FORAMEN TYMPANICUM- AN EMBRYOLOGICAL DEFECT IN TYMPANIC PLATE

Anatomy

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ABSTRACT

Foramen tympanicum or Foramen Huschke is a bony defect in the tympanic part of temporal bone that persists after 5 years of age. Due to this, there is a chance of discharge in the ear leading to persistent otitis externa, herniation of soft tissue into auditory canal and due to the communication there is higher chances of parotid infections to be transmitted into the EAC. The present study was conducted on 40 dried human crania. The tympanic part of temporal bone that forms the inferior wall of external auditory canal was studied to find any developmental defect - foramen tympanicum. Out of all crania studied, foramen tympanicum was observed on right side in two crania and on both sides in one cranium. The persistent foramen can produce clinical complications like fistula formation or herniation of tissues into external auditory canal. Knowledge of this embryological defect is useful for ENT and Maxillofacial surgeons to avoid complications during operative procedures of this region and also to diagnose rare clinical presentations like persistent or chronic pain in the region of Temporomandibular joint.

KEYWORDS

Temporal bone, Tympanic plate, External auditory canal, Herniation

INTRODUCTION:

Foramen tympanicum is a developmental anomaly in the tympanic plate of temporal bone. The foramen was first described by German anatomist and embryologist Professor Emil Huschke in 1889. Hence it is also called as foramen of Huschke. The foramen is related to anteroinferior wall of external auditory canal, which is formed by tympanic plate. It may present in the centre or in the margin of the tympanic plate. It is of irregular in shape but may be of oval, circular or pinpoint in shape. Persistent foramen establishes a connection between the external acoustic canal and the mandibular fossa (1,2). It can be either asymptomatic or symptomatic. Persistent foramen of variable size may lead to complications like discharge into external auditory canal and fistula between temporomandibular joint and external auditory canal. Clinicians should be aware of presence of foramen tympanicum in radiological evaluation of Temporomandibular joint and external auditory canal prior to surgery to avoid intra operative complications and infections of these regions.

MATERIALS & METHODS:

The study was conducted in the department of Anatomy, GIMSIR on the 40 dried human crania. The crania without any damage in the tympanic region were included in the study. The base of skull was studied at the region of mandibular fossa. Tympanic plate that forms the anteroinferior boundary of external acoustic meatus was studied to find any foramen in the bone. The foramen that creates a communication between external auditory canal and mandibular fossa was found, it was identified as foramen tympanicum and studied in detail. The number and size of foramen tympanicum was observed with its unilateral and bilateral presence. The size of the foramen was measured with digital vernier calipers.

Observations:

All the 40 crania were studied in the region of the mandibular fossa. The mandibular fossa had articular and non articular parts. The tympanic part of temporal bone that forms the non articular part of mandibular fossa and it forms the anteroinferior wall of external auditory canal. A deficiency or foramen was observed in the tympanic plate of temporal bone in 3 crania and it was normal in all other crania. The foramen Huschke was irregular in size and shape in these crania.

Foramen tympanicum was found on right side in two crania and on both sides in one cranium.

Unilateral foramen was identified on right side in two crania. The shape was round in one cranium and oval in another cranium. The round foramen measured 1mm and oval foramen measured 2.3mm in size. (Fig.1)

Fig.1 Showing unilateral foramen tympanicum

Bilateral foramen was observed in one cranium and the shape was irregular on both sides and measured 3.5mm on left side and 3.68 on right side. (fig.2)

Fig.2 Showing bilateral foramen tympanicum

DISCUSSION:

The temporal bone comprises of squamous part, petrous part, mastoid part, and tympanic part. The external auditory canal and tympanic cavity develop mostly from the tympanic portion of the temporal bone. Foramen tympanicum occurs due to a congenital defect during the ossification process that leaves a bony defect in the tympanic plate. Thus an opening is formed in the floor of external acoustic meatus establishing communication with temporomandibular joint. Normally this opening closes by the age of 5 years, but sometimes it persists as foramen tympanicum. It is located posteromedial to the temporomandibular joint and anteroinferior of the external auditory canal. The foramen of Huschke has a specified location but not a specified size; Cadaver studies showed a variation of the foramen width in the range of 1-5 mm (3).

The incidence of foramen tympanicum varies from 0.6% to 46%. Foramen tympanicum was most prevalent in Asia and most frequently observed in females than males and it is more prevalent on left side. Persistent foramen tympanicum was reported from different parts of India. Higher rates of persistent foramen tympanicum of Indian origin could be due to ethnic variation (4).

Chauhan Renee et al and Yadav Yogesh et al observed both unilateral and bilateral presence of foramen. They observed pin point, pin head, circular, triangular, irregular and U-shaped foramen in their study(5,6)

Persistent foramen tympanicum leads to herniation of soft tissue from temporomandibular joint(TMJ) into external auditor canal and it may cause pain and dysfunction of TMJ(7). The herniation is easily identified when the patient mouth is closed. Presence of foramen tympanicum may also cause ear injury during TMJ arthoscopy and otologic complications like persistent otitis externa , tympanic rupture ,dislocation of incus , injury to facial nerve ,ear infections ,salivary gland fistula have been reported due to this foramen. Cadaveric studies reported high incidence of FT compared to radiological studies and new imaging techniques like cone beam CT scan will accurately evaluate the anatomical variations of foramen tympanicum .

The protrusion of soft tissue into the external auditory canal (EAC) through the foramen of Huschke can mimic a mass lesion in the EAC. The difference between TMJ soft-tissue herniation and mass lesions can be made with EAC inspection with the patient with an opened mouth because protruded TMJ tissue will retract in this position(8,9)

Foramen tympanicum is a congenital defect during the ossification process that leaves a bony defect in the tympanic plate(10) . The EAC is incompletely formed at birth and during the first year of life, the anterior and posterior processes of the tympanic plate grow towards each other to fuse and form the tympanic plate(11) . This process continues till the age of 5 years. Any defect in encroachment of this ossifying plate results in foramen formation in tympanic plate as foramen tympanicum that maintains a continuity between mandibular fossa and external auditory canal.

CONCLUSION:

Foramen tympanicum is an embryological bony defect that occurs in the tympanic plate of temporal bone. It's location is specific but vary in size and shape. This foramen may remain as asymptomatic in life or become symptomatic leading to infections , fistula formation and complications during operative procedures of temporomandibular joint. Prior knowledge of this osseous defect prevent damage to soft tissue and neural injury of structures around external auditory canal.

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