Research Article

A Study on Bilateral Ossified Pterygospinous Ligament and Its Clinical Significance

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Abstract

The pterygospinous ligament extends from lateral pterygoid plate to spine of sphenoid bone. The ossification of pterygospinous ligament is very rare. The pterygospinous ligament located close to foramen ovale and of anatomical, clinical and surgical importance because ossified ligaments may compress neurovascular structures present in region of foramen ovale causing trigeminal neuralgia. In many studies, the incomplete ossified pterygospinous ligament was more common than complete one and unilateral ossified pterygospinous ligament was more common than the bilateral one. Whether complete or incomplete ossified pterygospinous ligament can produce various symptoms depending upon the dimensions of the pterygospinous foramina and grades of neurovascular compression. Antonopoulou et al observed incompletely ossified pterygospinous ligaments in 2.5% skulls and completely ossified Pterygospinous Bridge bilaterally in 2% of the skulls by 3D reconstruction in a CT image. The present study, analysed morphologically exposed the presence of bilateral ossified pterygospinous ligament and civinini’s foramen which are clinically important with an incidence 0.95% found 1 out of 105 dried human adult skull bones of either sex. Therefore, the knowledge of Anatomical variation of the pterygospinous ligament-ossification is clinically important to radiologists and neurosurgeons, maxillofacial and dental surgeons, and anaesthetists along with academically for anatomists and anthropologists.

Keywords: Pterygospinous ligament, Spine of sphenoid bone, Civinini’s foramen, Mandibular nerve, Pterygoid plate, Ossification, Pterygospinous bar

1. Introduction

The pterygospinous ligament extends from lateral pterygoid plate to spine of sphenoid bone. This ligament is ossified sometimes, forming a foramen, which can be traversed by mandibular nerve branches to supply temporalis, masseter and lateral pterygoid muscle. In 1837, Civinini described the pterygospinous ligament and found that this ligament ossified in 2% to 3% of his specimens. The pterygospinous ligament and ossified foramen formed is named after Civinini.

Nayak et al found Civinini ligament fully ossified in 5.76% and incompletely ossified in 3.84% of their specimen. The complete ossification of pterygospinous ligament is known as the pterygospinous bar. Partial or complete ossification of pterygospinous ligament seems to be a major cause of trigeminal neuralgia, causing lingual numbness and pain associated with speech impairment.

Knowledge of ossified pterygospinous ligament (Civinini ligament), pterygospinous foramen (Civinini foramen) and pterygospinous bar are important for anatomists, radiologists, anthropologists, neurosurgeons, maxillofacial surgeons, dental surgeons and anaesthetists especially while treating Trigeminal neuralgia and also while performing surgical operations on the pterygoid region.

2. Materials and Methods

A total of 105 dried Human adult skull bones of either sex were carefully studied from the collection in the osteology lab, Department of Anatomy, Vijayanagar institute of medical sciences, Bellary, Karnataka, India.

3. Results

A total of 105 dried Human adult skull bones were studied and only in one skull bone we found the bilateral complete ossification of pterygospinous ligament. In the present study, the bilateral complete ossified pterygospinous ligament incidence 0.95%.
4. Discussion

The ossification of pterygospinous ligament is very rare. The presence of an osseous bar between the lateral pterygoid plate and the spine of sphenoid has been considered as a phylogenetic remnant in human beings. The lingual nerve and the inferior alveolar branch of mandibular nerve in the region of the infratemporal fossa are forced to take a long curved course in presence of a large pterygoid plate and during contraction of pterygoid muscles, these nerves are subjected to compression. The pterygospinous bony bridge can also pass among the fibers of the lingual nerve and divide it into anterior and posterior parts. Anterior part passes medially and lies between Tensor veli palatini muscle and the bony bridge, so these fibers are vulnerable to the risk of compression. In view of close relationship of the chorda tympani nerve, it may also be compressed by anomalous bar of bone and its involvement would result in impairment taste sensation in anterior 2/3rd of the tongue. The presence of ossified pterygospinous ligament means that there would be less accessible space to gain entry into the para and retro pharyngeal space.

Lateral pterygoid plate forms an important landmark for mandibular anaesthesia and any anomalies in lateral pterygoid plate is bound to confuse anaesthetists and also cause difficulty during thermocoagulation of trigeminal ganglion due to pterygospinous ligament ossification.

According to Newton and Potts an ossified pterygospinous ligament can be an obstacle in a radiographically guided trigeminal ganglion blockage. While applying conductive anaesthesia on mandibular nerve by lateral subzygomatic route may encounter obstacle to high quality conductive anaesthesia due to ossified pterygospinous ligament at lateral pterygoid plate. A research study had also advocated that a distance of approximate 0.25 cm beyond the distance to the lateral pterygoid plate be taken while performing maxillary nerve block by lateral extraoral approach.

Incidence of ossified pterygospinous ligament with entrapment of nerve between ossified pterygospinous ligament and medial pterygoid plate was found. The lingual nerve and the inferior alveolar branch of mandibular nerve in the region of the infratemporal fossa are forced to take a long curved course in presence of a large pterygoid plate and during contraction of pterygoid muscles, these nerves are subjected to compression. The pterygospinous bony bridge can also pass among the fibers of the lingual nerve and divide it into anterior and posterior parts. Anterior part passes medially and lies between Tensor veli palatini muscle and the bony bridge, so these fibers are vulnerable to the risk of compression. In view of close relationship of the chorda tympani nerve, it may also be compressed by anomalous bar of bone and its involvement would result in impairment taste sensation in anterior 2/3rd of the tongue. The presence of ossified pterygospinous ligament means that there would be less accessible space to gain entry into the para and retro pharyngeal space.

5. Conclusion

Different authors have reported with different results, though and this difference is probably regional. The ossification of pterygospinous ligament is very rare. In the present study, the bilateral complete ossified pterygospinous ligament incidence 0.95% found 1 out of 105 dried human adult skull bones of either sex.

In most of the above studies the complete bilateral ossified pterygospinous ligament very rare. Whether complete or incomplete ossified pterygospinous ligament can produce various symptoms depending upon the dimensions of the pterygospinous foramina and grades of neurovascular compression. Pterygospinous bar leads to difficulty while performing surgical operation on pterygoid region by leaving little space due to increase in width and flattening of lateral pterygoid plate causes less accessible space to gain entry into para and retropharyngeal space. Thus, the knowledge of the ossified pterygospinous ligament is important for surgeons for planning surgical procedures and who perform invasive procedures in/near infratemporal fossa would
increases the success rate of the surgical procedures. Also important for anaesthetists and neurosurgeons since anomalous bony obstructions could interfere positioning the needle during transfacial needle approaches to foramen ovale. Therefore, the knowledge of anatomical variation of the pterygospinous ligament ossification is clinically important to radiologists and neurosurgeons, maxillofacial and dental surgeons, and anaesthetists along with academically for anatomists and anthropologists.

References
1. Standing S. Grays Anatomy, The Anatomical basis of clinical practice. 40th edition Edinburgh; Elsevier Churchill Livingstone, 2005: p.540.
2. Civinini F. The pterygospinosous ligament as described by Filippo Civinini Pistoiese in 1837 [in Italian]. Arch sc med-fis Toscane 1, 1837: 381–387.
3. Shane Tubbs R et al. “Ossification of ligaments near the foramen ovale; An Anatomical study with potential clinical significance regarding transcuateanous approaches to the skull base”, Neurosurgery; 2009; 65(1): 60–64.
4. Nayak SR, Saralaya V, Pai MM, Vagdaonkar R, D’Costa S. Pterygospinosous bar and foramina in Indian skulls: Incidence and phylogenetic significance. Surg Radiol Anat 29, 2007: 5–7.
5. Antonopoulou M, Piagou M, Anagnostopoulou S: An anatomical study of the pterygospious and pterygoalar bars and foramina—Their clinical relevance. J Cranio Maxillofac Surg 2008; 36: 104–108.
6. Peeker ET, Fischer G, Filler TJ: Entrapment of the lingual nerve due to an ossified pterygospinosous ligament. Clin Anat 2001; 14: 282–284.
7. Srijit Das and Shipra Paul. Ossified Pterygospinosous ligament and its clinical implications. Bratisl Lek Listy, 2007; 108 (3): 141–143.
8. Shinde V. S., Mallikarjun M., and Patil R., “Astudionanossified pterygospinosous ligament,” Journal of Clinical and Diagnostic Research 2011; 5 (5): 978–979.
9. Shweta Solan and Gokul Krishna Reddy Nune. Anomalous ossified pterygospinosous ligament in eastern Zone- a case study. IOSR-JDMS 2014; 13 (4): 60-62.
10. Ludinghausen M., Kageyama I, Miura M., and Aikhatib M., “Morphological peculiarities of the deep infratemporal fossa in advanced age,” Surgical and Radiologic Anatomy 2006; 28 (3): 284–292.
11. Faig-Leite H, Faig-Leite FS, Fernandes RG. Anatomia do ligamento pterigopalatino e do forame craniocaudal bucinatório [resumo]. Int J Morphol, 2007; 25:15.
12. Suazo G, Zavardo, M. D. Smuth, R.L. Anatomical Study of the Pterygospinosous and Pterygoalar Bony Bridges and Foramens in Dried Crania and its Clinical Relevance. Int. J. Morphol., 2010; 28(2):405-408.
13. Soubhagya R Nayak, Rajalakshmi Rai. An unusual course and entrapment of the lingual nerve in the infratemporal fossa. Comp. Anat, 2008; 109[11]; 525-527.
14. Krmpoti cz-Nemani c J., Vinter I, Hat J., and Jalsovec D., “Mandibular neuralgia due to anatomical variations,” European Archives of Oto-Rhino Laryngology, 1999; 256 (4): 205–208.
15. Ergodamus S., Pinar Y., and Celik S., “A cause of entrapment of the Lingual nerve: ossified pterygospinosous ligament- a case report,” Neuroanatomy, 2009; 8: 43–45.
16. S. Das and S. Paul, “Ossified pterygospinosous ligament and its clinical implications,” Bratislask e Lek arske Listy 2007; 108 (3): 141–143.
17. Lang J., Skull base and related structures. Schattauer, Stuttgart, 1995: p.300–311.
18. Kapur E., Dilberović F., Redzepagić S., and Berhamović E., “Variation in the lateral plate of the pterygoid process and the lateral subzygomatic approach to the mandibular nerve,” Medicinski arhiv, 2000; 54 (3): 133–137.
19. Singh B., Srivastava SK., Dang R., Anatomic Considerations in relation to the maxillary nerve block. Reg. Anesth Pain Med, 2001; 26: p.507 – 511.
20. Wood J. F., “The non-metrical morphological characters of the skulls as criteria for racial diagnosis,” Journal of Anatomy 1931; 65: 179–195.
21. Verma R. K., Rani A., Chopra J., Pankaj A. K., and Kumar N., “Civinini Bar: incidence in North Indians and its clinical relevance,” NJCA 2013; 2 (3): 128–133.
22. Peker T., Karaço şe M., Anil A., Turgut H. B., and Gülekon N., “The incidence of basal sphenoid bone bridges in dried crania and cadavers: their anthropological and clinical relevance,” European Journal of Morphology, 2002; 40 (3): 171–180.
23. Atanaz-Pinar Y., Arzu G., Akta-n-Ekiz Z. A., and Bilge O. “Pterygospinosous and pterygoalar bridges,” Sendrom, 2004; 16 (7): 66–69.
24. Yadav Anjoo et al. “Pterygospinosous bar and foramen in the adult Hunan skulls of North India; Its incidence and clinical relevance”. Anatomy research International. Article id. 286794, 2014.
25. Thomson Jones Ebenraj et al. “Pterygospinosous bar and multiple civinini foramens: A rare anatomical variant and its clinical implications”. Int J Car Res Rev, 2014; 06(10).
26. Rafaela. R. Rosa et al. “Radiographic study of ossification of the pterygospinosous and pterygoalar ligaments by the Hirtz axial technique. Acta odontol. Latinoam. 2010; 23 (1)); 63-67.
27. Agarwal B., Gupta M., and Kumar H., “Ossified ligaments of the skull,” Journal of the Anatomical Society of India, 2012; 61 (1): 37–40.