Most diseases arising between the clavicles and skull base (and even beyond) have been reported as associated with otalgia, a pain in or around the ear.

**Neurophysiology of pain**

- The International Association for the Study of Pain has defined pain as 'an unpleasant sensory or emotional experience associated with actual or potential tissue damage or expressed in terms of such damage'.
- Most otalgia is mediated via unmyelinated pain fibres, which characteristically cause a diffuse dull ache. Myelinated fibres, such as supply skin or dental enamel, are associated with much better localization and easier diagnosis.

**Neuroanatomy**

- A central common pathway for otalgia, whether primary or referred, is probably the spinal tract nucleus of the trigeminal nerve. Fibres from cranial nerves V, VII, IX and X and cervical nerves C2, C3 converge here and all play some role in sensory supply of the ear and temporal bone.
- Auriculotemporal Branch ➔ EAC + Pinna + TMJ
- The facial nerve makes a smaller contribution, providing some sensory input from the posterior tympanic membrane and external canal and the bowl of the concha.
- Cranial nerve IX innervates the posterior external canal, meatus and tympanic membrane, but also the ipsilateral oropharynx. Its tympanic branch (Jacobson's nerve) forms the tympanic plexus, innervating the middle ear cleft.
- The auricular branch of the vagus (Arnold's nerve) has a similar otologic distribution, but cranial nerve X has a vast dispersion to the viscera of the neck and even mediastinum.

**Bullous myringitis**

- Bullous myringitis is characterized by an acute and severe unilateral earache, during, or immediately following an upper respiratory tract infection (URTI).
- Children or young adults are commonly affected and will demonstrate serosanguineous blisters on the tympanic membrane or deep meatal skin.
- An occasional associated sensorineural hearing loss can lead to confusion with Ramsay-Hunt syndrome, but, in bullous myringitis, serology will not demonstrate herpes simplex/ zoster infection and the vesicles characteristically contain blood, between the outer and middle layers of the tympanic membrane.
- Bullous myringitis may simply represent a variant of acute otitis media (AOM). Influenza has been implicated. One evidence of *Mycoplasma pneumonia* too.
**CAUSES INCLUDE:**

**EXTERNAL EAR DISEASES:**
- OE, Malignant OE, Bullous Myringitis.

**MIDDLE EAR DISEASE:**
- Acute otitis media (No need antibiotics to relieve pain)
- Acute mastoiditis

**DEEP TEMPORAL BONE AND INFRATEMPORAL FOSSA**
- Petrous apex erosion
- Adenoid cystic carcinoma

**INNER EAR DISEASE**
- Vestibular schwannoma

**DENTAL DISEASE**
- **Caries**:
  - The neurovascular bundle supplying a tooth lies in the deep central pulp. Caries and necrosis of this core causes a dull ache, which, being mediated by unmyelinated nerve fibres, is poorly localized.
  - Acute pulpitis is associated with sudden exacerbations of pain and only local radiation.
  - The ache of chronic pulpitis is more diffuse and the tooth becomes hot/cold sensitive.
  - In contrast, the **Myelinated innervation of Dentine, Enamel And Periodontium** produces a more confined throbbing pain and tenderness to percussion

**TEMPOROMANDIBULAR JOINT DYSFUNCTION**
- Not from TMJ but from masticatory muscles.
- Indeed, the disc and articular surfaces lack any innervation.
- True joint pain, as seen in rheumatoid arthritis or gout, can however arise from the:
  - Capsule
  - Collateral ligaments;
  - Retrodiscal bilaminar fold;
  - Exposed subcortical bone;
  - Synovial proliferation

**Clinical features**
- The cardinal features of temporomandibular disorder (TMD) are:
  - Pain around the TMJ.
  - Trismus.
  - Joint sounds or crepitus.
  - Tenderness of the joint or associated muscles, the pterygoids and posterior belly of digastric.
Intraoral palpation between the zygomatic arch and coronoid process of the mandible may reveal tenderness of the lateral pterygoid.

**Radiology**

Radiology rarely contributes to diagnosis, but MRI can demonstrate joint effusion or internal derangement of the joint.

**Costen's syndrome**

Several otologic symptoms often associated with TMD have been traditionally grouped into Costen's syndrome otalgia, tinnitus, a sense of impaired hearing and even vertigo have been implicated. (TVSO)

Certainly active treatment of TMD has been claimed to relieve such complaints.

**Management**

- The mainstay of treatment for TMD is rest, a soft diet and avoidance of excessive chewing.
- Nonsteroidal anti-inflammatory drugs may be a useful temporary measure.
- Auriculotemporal nerve block can be a useful confirmatory diagnostic test, but TMJ surgery is a last resort.

**NASAL DISEASE**

- Referred otalgia is a relatively minor feature of paranasal sinus disease.

**ORAL, OROPHARYNGEAL AND HYOPHARYNGEAL DISEASE**

- Post-tonsillectomy
- Occult malignancy
- Significant otalgia, a feature of laryngeal cancer and tuberculosis, suggests cartilage involvement and an unfavourable prognosis.

**NEURALGIAS**

- Earache is one minor feature of many disorders causing facial pain, e.g. trigeminal neuralgia or paroxysmal hemicranias.
- Neuralgias of various cranial nerves or of their subdivisions have been suggested based on:
  - The site of the pain corresponding to a recognized nerve distribution;
  - A beneficial effect from surgery to the implicated nerve.

**GLOSSOPHARYNGEAL NEURALGIA**

- The glossopharyngeal nerve has been called the neglected cranial nerve, as it is small, inconspicuous to the surgeon and innervates no major structure in isolation.
- Sufferer have paroxysms of severe unilateral pain in the nerve's wide distribution, either spontaneously or through stimulation of trigger zones.
- It is fortunately much rarer than trigeminal neuralgia and runs a more benign course.
SYMPTOMS

- The literature describes **two clinical types**: the **tympanic** causing otalgia and the **oropharyngeal** affecting the posterior oropharyngeal wall, tonsillar fossa and tongue base.

AETIOLOGY

- **Idiopathic or primary glossopharyngeal neuralgia** is the result of neural hyper excitability and many authors implicate vascular compromise by a loop of the posterior inferior cerebellar artery (PICA).
- **Cranial root injury** has long been suspected in GPN and histologic changes, includes **patchy demyelination**, very similar to those found in trigeminal neuralgia, have been demonstrated.
- **Compression** of vagus and **glossopharyngeal** nerves by the brainstem herniation of **Chiari type I** malformation has also been reported as causing GPN and cardiac syncope.

MEDICAL MANAGEMENT

- Anticonvulsant drugs have been used for chronic neuropathic pain.
- Carbamazapine and Phenytoin
- Although increasingly used, there is no evidence that gabapentin is superior to carbamazepine,
- Ketamine tried

SURGERY

- Surgery has conventionally concentrated on destructive procedures, i.e. rhizotomy of cranial nerves IX and X.

GENICULATE NEURALGIA

- Also known as tic doloureux of the nervus intermedius.
- Characteristic severe paroxysmal neuralgic pain deep in the ear.
- Typically, the pain was of gradual onset, dull and persistent but with occasional sharp, stabbing exacerbations.
- Pain extending to the neck, face or temple should rule out the diagnosis.

AETIOLOGY

- Aetiology has been ascribed to **vascular adhesions, arachnoid thickening, benign osteoma and Lyme disease**.

SURGERY

- The literature stresses surgical management, concentrated on the geniculate ganglion and/or nervus intermedius.
- Pain fibres passing from the geniculate ganglion to the brain are not confined to the nervus intermedius, but are also present in the motor trunk of the facial nerve. So the section of the nervus intermedius alone would be inadequate.
Ganglion cells could be shaved off the anterior convexity of the first genu of the facial nerve via a middle cranial fossa approach without sacrificing motor function.

**Stylohyoid syndrome**

If primary glossopharyngeal neuralgia is an ill-defined phenomenon, the diagnosis of GPN secondary to an elongated styloid process is an even more controversial entity.

**PRESENTATION**

- **EAGLE** described two clinical presentations, the classical **stylohyoid** syndrome and a **stylocarotid** syndrome. The former, he felt, almost invariably arose following tonsillectomy, with a dull ache in the lateral oropharynx and ipsilateral ear. The latter was said to develop spontaneously, with cervical, ocular and facial pain and be due to carotid artery irritation.
- **Stylocarotid Syndrome** should be differentiated from **Carotidynia** which is characterized by pain over carotid bifurcation.

**INVESTIGATION**

- The normal styloid process is 2.5 cm long and is generally accepted to be elongated if exceeding 4 cm.
- X ray
- CT scan

**SURGERY**

- Pain on deep palpation of the tonsillar fossa, with CT imaging to suggest either elongation of the styloid process or calcification of the stylohyoid apparatus, may indicate surgery.