Introduction

The most common condition affecting the temporo-mandibular region is temporomandibular dysfunction, or myofascial pain dysfunction. This may be associated with a clicking of the temporomandibular joint. This is a disorder characterised by pain and masticatory muscle spasm and limited jaw opening, which is treated by conservative measures such as soft diet, analgesics, occlusal splint therapy or physiotherapy. Intransigent cases may respond to psychotropic therapy.

Conditions affecting the temporomandibular joint (TMJ) that might require surgery are listed in Table 20.1. A detailed knowledge of the anatomy of the TMJ is necessary and an overview of this follows, with aspects of the history and examination of the patient and details of the investigations that are a prerequisite to appropriate surgical care. This is followed by a discussion of the procedures available for the surgical management of TMJ disorders (Table 20.2).

Anatomy of the temporomandibular joint (TMJ)

The TMJ is a synovial joint with articular surfaces made up of fibrocartilage. Fibrocartilage is adapted to take shearing forces, rather than the compressive forces that act on the hyaline cartilage in the knee joint. The TMJ has an upper and a lower compartment separated by a cartilaginous meniscus. The non-articular surfaces are lined by a synovial membrane, which produces the synovial fluid that lubricates the joint and nourishes the cartilage (Fig. 20.1).

The only time that the joint is loaded is when eating or clenching. When speaking or relaxed the teeth are

Table 20.1  Surgical conditions of the temporomandibular joint

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal joint derangement</td>
</tr>
<tr>
<td>Recurrent dislocation</td>
</tr>
<tr>
<td>Traumatic injury</td>
</tr>
<tr>
<td>Arthritic conditions</td>
</tr>
<tr>
<td>Ankylosis</td>
</tr>
<tr>
<td>Tumours</td>
</tr>
</tbody>
</table>

Table 20.2  Surgical procedures for the temporomandibular joint (TMJ)

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthrocentesis</td>
</tr>
<tr>
<td>TMJ arthroscopy</td>
</tr>
<tr>
<td>Meniscal plication</td>
</tr>
<tr>
<td>Meniscectomy</td>
</tr>
<tr>
<td>Eminectomy</td>
</tr>
<tr>
<td>Dautrey procedure</td>
</tr>
<tr>
<td>Condylotomy</td>
</tr>
<tr>
<td>Condylectomy</td>
</tr>
<tr>
<td>TMJ reconstruction</td>
</tr>
</tbody>
</table>

Fig. 20.1  The anatomy of the temporomandibular joint. A, bilaminar zone; B, condylar head; C, mandibular eminence; D, glenoid fossa.
apart. When the jaws are closed much of the force is transmitted through the teeth into the facial bones but some of the forces will go into the jaw joints.

The joints are supported by ligaments, which surround the joint capsule. Movement is by the action of the masticatory muscles and information from proprioceptors in the mouth and particularly in the periodontal ligament allow coordination of all components when chewing or speaking. Injury or damage to any of these components affects jaw function.

**Investigations**

Investigations of the temporomandibular joint include history, examination and special investigations, and these are discussed in turn.

**History**

The patient’s presenting symptoms should be noted. Symptoms might include pain, swelling, clicking, crackling in the preauricular region and limitation of jaw opening. There may also be an accompanying generalised facial ache or a numb sensation over the masseter muscles. When asked about pain, if a patient points to the preauricular region then the pain is likely to be in the TMJ, but if the patient puts a hand over the side of the face as the area of pain then it is likely to be muscular pain. There is often a combination of both in arthromyalgia.

TMJ symptoms must be distinguished from other conditions in the orofacial regions.

Previous symptoms, duration and potential causes of the symptoms such as trauma should be elicited from the patient. Any activity that exacerbates or relieves the condition should be noted. Chewing, yawning or parafunctional habits can aggravate TMJ disease.

A full medical and drug history should be taken, as well as a family and social history. Of particular relevance are traumatic life events such as bereavement, a house or job move or a divorce. Stress is a common factor in TM dysfunction.

**Examination**

A general examination of the head and neck should be carried out, paying particular attention to tenderness in the sternomastoid and temporal muscles. The angle of the jaw may be tender where the medial pterygoid muscle is attached.

Palpation of the TMJs may cause pain and, on movement, clicking or crepitations may be felt or even heard.

On intraoral examination the patient may have limited opening (normal interincisal opening 40–50 mm). There may be deviation of the jaw to one side when asked to open widely due to limitation of movement from that side (normal lateral movement 10 mm to each side).

Palpation of the masseter muscles and the pterygoid muscles should be carried out. To palpate the pterygoid muscles the patient should be asked to deviate the jaw to the side being examined to allow a finger to be passed along the upper buccal sulcus backwards between the ramus of the mandible and the tuberosity of the maxilla. Behind the tuberosity are the pterygoid plates – the origin of the pterygoid muscles. This site is often tender in TM dysfunction, due to muscle spasm and fatigue.

**Special investigations**

The special investigations which may be considered are listed in Table 20.3.

Plain radiographs include an orthopantomogram, and transcranial and transpharyngeal views of the TMJ. These images give information about the bone structure. Open and closed views will give some indication about jaw mobility.

Arthrography is an invasive investigation using a radiopaque dye, which is injected into the upper joint compartment, the lower joint compartment or a combination of both. This technique can provide information about the internal structures of the joint. The cartilaginous meniscus is outlined. The procedure is usually carried out under videofluoroscopy so that the joint can be imaged in motion. Disc displacement and perforations can be identified. However, extravasation of dye into surrounding tissues will spoil the investigation. With newer imaging techniques this method is now less frequently used.

Computerised tomography (CT) scanning can give a lot of information about the bony relations and bone.

### Table 20.3 Investigation of temporomandibular joint pathology

<table>
<thead>
<tr>
<th>Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain radiographs</td>
</tr>
<tr>
<td>Arthrography</td>
</tr>
<tr>
<td>CT scan</td>
</tr>
<tr>
<td>MRI scan</td>
</tr>
</tbody>
</table>
quality of the TMJs. It gives axial views and computer-generated coronal views; it can also give three-dimensional images. This method is very helpful in providing information about trauma to the joint, bony disease in the joint and ankylosis.

Magnetic resonance imaging (MRI) images the soft tissues and is helpful in identifying disc position. It can demonstrate disc perforation and joint effusions. It may also pick out adhesions within the joint. It does give information about the bone but it is not as good as a CT scan.

**Surgical management**

**Arthrocentesis**

Arthrocentesis is a method of flushing out the TMJ by placing a needle into the upper joint compartment using local or general anaesthesia. Ringer’s lactate (see Ch. 5) is injected into the joint. This compartment will take up to 5 mL of fluid. By filling under pressure, any minor adhesions are broken down or lysed. A second needle placed into the same joint compartment allows through-flow of fluid to be achieved. This allows thorough washing or lavage of the joint. The process is referred to as ‘lysis and lavage’ and can produce good therapeutic outcomes. It has a particular roll in cases of acute closed lock. In this situation, the meniscus is usually jammed in front of the condyle, preventing translatory movement. By ballooning-up the joint the potential space becomes real and the meniscus may have room to reduce to its normal position. The lavage will wash-out products of inflammation, creating a better environment for healing. Sodium hyaluronate can be injected at the end of the procedure to improve joint lubrication.

**TMJ arthroscopy**

TMJ arthroscopy can be used both as a diagnostic tool and as a treatment modality. The synovium, joint and meniscal cartilage can be visualised.

The standard technique for TMJ arthroscopy is via a lateral approach. The upper joint compartment, where most of the translatory movement occurs, is entered with a 21 gauge needle posteriorly. After insufflation of the joint with Ringer’s lactate, through-flow of fluid is established via a second 19 gauge needle placed anteriorly in the joint space. A trochar and cannula are then introduced into the space created by the fluid in the joint. The trochar is removed and replaced by the arthroscope. An outport second cannula may be inserted anteriorly into the joint for instrumentation – the working cannula. The upper joint compartment can then be examined for synovitis, displacement of the meniscus, adhesions between meniscus and the joint fossa and other pathology.

If adhesions are seen they can be divided with very small scissors inserted through the working cannula. It is possible in some cases to reduce a dislocated meniscus, biopsy cartilage or synovium, remove loose bodies (fragments of cartilage floating in the joint) and reduce the joint eminence with rotary instruments. Drugs such as corticosteroids or sodium hyaluronate may be injected into the joint to reduce inflammation and improve lubrication respectively.

Splint therapy, soft diet and analgesics are used as part of the postoperative management. The patient is also instructed in gentle jaw stretching exercises.

**Meniscal plication**

When conservative management has not caused improvement after a period of 4–6 months, and arthrocentesis or arthroscopy have failed to correct meniscal dislocation, then open arthrotomy should be considered.

The usual approach is via a preauricular incision (Fig. 20.2). Once the joint is exposed, entry is made into the upper joint compartment and the position of the meniscus identified. Any adhesions are released and the meniscus is repositioned and fixed with sutures from the lateral aspect of the cartilage and posteriorly into the temporal muscle and fascia. Some surgeons will also enter the lower joint space to increase the mobilisation of the meniscus and remove a wedge of retrodiscal tissue, stitch or plicate the defect created with retrodiscal sutures, repositioning the meniscus more posteriorly. Sometimes these procedures are combined with an eminectomy to increase joint space.

Postoperative management is similar to that of arthroscopy. Physical therapy is important as there is inevitably a degree of scarring following this surgery.

**Meniscectomy**

This procedure is not commonly performed in the UK but there have been reports of successful outcomes in patients suffering from internal joint derangement by this
method. Essentially, the approach is the same as that for meniscal plication. Once the meniscus is identified the cartilaginous part is excised. There is uncertainty about long-term effects this may have on the joint.

**Eminectomy**

This procedure is used for recurrent jaw dislocation. The approach is the same as for the plication procedure. The joint eminence, which lies anteriorly to the fossa, has to be well exposed. The eminence is then excised by a combination of bur cuts and a fine osteotome (Fig. 20.3). The theory is that by taking away this eminence over which the joint head sticks, the joint head has no obstruction to prevent its return into the fossa.

**Dautrey procedure**

This procedure is another method of stopping TMJ dislocation. The approach is again exposure of the joint via the preauricular incision. The eminence is again exposed but in this procedure the anterior part of the eminence, which is attached to the zygomatic arch, is incised in a more vertical direction (Fig. 20.4). This anterior portion is fractured-off and, still attached anteriorly to the zygomatic arch, is swung downwards and wedged against the remaining eminence to augment the eminence. In theory, because of the increase in eminence height, the condyle is unable to dislocate. Other methods of eminence augmentation have been described, for example bone graft augmentation.
**Condylotomy**

This technique for treating painful TMJs originally used a blind external approach using a Gigli saw. Nowadays this procedure is carried out via an intraoral approach. The lateral aspect of the ramus of the mandible is exposed and a cut is made below the condyle with an oscillating saw. It may be subcondylar or subsigmoid (Fig. 20.5). This causes reduced pressure on the meniscus and anterior movement of the condylar head, which reduces pain and often allows reduction of the displaced joint meniscus.

**Condylectomy**

Condylectomy is usually performed when there is either ankylosis or pathology of the TMJ. A preauricular approach is used and, once the condyle is well exposed, it is cut at the neck of the joint and removed. This procedure is generally combined with joint reconstruction.

**TMJ reconstruction**

On rare occasions the TMJ requires reconstruction. To date no replacement adequately replaces the normal TMJ. Indications for joint reconstruction are listed in Table 20.4.

The goal of treatment is to restore the mandible and TMJ to as near normal an anatomical state. Partial or total TMJ reconstruction may be required; partial reconstruction may be indicated. There are fossa prostheses but these are usually used in conjunction with condylar replacement.

Various synthetic materials or alloplasts have been used for meniscus replacement (e.g. Teflon®). These materials can cause a foreign body giant cell reaction, which is relentless in its destruction of surrounding tissues. For this reason, these materials are now rarely used. Autogenous grafts such as auricular cartilage and dermis are sometimes used. Potential complications from these grafts are disruption or displacement, cyst formation with the dermal graft and fibrous ankylosis.

Ankylosis may be treated with a temporalis muscle flap, gap arthroplasty or total joint reconstruction.

The usual method in gap arthroplasty is by parallel cuts approximately 1 cm apart from the sigmoid notch to the posterior ramus (Fig. 20.6). Interpositional material can be placed to reduce union. Alloplasts such as Silastic® or a chrome–cobalt cap prosthesis have been used.

Suturing medial pterygoid and masseter muscles together above the ramus stump is a biological interpositional graft.

Most surgery for ankylosis is carried out through the preauricular approach but when joint replacement is required a submandibular incision is used for access to the ramus for a combined approach. A method of biological reconstruction of the TMJ is the use of an inferiorly based temporalis muscle flap, which is rotated anteriorly beneath the zygomatic arch as an interpositional material (Fig. 20.7).
Total joint reconstruction is required where there is no functional joint plus loss of ramus height. This may be necessary where there has been severe trauma, ankylosis, tumour resection or a developmental abnormality such as hemifacial microsomia. Costochondral grafts or vascularised free bone grafts such as the second metatarsal bone from the foot could be used in combination with an interpositional temporalis muscle graft. The most satisfactory method of total joint reconstruction is the combination of the temporalis muscle flap and an autogenous costochondral rib graft (Fig. 20.8).

Several prosthetic joint replacement systems have been devised to replace both glenoid fossa and condyle. Some have had problems from chronic foreign body giant cell reactions to the synthetic materials.

Surgery is not the endpoint of treatment. The postoperative phase, as in all surgery, is very important and neglect in this area is often a reason for failure. Analgesic and anti-inflammatory medications are usually indicated and physical therapy is essential, with jaw opening exercises plus lateral and protrusive movement exercises.