ABSTRACT

Introduction: Study on Morphometric and radiological aspect on existence of foramen of civinini. Sphenoid bone comprises of some rare ossified ligaments, may encourage difficulty in surgical procedures. Incidence of Pterygospinous bars varies with different racial groups and they are genetically controlled. Complete ossification of pterygospinous ligament form foramen of civinini. Entrapments of vessels or nerves may occur due to existence of pterygospinous bar. The bar may locate medially or inferiorly to formen ovale as seen in Hawaiian and lemurs. Co-existence of bar with the wide lateral pterygoid plate exhibits development of the bar from herbivore, carnivore and old world monkeys. Comparatively absence or small spine of civinini noted in new world monkeys, rodents and platyrrhines. Pterygospinosubar represents the phylogenetic remnant of Human beings.

Material and Methods: By using digital vernier caliper, the measurements of length, width of the pterygospinous bar and area of foramen of civinini including the length and breadth of lateral pterygoid plate were measured. Using X-rays the radiological view was determined.

Results: In this study from 160 cases of skull and sphenoid bones revealed that complete and incomplete foramen of civinini in 1.25% and 7.5% of cases respectively. Peculiarly accessory foramen of civinini noticed in 1.25% of cases. Maximum area of foramen of civinini was 94.2mm². The maximum width of lateral pterygoid was noted as 19.6mm respectively. Mentocoronal view of skiagram clearly shows the bar.

Conclusion: During Anaesthesia for trigeminal neuralgia may encounter difficult to pass the needle. The bar compress the mandibular nerve branches can cause lingual numbness, pain and speech impairment. Conductive anaesthesia on the mandibular nerve through the lateral subzygomatic route may be difficult to approach. Exploring the anatomical and clinical updates of pterygospinous bar may guide the surgeons and radiologists to overcome any difficulties in infratemporal and para or retropharyngeal regions.

Key words: Pterygospinous bar, Ossification, Radiology, Mandibular nerve entrapment, Phylogeny
on the right side and an incomplete foramen on the left side and it also represented the absence of foramen spinosum on right side [Table/Fig-2]. As a result, the complete ossified bar that formed a complete foramen of civinini was noticed in two (1.25%) cases, one on left side of the skull and other on right of the sphenoid bone. In both the cases, pterygospinous bar was placed across or inferiorly to the foramen ovale [Table/Fig-1 and 3] [6-9]. Incomplete foramen of civinini were noticed in 12 (7.5%) cases. The peculiar sphenoid and a skull bone which showed a larger area and accessory foramen of civinini were considered, to be discussed.

In a sphenoid bone, the maximum width of lateral pterygoid plate which was measured at the level of spine of civinini and root was approximately 19.6mm and 17mm and the length was 12mm and area of foramen of civinini in a sphenoid bone was 94.2mm². The transverse and vertical diameters were 10mm and 12mm [Table/Fig-4]. The length and width of the pterygospinous bar were 12mm and 3.5mm respectively. The same sphenoid bone also showed complete ossification of carotico–clinoid and interclinoid ligament, which was significant. On left sided skull bone, it was difficult to measure the length and width of pterygospinous bar and area of foramen, because the pterygospinous bar was not present in a single stretch, from one point to other. Rather, pterygospinous ligament may spread as a thin sheet from spine of sphenoid to spine of civinini. The sheet may be ossified around the perforated branches of mandibular nerve, resulting in one very small complete foramen and one accessory foramen of civinini in 0.625% of the cases.
DISCUSSION

The thickened cranial part of fascia, between the lateral and medial pterygoid muscles, results in fibrous bands which are named as pterygospinous ligaments. Italian anatomist F Civinini (1805-1844), first described and coined the term “pterygospinous ligament” or “ligament of civinini,” but earlier, Pterygospinous bar used to be named as ala Ingrassiae, after its inventor GF Ingrassia (1510-1580), who is also known as “Hippocrates of Sicily”. Ossified ligament projects as a bar, medial or lateral or sometimes across the foramen ovale in the submento vertical projection and it may interfere with percutaneous injection of the mandibular nerve. Pterygospinous bar passed medial to foramen spinosum and crossed the foramen ovale at an angle of 20º – 40º degree to the sagittal plane [9].

In the present report, the complete pterygospinous bar was parallel across the foramen ovale, with the absence of foramen spinosum in an individual sphenoid bone. A foramen which is created between the base of skull and the complete ossified bar transmits neurovascular structures of the medial pterygoid muscles [6, 9]. The size of the foramen varies from 2 to 12 mm [9]. In this study, the maximum transverse and vertical diameters of the complete foramen on right side of the individual sphenoid bone were approximately 10mm and 12mm.

Von Ludinghansen et al., studied the pterygospinous bar in 100 human dried skulls from Japan and in 54 cadaveric cases from German and they noticed complete osseous bar in 6 of the human dry skulls. Pterygospinous ligament in 11 (20.4%) cases, pterygospinous muscle in 5 (9.2%) cases, which gets inserted into medial wall capsule and the articular disc of temporomandibular joint and is considered to be the third head of lateral pterygoid muscle. In a cadaveric study, coexistence of pterygospinous bar with pterygospinous muscle and pterygospinous ligament with pterygospinous muscle was observed. The existence of such muscle or fascia which accompanied the pterygospinous ligament has been described earlier by Testut and Latarjet [10]. Nathan et al., specified that pterygospinous muscle, as an atavistic remnant of one of the many pterygoid muscles, was present in reptiles. Among 50 Greek dry skulls, complete ossifications were found in only one skull bilaterally and incomplete ossifications were found in 25 cases [11]. Among 154 adult human dry skulls, only one foramen of civinini with complete ossification of pterygospinous bar was reported [12]. In a series of 1000 skulls, the incidence of complete ossification was noted to be 4.3% [9]. The percentage of complete ossification of pterygospinous bar was less as compared to that in present study were clinically much significant. Because among the 160 cases, a sphenoid bone showed one complete foramen civinini was found to be 94.2mm² respectively. The width of pterygospinous bar was 4.5mm and its length (AP) was 11mm [24, 25].

In our study, the maximum width of the pterygospinous bar was 3.5mm and its length was 12mm respectively. The maximum width of lateral pterygoid plate from the spine of civinini was 19.6mm, which was 0.6 mm higher than that which was reported from studies which were done on 50 bones [26]. 21% skulls from various regions showed the width of lateral pterygoid plate to be higher than 20mm [4]. In this present case, the gap between the projections of spine of civinini and spine of sphenoid from the right sided skull was 0.3mm, whereas in the previous reports, it was noted as 1mm [26] and 3mm [27].

There are wide variations in the mammals with respect to the development and disposition of the lateral and medial pterygoid process [23]. The wider lateral pterygoid plates should be considered for the possible embracement of neurovascular structures and they may difficult for the administration of mandibular anaesthesia. A variable ossification at the posterior border of lateral pterygoid plate may be an obstacle for conductive anaesthesia on mandibular nerve via sub zygomatic route [16]. The lingual nerve and the inferior alveolar nerve are forced to take a long curved course in presence of a large pterygoid plate and the mandibular nerve gets fixed between the foramen ovale and mandibular foramen. So, during contraction of pterygoid muscles, there may be pain, that may lead to trigeminal neuralgia. Similar symptoms could be provoked by the foramen of civinini, since it lies across the foramen ovale. A bilateral foramen was noticed in 2 skulls and three were unilateral [17].

The area and the vertical and transverse diameters of the foramen civinini and the length and width of the pterygospinous bar in this present study were clinically much significant. Because among the 160 cases, a sphenoid bone showed one complete foramen with a large area and one accessory foramen civinini was noted in skull unilaterally.

Pterygospinous bar was clearly notable in normal basal view (mentocoronal) and described its applied aspects and observed unilateral PSB in 7.05% and bilateral in 0.89% of cases [28]. Pterygospinous bar is visible in the basal view as a 1 to 2mm [9]. In a study of 50 sphenoid bones, unilateral incomplete foramen of pterygospinous bar was seen in oblique view of skiagram [25].
Hirtz axial or submentovertex technique is an excellent tool for the observation of a complete or an incomplete ossification of pterygospinous ligaments[13]. Pterygospinous bar also is visible on Panorax and Trans maxillary views[9]. Similarly, in this study, it was noted that normal basal view [Table/Fig- 5] and lateral radiological view demonstrated the pterygospinous bar and foramen clearly. In radiographic anatomic picture, the existence of foramen of civinini or a complete pterygospinous bar may superimpose the Para and retro maxillary space. Pterygospinous ligaments can be an obstacle in a radiographically guided trigeminal ganglion blockage [9–11, 15].

As the pterygospinous bar is more medially oriented, it doesn’t compromise the foramen ovale and therefore, it has no clinical significance [29]. Only pterygoalar bar interfere with injection of mandibular nerve. Contrary to this, the literature has proved that Pterygospinous bar is clinically significant. Developmental basis for the formation of the ligaments was described by James [2,30]. Possibilities of entrapment or compression of lingual nerve from the ossified pterygospinous ligament or between the ossified ligament and medial pterygoid muscle have been reported [31,32]. Chorda tympani branch of facial nerve may also get compressed by an ossified ligament [26] and it may result in impairment of taste sensation to the anterior two thirds of tongue. The course of the branches of mandibular nerve and maxillary artery may change during development, because of the hindrance in development of ligament or bar and even the branches of mandibular nerve, that innervate the muscles of mastication, also get compressed or a difficulty in approaching these structures is highly accidental. The presence of ossified pterygospinous ligament may cause trouble in performing thermo coagulation and anaesthesia for trigeminal neuralgia and it may cause a surgical difficulty in a lateral transzygomatic infratemporal fossa approach to the para and retro pharyngeal space [10,15].

Entrapment and compression of lingual nerve may occur due to one of the following causes: partial or complete ossification of pterygospinous ligaments. Pterygospinous bar ridge separates the trunk of lingual into anterior and posterior branches. Anterior fibres may get compressed because of their course between the tensor veli palatini muscle and the bony ridge [31] or because of a large lateral pterygoid plate [32–34].

Existence of osseous bar between the lateral pterygoid plate and the spine of sphenoid has been considered as a phylogenetic remnant in human beings. A wide pterygospinous bar was noted in all the skulls of herbivores, carnivores and old world monkeys and a small pterygospinous bar was noted in rodents but never in new world monkeys. So, in humans, this pterygospinous bar represents a phylogenetic remnant [10]. In lemurs, the bar passses medial to foramen ovale, but in pithecid condition, the pterygospinous bar is complete and it passes lateral to foramen ovale. In man and anthropoids, the pterygospinous bar is incomplete. If it is present in varying degrees of completion, it forms porus Crotaphitico-buccinatorius and foramen of civinini [35]. In 100 Hawaiian skulls, 8% showed the unilateral completion of pterygospinous bar, which passed medial to foramen ovale and in no case was it bilateral [23].

In platyrhines, a small spine, the spina civinini, projects from the middle portion of the posterior border of the short lateral pterygoid plate. A wide semilunar space, the insicura civinini, is present between the plate and anterior border of auditory bulla. In Aotus, an incomplete or a complete ossification of the ligamentum pterygospinosum bridges the gap between the spina civinini and the posterosventral process of the sphenoid bone. In tarsius, lemurids and galagids, the plate is long and widely expanded, and the posterior border has intimate contact with the outer wall of the auditory bulla. In cercopithecoid condition, the ossification of the ligament may be complete and also in colobines, the foramen of civinini is usually established and it serves as a passage for the vessels, which include the internal pterygoid nerve. But in pongids, spine of civinini is well defined, inisicura civinini is well opened and the sphenoidal spine for attachment of ligamentum pterygospinosum is little or only moderately developed. In humans, lateral pterygoid plate resembles pongids, but spine of sphenoid is well developed [36].

CONCLUSION
Various studies have stressed about the significance of this pterygospinous bar. The present study report on occurrence of larger area and accessory foramen of civinini may be the additional variations which have to be noted. So, the presence of an anatomical rare variant of pterygospinous ligament or bar or muscle, inadvertently affects the neurovascular structures of the foramen ovale and causes a problem during anaesthesia or surgeries. Pterygoalar or pterygospinous bar is never a hindrance for injecting semilunar ganglion via inframandibular approach, but an ossified pterygoalar bar is truly significant in a supramandibular approach [33]. Importance of the foramen of civinini and structures which pass through it, may guide the dental and maxillofacial surgeons in doing safe and effective procedures. From the present study, it is concluded that when the area is more, the risk of the entrapment is less, as compared to the smaller foramen, where the risk is higher. But in both the circumstances, a hindrance against mandibular anaesthesia is common.

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REFERENCES

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