove it en bloc with the laryngectomy specimen. On the contralateral side, dissect the thyroid lobe away from the trachea, and preserve it and the attached parathyroid glands (36.4).

6 Dividing the suprahyoid muscles
Using cutting diathermy, divide the suprahyoid muscle attachments from the anterior border of the hyoid bone (36.4). Start in the midline and dissect laterally onto the greater cornu, to avoid inadvertently injuring the hypoglossal nerve.
7 Mobilising the larynx
Using dissecting scissors, divide the pretracheal fascia to separate the carotid sheath from the lateral wall of the larynx on both sides. Continue dissection from the level of the trachea inferiorly to the level of the hyoid bone superiorly. Use cutting diathermy to skeletonise the thyroid cartilage. If possible, preserve the inferior constrictor muscle fibres to help reconstruct the neopharynx.

8 Tracheostomy
Aim to position the tracheostomy between the 2nd to 4th tracheal rings, but if the tumour is subglottic, then the tracheostomy will need to be placed lower than this. Use an 11 blade to enter the trachea, and continue the incision laterally onto the posterior wall of the trachea. Leave the posterior wall of the trachea intact at this stage. Insert a flexible tracheostomy tube (Rusch Montando tube) into the trachea, attach to ventilation, and suture the tube in place on the anterior chest wall (36.5).

9 Entering the pharynx
Palpate the pre-epiglottic space to determine the level of the tip of the epiglottis. Use two pairs of Adson forceps to lift the mucosa of the pharynx on either side of the midline at this level. Use cutting diathermy to enter the pharynx in the midline, grasp the tip of the epiglottis with a Babcock forceps and retract anteriorly.

10 Laryngectomy
Using iris scissors, extend the incision laterally, along the aryepiglottic folds bilaterally. You now have a full view of the larynx and can assess the extent of the disease. Using iris scissors, continue the dissection inferiorly into the piriform fossa, if the disease permits. Place one finger inside the piriform fossa to stretch the mucosa and make dissection easier. Continue dissection posteriorly into the postcricoid region on both sides and mobilise the superior attachment of the larynx. Peel the larynx forward off the oesophagus as far as the tracheostomy inferiorly. You can now resect the posterior wall of the trachea.

Surgeon’s tip
Rotate the laryngeal skeleton away from you in order to bring the greater cornu into view.

Surgeon’s tip
Warn the anaesthetist that you are about to perform the tracheostomy.

Surgeon’s tip
Preserving as much of the piriform fossa mucosa as possible allows pharyngeal closure without tension and reduces the risk of pharyngocutaneous fistula and stenosis.
11 Cricopharyngeal myotomy
Insert your index finger down the lumen of the oesophagus, and rotate the posterior aspect of the oesophagus into view. Using a fresh 15 blade, cut longitudinally down onto your finger, dividing first the longitudinal and then the circular oesophageal muscle fibres. Divide the last few fibres very carefully, to avoid perforating the oesophageal mucosa.

12 Primary tracheoesophageal puncture, speaking valve, and stomagastric tube
Insert a long curved forceps into the upper oesophagus and position the point of the forceps against the posterior wall of the trachea, in the midline, 1 cm below the edge of the tracheal stoma. Use a fresh 15 blade to cut down onto the tip of the forceps, dividing the trachea and oesophagus. Push the tip of the forceps through the hole, grasp the end of a size 16 stomagastric tube, and pull the tube back into the oesophagus. Push the tip down towards the stomach. Use a 2/0 silk suture to secure the stomagastric tube to the anterior chest wall.

13 Closure of the neopharynx
Use a 4/0 vicryl rapide to insert the first stitch at each end of the pharyngeal mucosa. Do not cut the suture, and leave the end of the suture long so you can put a mosquito clip on it. Your assistant gently lifts the suture at both ends to put the mucosal edge under tension. Then continue your running suture horizontally to the opposite side, making sure the suture everts the intraluminal mucosal edges.

Suture the inferior constrictor muscles together over your mucosal repair, to provide a second layer of closure.

14 Haemostasis, stomaplasty, and closure
Ask the anaesthetist to put the patient head down and normalise the blood pressure, to check for any bleeding. Insert two size 16 suction drains, making sure that the drain does not touch the anastomosis, and suture the drains in place with 2/0 prolene. Divide the stay sutures and trim the skin of the upper flap in a semi-circle around the tracheal stoma, so the skin is not under any tension. Use a 2/0 prolene to insert vertical mattress stitches between the skin and the tracheal edge, making sure that you do not leave any cartilage exposed.

Close the neck wound using 3/0 vicryl to platysma and deep subcutaneous tissues, and skin staples. Change the Rusch Montando tube to a double lumen nonfenestrated cuffed tracheostomy tube. Inflate the cuff, and suture the tube in position to avoid using tracheostomy tapes which may put pressure on the neck wound.

*Surgeon’s tip*
An alternative technique for creation of the stoma is to fashion a separate incision in the lower flap, keeping the stoma separate from the Gluck Sorenson incision.

*Surgeon’s tip*
Divide the sternal heads of the sternocleidomastoid to avoid a depressed stoma.
Pectoralis major myocutaneous flap

SURGICAL STEPS

1 Positioning the patient
2 Designing and marking the skin pedicle flap
3 Designing and marking the incision/approach
4 Raising the skin pedicle
5 Delivering the pedicle to the neck
6 Closure

PROCEDURE

1 Positioning the patient
The patient is positioned with a head ring and sand bag under the shoulders. The chest wall is prepared with betadine from the umbilicus to the clavicle.

2 Designing and marking the skin pedicle flap
Design your skin pedicle as shown (37.1a, b) in either a horizontal or vertical position. Avoid including the nipple as part of the pedicle as this will cause a poor cosmetic result.

3 Designing and marking the incision/approach
Mark the deltopectoral flap as shown (37.2a). For horizontal skin pedicles: connect the lower limb of the deltopectoral flap to the pedicle, using an incision along the anterior edge of the axillary fold (37.2b). For vertical skin pedicles: connect the lower limb of the deltopectoral flap to the pedicle with an incision across the chest wall as shown (37.3).

Surgeon’s tip
When determining the position of the pectoralis major flap, take into consideration, and therefore preserve, the possible future use of a deltopectoral flap as shown in 37.3.
4  Raising the skin pedicle
Make the skin pedicle incision using a 10 blade and incise the skin and subcutaneous fat as far as pectoralis fascia.

With a 3/0 vicryl suture, secure the edges of the skin pedicle to the pectoralis fascia to prevent shearing. Now connect the skin pedicle flap to the pectoralis flap with an incision through skin and subcutaneous fat as shown. Use McKindoe scissors to elevate the chest wall skin superior to the pedicle as far as the clavicle. Identify the pectoralis major muscle inferolaterally. Use finger dissection to delineate the plane between pectoralis major and minor muscles and separate the two. Now identify the pectoral branch of the thoracoacromial neurovascular pedicle which is the primary vascular supply for the flap.

Continuing with finger dissection, elevate the pectoralis major flap as far as the clavicle. Make sure you keep the neurovascular pedicle in view at all times and protect it from injury. As you dissect superiorly and approach the superior attachment of the pectoralis major to the clavicle, reduce the width of the flap (medial to lateral width) using McKindoe scissors.

5  Delivering the pedicle to the neck
Once the pedicle is mobilised, create a small tunnel superficial to the clavicle into the neck. Use Babcock forceps to advance the flap back into the neck through the subcutaneous tunnel. Avoid twisting or occluding the vascular pedicle.

6  Closure
A size 16 drain is inserted and the incision closed in two layers using 2/0 vicryl and skin clips.

🌟 Surgeon’s tip
Make sure your incision is slightly oblique to the fascia to include as many perforator vessels to the muscle as possible. This will maximise vascularity of the skin pedicle flap.

🌟🌟 Surgeon’s tip
Free tissue transfer flaps are widely used as an alternative to the pectoralis major flap, e.g. radial forearm flap, anterolateral thigh flap.
CONSIDERATIONS

- Planning
- Z-plasty
- Advancement flap
- Bilobe flap
- Rhomboid flap

Planning

Factors to consider when planning a local flap include:
- Site and size of defect (excision margin depends upon lesion pathology).
- Aesthetic units (38.1).
- Skin quality (patient age, smoker, scars, previous radiotherapy).
- Relaxed skin tension lines (RSTLs) (38.2).
- A variety of local flaps is available; the most common are described below.

38.1 Aesthetic units of the face.

38.2 Relaxed skin tension lines.
Z-plasty

Use the Z-plasty to revise scars by increasing the length of the scar, reorientating the scar, or breaking up a straight scar.

**SURGICAL STEPS**

1. **Positioning the patient**
2. **Draping and local anaesthetic**
3. **Excision of the lesion**
4. **Raising local flaps**
5. **Closure and dressing**

**PROCEDURE**

1. **Positioning the patient**
   Position the patient on a head ring, with the operating table head-up. Mark the extent of the lesion and excision margin. Design the flap, with two lines at angles of 60°, utilising RSTLs.

2. **Draping and local anaesthetic**
   Use a head drape, and prepare the skin with betadine. If the procedure is being done under local anaesthetic, take care to leave the patient’s eyes exposed. Inject subcutaneous local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline to the planned incision site.

3. **Excision of the lesion**
   Using a 15 blade, excise the scar. Ensure that the blade is held at right angles to the skin surface at all times, to avoid ‘bevelling’ the edge. Incise the limbs of the Z-plasty.

4. **Raising local flaps**
   Undermine the skin flaps so that sufficient skin is made available to transpose the tissue from A to B (38.3).

5. **Closure and dressing**
   Suture points A to C and B to D using a 5/0 undyed vicryl (on the face) to anchor the flaps in position. Use 6/0 prolene to close the incisions, making sure to evert the skin edges and avoid closure under tension. Apply chloramphenicol ointment to the wound.

![Diagram of Z-plasty](38.3)
Advancement flap

Advancement flaps are used to advance tissue from one area to another. Burow’s triangles may be used to bring in more tissue for advancement than a simple advancement flap alone.

**SURGICAL STEPS**

1. Positioning the patient
2. Draping and local anaesthetic
3. Excision of the lesion
4. Raising local flaps
5. Closure and dressing

**PROCEDURE**

1. **Positioning the patient**
   Position the patient on a head ring, with the operating table head-up. Mark the extent of the lesion and excision margin. Design the flap, with Burow’s triangles at the base of the flap if extra advancement is required (38.4). Bilateral advancement flaps can be used for larger lesions.

2. **Draping and local anaesthetic**
   Use a head drape, and prepare the skin with betadine. If the procedure is being done under local anaesthetic, take care to leave the patient’s eyes exposed. Inject subcutaneous local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline to the planned incision site.

3. **Excision of the lesion**
   Using a 15 blade, excise the lesion. Ensure that the blade is held at right angles to the skin surface at all times, to avoid ‘bevelling’ the edge. Incise the limbs of the advancement flap, and excise the tissue of Burow’s triangles if necessary.

4. **Raising local flaps**
   Undermine the skin flaps so that sufficient skin is made available to transpose the tissue into the defect.

5. **Closure and dressing**
   Suture the 2 corners of the flap to the top of the defect using a 5/0 undyed vicryl (on the face) to anchor the flap in position. Use 6/0 prolene to close the incisions, making sure to evert the skin edges and avoid closure under tension. Apply chloramphenicol ointment to the wound.
Bilobe flap

Bilobe flap is a rotational flap, which advances tissue from adjacent skin areas, in a circular direction, by using two transposition flaps. It is very useful for filling defects on the side-wall of the nose.

SURGICAL STEPS

1 Positioning the patient
2 Draping and local anaesthetic
3 Excision of the lesion
4 Raising local flaps
5 Closure and dressing

PROCEDURE

1 Positioning the patient
Position the patient on a head ring, with the operating table head-up. Mark the extent of the lesion and excision margin. Design the flap, with two lobes as shown, with the base facing inferiorly to avoid flap oedema (38.5). If the lesion is on the side-wall of the nose, take care that your flap will not cause tension on the lower eyelid and produce an ectropion.

2 Draping and local anaesthetic
Use a head drape, and prepare the skin with betadine. If the procedure is being done under local anaesthetic, take care to leave the patient’s eyes exposed. Inject subcutaneous local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline to the planned incision site.

3 Excision of the lesion
Using a 15 blade, excise the lesion, and incise the skin flaps as marked. Ensure that the blade is held at right angles to the skin surface at all times, to avoid ‘bevelling’ the edge.

4 Raising local flaps
Undermine the skin flaps so that sufficient skin is made available to transpose the tissue from A to donor site, and B to A. Ensure adequate undermining so that defect b can be closed primarily.

5 Closure and dressing
Suture point A to primary defect, B to a, and b is closed primarily using a 5/0 undyed vicryl (on the face) to anchor the flaps in position. Use 6/0 prolene to close the incisions, making sure to evert the skin edges and avoid closure under tension. Apply chloramphenicol ointment to the wound.

Rhomboid flap

Rhomboid flap is a transposition flap with four limbs, which can be closed in a variety of different orientations. The donor site is closed primarily.

SURGICAL STEPS

1 Positioning the patient
2 Draping and local anaesthetic
3 Excision of the lesion
4 Raising local flaps
5 Closure and dressing

38.5 Bilobe flap.
**PROCEDURE**

1 **Positioning the patient**
Position the patient on a head ring with the operating table head-up. Mark the extent of the lesion and excision margin. Design a rhomboid flap around the planned excision margins, with angles of 60° and 120°. Mark a second rhomboid flap starting from the 120° angle of the first rhomboid, which will then transpose into the defect, as shown (38.6). The donor flap may be orientated in one of four ways in order to maximise RSTLs and skin availability.

2 **Draping and local anaesthetic**
Use a head drape, and prepare the skin with betadine. If the procedure is being done under local anaesthetic, take care to leave the patient’s eyes exposed. Inject subcutaneous local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline to the planned incision site.

3 **Excision of the lesion**
Using a 15 blade, excise the lesion, and incise the skin flaps as marked. Ensure that the blade is held at right angles to the skin surface at all times, to avoid ‘bevelling’ the edge.

4 **Raising local flaps**
Undermine the skin flaps so that sufficient skin is made available to transpose the tissue from A and B to donor site.

5 **Closure and dressing**
Suture points A and B to donor site using a 5/0 undyed vicryl (on the face) to anchor the flaps in position. Use 6/0 prolene to close the incisions, making sure to evert the skin edges and avoid closure under tension. Apply chloramphenicol ointment to the wound.

Also demonstrated in 38.7–38.9 is a V–Y advancement flap.
Surgical Steps

1. Positioning the patient
Position the patient on a head ring with the operating table head-up. Turn the patient’s head away from the operative side. A head dressing is used to cover the hair and a self-adhesive drape can be used to cover the whole face.

2. Marking and local anaesthetic
Using a sterile marker pen, mark the inferior crus, the superior crus, and the scapha as in Figure 39.1. Use a 16G needle soaked in methylene blue to mark the planned convexity of both the superior crus and scapha (39.2, 39.3). Pass the needle through the pinna from anterior to posterior. Use capillary action to fill the lumen of the needle with dye, and then withdraw the needle through the cartilage, leaving a tattoo mark.

Inject 2 ml of local anaesthetic and adrenaline in the form of 2% lignocaine and 1/80,000 adrenaline using a dental syringe. Make sure the local anaesthetic is injected subperichondrially. Next, pull the pinna forward and draw an elliptical skin incision on the posterior aspect of the pinna (39.4, 39.5). Inject 2 ml of local anaesthetic and adrenaline.

3. Postauricular incision
Use a 15 blade to excise the marked ellipse of skin on the posterior aspect of the pinna down to the perichondrium. Remove any connective tissue and muscle on the postauricular sulcus down to the periosteum of the mastoid bone. Now dissect the skin anteriorly, towards the helix, until you reach the methylene blue markings (39.6).
4 Cartilage exposure and scoring

Using the 15 blade, incise the cartilage, taking care to avoid perforating the skin of the anterior surface of the pinna. Use a Freer elevator or curved iris scissors to elevate the periosteum of the pinna anteriorly as far as the whole length of the antihelix (39.7).

Use the 15 blade to score the concave surface of the cartilage (39.8).

**Surgeon’s tip**

Two main techniques are available for pinnaplasty – suturing and scoring. The traditional Mustarde technique uses conchoscaphal mattress suturing only.

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39.4, 39.5 Marking the posterior skin incision.

39.6 Dissecting the skin anteriorly.

39.7 Elevating the periosteum of the pinna anteriorly.

39.8 Scoring the concave surface of the cartilage.
5 Cartilage suturing
To create the antihelical fold, first assess the amount of folding necessary by furling the cartilage with index finger and thumb, then place a series of horizontal mattress sutures from the lateral aspect of the posterior pinna to the medial aspect. Place the superior suture first, followed by a further 3–4 mattress sutures as necessary (39.9, 39.10). Only tie when all the sutures are in place, again starting with the superior most suture, adjusting the tightness to achieve the desired effect.

Finally, using a 4/0 absorbable suture, anchor the concha to the periosteum of mastoid bone to correct a deep conchal bowl (39.11).

6 Closure and dressing
Use a 4/0 prolene to close the postauricular incision. Measure the distance between pinna and mastoid bone (39.12) and follow the same procedure on the contralateral side. Make sure the distance on the two sides is the same for a symmetrical cosmetic result. Use a cotton wool ball to block the opening of the external ear canal; use a paraffin impregnated dressing such as Jelonet® to pack the concavities of the pinna and another Jelonet to cover the postauricular incision. Cover both ears with cotton wool and apply a head bandage. The head bandage should not be removed before 1 week postoperatively.
Upper eyelid

SURGICAL STEPS

1. Preoperative marking
2. Positioning the patient
3. Skin incision
4. Resection of skin and muscle
5. Fat pad removal
6. Closure

PROCEDURE

1. Preoperative marking
Mark the lower line of the incision on the superior tarsal border, which corresponds to the lower wrinkle of the upper eyelid. The scar will then lie in a natural skin crease. Mark the upper incision line according to how much excess skin and muscle needs to be removed. Remember to leave at least 2.5 cm of intact skin between the brow and eyelashes (40.1). The two lines meet medially just above the inner canthus and laterally along the crease of the upper eyelid.

2. Positioning the patient
Position the patient on head ring (40.2). This procedure may be performed under local or general anaesthesia. Inject 2 ml of lignocaine with 1/80,000 adrenaline to the incision lines bilaterally. Use a dental syringe to inject the anaesthetic in the subcutaneous layer; avoid injecting anaesthetic into the globe.

3. Skin incision
Use a 15 blade to incise the skin under tension. Start at the medial end of the inferior incision, and continue to the lateral edge. Complete the incision along the superior margin, again starting medially and extending the incision laterally.

Surgeon’s tip

Make sure that you mark the incision with the patient in both supine and upright positions. Always remember that patients may have anatomical variations, and the eyes may not be symmetrical.
4 Resection of skin and muscle
Hold the skin with Adson forceps, and starting laterally excise the skin and orbicularis oculi muscle together. This releases the upper eyelid fat, which lies just beneath the muscle (40.3). If necessary, reduce the thickness of the lateral part of the orbicularis oculi muscle to reduce the chance of irregular or prominent scarring.

5 Fat pad removal
Incise the orbital septum, which lies beneath the orbicularis oculi muscle. Gently press the eyeball so that the fat pad herniates through the orbital septum (40.4). Hold the fat with two Adson forceps and use fine artery forceps to clamp the fat. Use monopolar cutting diathermy to remove the fat above the artery forceps. Release the artery forceps slowly, and use bipolar diathermy to cauterise any bleeding points.

6 Closure
Using 6/0 prolene, close the muscle and skin edges laterally with two or three interrupted sutures. The remainder of the incision can be closed with a continuous 6/0 prolene suture (40.5). Apply ¼-inch steri-strips to the incision.

*: Surgeon’s tip
Incise the orbital septum from lateral to medial, taking care to avoid damaging the lacrimal sac medially.

Lower eyelid – transcutaneous approach

**Surgical steps**

1 Preoperative marking
2 Positioning the patient
3 Skin incision
4 Fat pad removal
5 Resection of skin and muscle
6 Closure

**Procedure**

1 Preoperative marking
Mark the incision 2 mm below the tarsal margin (40.6). Medially the incision starts just below the lower punctum and extends laterally beyond the lateral canthus, following the natural skin crease for approximately 5–10 mm. This incision marking can be made with the patient supine.

2 Positioning the patient
Position the patient on a head ring. This procedure may be performed under local or general anaesthesia. Inject 2 ml of lignocaine with 1/80,000 adrenaline to the incision lines bilaterally. Use a dental syringe to inject the anaesthetic in the subcutaneous layer, avoid injecting anaesthetic into the globe.
3 Skin incision
Use a 15 blade to incise the skin under tension. Start at the medial end of the incision, ensuring that you only incise the skin, exposing the orbicularis oculi muscle. Using blunt iris scissors, cut through the muscle laterally and create a tunnel under the muscle (40.7). Use the scissors to cut the muscle along the line of the skin incision. Use two skin hooks to retract the lower eyelid superiorly and the skin and muscle inferiorly, to expose the medial aspect of the orbicularis muscle. Use a Lahey swab to develop a plane beneath the muscle, as far as the infraorbital rim.

4 Fat pad removal
Use Adson forceps to retract the medial fat pad and decide how much fat to excise. Hold the fat with two Adson forceps and use fine artery forceps to clamp the fat. Use monopolar cutting diathermy to remove the fat above the artery forceps (40.8). Release the artery forceps slowly, and use bipolar diathermy to cauterise any bleeding points. Usually, there is no need to reduce the lateral fat pad.

5 Resection of skin and muscle
If the orbicularis oculi muscle is hypertrophic, excise a narrow strip of muscle using iris scissors. Remove the excess skin, keeping the lower eyelid under tension and excising the skin from lateral to medial. Take great care to excise only a conservative amount of skin, especially medially, to avoid ectropion.

6 Closure
Use 6/0 prolene to close the skin edges laterally. Use two or three interrupted sutures to close the orbicularis muscle and skin together. Complete the closure with a continuous 6/0 prolene suture (40.9). Apply ¼-inch steri-strips to the incision.
SURGICAL STEPS

1 Preoperative marking
2 Positioning the patient
3 Incision
4 Skin elevation and superficial musculo-aponeurotic system (SMAS) dissection
5 Submental dissection
6 Closure and dressing

PROCEDURE

1 Preoperative marking
Mark the patient while in the upright position so that areas such as the jowls, nasolabial folds, and platysmal bands will be emphasised (41.1). Mark the following anatomical landmarks: angle of the mandible, jaw line, zygomatic arch, and the frontal branch of the facial nerve as it crosses the root of the zygoma.

2 Positioning the patient
Infiltrate the incision line and face with local anaesthetic and adrenaline. Minimise local anaesthetic toxicity with the tumescent technique – mix 100 ml of normal saline with 20 ml of 1% lignocaine with 1/200,000 adrenaline. Using a blue needle, infiltrate first the incision, and then change to a spinal needle and infiltrate the subcutaneous layer of the face and neck.

3 Incision
The incision is divided into four parts – temporal, preauricular, postauricular, mastoid/occipital, and differs between males and females. In females the incision starts 2 cm above the tip of the pinna, behind the hairline and then joins the preauricular crease just above the tragus. The incision runs inferiorly across the posterior aspect of the tragus and then 2 mm anterior to the lobule as far as the insertion of the lobule. Continue the incision

Surgeon’s tip
It is important to remember that good infiltration decreases the chances of blood loss and significantly reduces postoperative haematoma and oedema.
postero-superiorly in the postauricular sulcus as far as the level of the external auditory meatus. The incision then runs transversely across the mastoid and into the hairline. Follow the hairline inferiorly for 5–6 cm.

In males, the incision starts 2 cm above the tip of the pinna in the hairline, rather than behind it, then continues in front of the sideburn and turns posteriorly through 90° to a point 2–3 mm anterior to the ear lobule, before continuing as for females. This variation of the incision avoids the patient having hair-bearing skin over the tragus postoperatively or losing the sideburn.

4 Skin elevation and SMAS dissection
Elevate the skin starting at the postauricular incision. The subcutaneous tissue is adherent to the sternomastoid fascia at its insertion to the mastoid tip. Dissect this carefully using a 15 blade until you reach the lateral border of the sternomastoid muscle. Continue the dissection in a subcutaneous plane anteroinferiorly as far as necessary (41.2). This dissection may connect with the dissection already made through the submental incision (see step 5).

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41.2 Incision of SMAS.

Surgeon’s tip
To ensure a good cosmetic result, leave 2–3 mm of skin below the ear lobe before the incision turns postero-superiorly – otherwise the lobule will look unnatural.

Surgeon’s tip
This chapter describes the most commonly used SMAS lift. Modifications include the supra-SMAS or sub-SMAS face lift, the neck lift, midface lift, or mini lift.
Continue with elevation of the SMAS layer in the temporal region if necessary (when there is excess tissue at the side of the brow or in the orbital region). The dissection continues superiorly over the temporalis fascia, which fuses with the SMAS layer. The preauricular elevation is continued superiorly as far as just below the zygomatic arch superiorly and anteriorly as far as the insertion of the SMAS layer to skin.

Identify the SMAS layer anterior to the tragus, superficial to the parotid fascia. Dissect the sub-SMAS layer, on the deep surface of the SMAS, as far as the anterior border of the parotid. Insert two 3/0 prolene sutures, one superiorly from the SMAS to the temporalis fascia (41.3), and the other posteroinferiorly to the mastoid tip. These sutures provide vector retraction of the SMAS (41.4).

**Surgeon’s tip**
Take great care at this point of SMAS dissection, to avoid damaging the facial artery, vein, and the temporal branch of the facial nerve which lie on the lateral surface of the temporalis muscle.

**Surgeon’s tip**
Where there is a great deal of tissue to be retracted, excess SMAS layer may need to be trimmed before placing the vector sutures.
5 Submental dissection
Using a 15 blade, make an incision along the submental skin crease to access the subcutaneous and submental fat in the midline of the neck. Remove the fat under direct vision using McIndoe scissors. Once the submental fat has been removed, suture the anterior borders of the platysma together using a 3/0 vicryl, to improve the cervicomental angle.

6 Closure and dressing
Remove any excess skin around the pinna (41.5). Retract the skin posteriorly and assess the amount of excess skin anterior to the pinna before excising it with McIndoe scissors. Then retract the postauricular skin in a superior direction, and excise any redundant skin (41.6). Insert a size 8 redivac drain. Avoid tension along the skin edges to prevent unsightly scarring. Close the deep subcutaneous layer with interrupted 4/0 undyed vicryl. For skin, use 6/0 prolene for the preauricular part of the incision, 5/0 prolene for the postauricular part, and skin clips for the hair-bearing part (41.7).
Apply a pressure bandage for 24 hours (41.8).
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Designed for trainees at all levels, ENT and Head and Neck Procedures: An Operative Guide provides concise, step-by-step instructions to the core otolaryngology, head and neck, and facial plastics procedures that surgeons are likely to encounter in daily practice. Convenient and portable, this guide provides enough information to allow trainees to perform the operations themselves under appropriate supervision.

Concise surgical steps for each procedure are followed by detailed explanations. Clear diagrams and photographs demonstrate the important stages of each operation. Surgeons’ tips bridge the gap between the theory and what actually works on the operating table. The book also includes an easy reference table of complications that should be discussed with the patient when obtaining consent.

The authors have used their wealth of experience to write a practical guide that will give trainees the skills as well as the confidence they will need in the surgical arena.

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