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Original Research Article

ANATOMICAL ANALYSIS OF THE ABNORMAL BONE OUTGROWTHS WITH SPECIAL EMPHASIS ON PTERYGOALAR BAR AND ITS CROTAPH-ITICO BUCCINATORIUS FORAMEN

Vishali. N *[1], T. Jones Ebenraj [2], G. Rajathi [3], N. Charanya [3].

*[1] Associate Professor, Department of Anatomy, Ponnaiyah Ramajayam Institute of Medical Sciences, Manamai – Nallur, Chennai, Kancheepuram District, India.

[2] Lecturer, Asan Memorial Dental college and Hospital, Asan Nagar, Oragadam Road, Keerapakkam Village, Chengalpet, Kancheepuram District, India.

[3] Assistant Professor, Ponnaiyah Ramajayam Institute of Medical Sciences, Manamai – Nallur, Chennai, Kancheepuram District, India.

ABSTRACT

Background: The knowledge of the ossified ligaments in the base of the skull is of utmost important for anatomical, clinical and anthropological correlations. One such ligament extending from the lateral pterygoid plate to the under surface of greater wing of sphenoid is named as Pterygoalar ligament and is named as Pterygoalar bar after its partial or complete ossification. This Pterygoalar bar is of great significance as it obscure the view of foramen ovale to approach it for anaesthetic , therapeutic purpose either suprazygomatic or infrazygomatic via. Also its enclosed foramen crotaphitico buccinatorius which is comparatively smaller than any other foramen may compress the structures passing through it, probably the structures emerging out of foramen ovale may take up a route via this foramen and get entrapped, which may lead to either neurovascular compression disorder.

Objective: The aim of this study was to determine the prevalence of thickened bony bar, pterygoalar bony bridges and to analyze morphometrically the homonyms foramen in a collection of contemporary skulls and discuss their clinical implications.

Materials and Methods: The present study was performed with 90 dried adult human skulls. Base of the skull was examined with naked eye, on both the sides for the presence of abnormal osseous structures from the lateral pterygoid plate.

Results and Discussion: In the current study, we presented only one skull with unilateral complete pterygoalar bar and 11 skulls with unilateral incomplete pterygoalar bar. The pterygoalar bar and pterygoalar foramen are rare clinical features but their presence may be of clinical importance in the event of trigeminal nerve injection or anaesthesia.

KEY WORDS: Pterygoalar bar, ossified ligaments, pterygoalar foramen, crotaphitico buccinatorius, foramen ovale, trigeminal neuralgia.

Address for Correspondence: Dr. Vishali.N, Department of Anatomy, Associate Professor, Ponnaiyah Ramajayam Institute of Medical Sciences, Manamai – Nallur, Chennai – 603102, Kancheepuram District, India. **E-Mail:** drvishalin@gmail.com

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INTRODUCTION

The ossified ligaments present in the base of skull are of anatomical, anthropological, clinical and surgical importance. Rouviere & Delmas

[1] stated that the pterygospinous ligament divides the sphenomandibular ligament into two independent parts, of which the interpterygoid fascia is thin. Lateral to the interpterygoid fascia is another fibrous structure attached to the infratemporal surface of greater wing of the sphenoid and in the superior segment of the posterior edge of lateral pterygoid plate. Its superior edge becomes flat and forms an innominated ligament, described by Hyrtl in 1862 (Cited by Tebo) called pterygoalar ligament [2] which when it is ossified, enclose the pterygoalar foramen (porus crotaphitico-buccinatorius) [3]. Pterygoalar bar was named by Chouki and Hodes [4] to an ossified pterygoalar ligament.

The want of anatomic data on the presence of the ossified pterygoalar ligament, porus crotaphitico buccinatorius is a severe dearth of modern anatomy textbooks. Most cited investigations related to the pterygospinosus ligament ossification and the formation of the homonym foramen did not mention the implications of these variations; however, from a clinical point of view the presence of ossification in the pterygoalar ligament is even more important for two reasons: (i) when pterygoalar ligament is partially ossified the bony prominence not mentioned in anatomical nomenclature, is projected anterolaterally to the greater wing of sphenoid that partially covers the access to the oval foramen from a lateral approach through the supra and the infrazygomatic via, decreasing the effectiveness of extra oral anesthetic treatment technique of the mandibular nerve; (ii) the complete ossification of the pterygoalar ligament determines the formation of the pterygoalar foramen (crotaphitico-buccinatorius), which is much smaller in diameter compared with the pterygospinosus foramen (Civinini's). The pterygoalar ligament completely prevents access to the mandibular nerve or trigeminal ganglion from foramen ovale by the supra or infrazygomatic via.

It is known that the pterygospinous and pterygoalar bony bridges are of great importance to the anesthetic treatment of the mandibular nerve and for therapeutics for the trigeminal ganglion [5], because their presence hinders access to the needle in the area of foramen ovale. The main objective of this study was to determine the prevalence of thickened bony bar, pterygoalar bony bridges and to analyze morphometrically the homonyms foramen in a collection of contemporary skulls and discuss their clinical implications.

MATERIALS AND METHODS

The present study was performed with 90 dried adult human skulls irrespective of age and gender, were obtained from Department of anatomy, Asan memorial dental college & Hospital and Karpaga Vinayaga institute of dental sciences. Skulls evident of trauma or morphological asymmetries were excluded from this study. The base of the skull was examined with naked eye, on both the sides for the presence of abnormal osseous structures from the lateral pterygoid plate. Anomalous ossified ligament stretching between the infratemporal surface of the greater wing of the sphenoid and the superior edge of the lateral pterygoid plate, the core structure of our study was noted in all these bone specimens.

As described by Suazo et al., [6] the following descriptions are given for ossification of the ligament:

Type III: Complete ossification of pterygoalar ligament: there is a bony bridge between the superior segment of the posterior edge of the ptergygoid process and a process that emerges from the anterolateral area of the base of the sphenoid spine. In this case, the enclosed foramen is the pterygoalar foramen (crotaphitico buccinatorius).

Type IV: Incomplete ossification of pterygoalar ligament. A elongated process from the anterolateral area of the sphenoid spine base, but does not reach sufficiently to contact with the lateral pterygoid plate. This was not excluded, to consider the elongated process that emerges from the sphenoid spine. It is a fact that in the lateral norma, at least half the foramen ovale is hidden.

The skulls with pterygoalar bar (Partial, complete and enclosed foramen) was photographed and compared to that of the normal and the same was also subjected to radiological study. In case, there was complete ossification as in Type III the average diameter of its enclosed Crotaphitico buccinatorius foramen was measured

using a vernier caliper. The bar described as Type IV variety was also measured. Even the small gap left between the two bars making it incomplete pterygoalar bar was also noted using the Vernier Caliper. With the data obtained, prevalence rates of the two proposed types were estimated, differentiating the bilateral, left and right presentations.

RESULTS

Among the ninety skulls studied, twenty seven (30%) of the skulls did not have any abnormal osseous structures extending from the lateral pterygoid plate.

Normal bone: No bony projection from the plate of lateral lamina of the pterygoid process of the sphenoid bone. The lateral pterygoid plate was thin, flat and everted. The maximum width of the lateral pterygoid plate was measured to be 1.4 cm.

Anomalous Osseous structure from the Lateral pterygoid plate: The following osseous structures were observed macroscopically and morphometrically extending from the lateral pterygoid plate. None of the type showed bilateral presence of pterygoalar bar (Table 1).

Type III:

i. In one (1.11%) skull, unilateral (right side) complete pterygoalar ligament was observed (Table 1). Ossified Pterygoalar ligament are present lateral to the Foramen Ovale. Since the bar is complete, it presented a complete Crotaphitico buccinatorius foramen with an average diameter of 0.3mm (Fig.1 & Fig. 3).

Type IV:

i. The seven (7.77%) skulls showed unilateral (right side) incomplete pterygoalar ligament (Table 1), in which one skull showed their presence inferior to the foramen ovale so that it is divided into medial and lateral compartments (Fig. 2 & 4).

ii. In four (4.44%) skulls, unilateral (left side) incomplete pterygoalar ligament was observed (Table 1, Fig. 2 & 4).

iii. The width of the lateral pterygoid plate measured -1.4 cm, while the width of pterygoalar bar measured to be 1.4mm. Thus two projections from the lateral projection plate and the greater wing of sphenoid approached each other and left a deficit of 6 mm between them.

Table 1: Case distribution of pterygoalar bar.

	TYPE III		TYPE IV	
	N	%	N	%
Bilateral	0	0	0	0
Right	1	1.11	7	7.77
Left	0	0	4	4.44
Total	1	1.11	11	12.22

Table 2: Incidence and Prevalence [11].

S.no.	Study	Complete PA bar (%)	Incomplete PA bar (%)
1	Suazo Galdames et al.	3.84	22.43
2	Peker et al	8.8 % in Anatolian Population	
3	Kalyan Chakravarthi and Sarath Babau	19.72 (14 SKULLS)	8.45 (6 SKULLS)
4	Present Study	1.11 (1 SKULL)	12.22 (11 SKULLS)

Fig. 1: Lateral view of skull showing Type –III complete pterygoalar bar extending between the lateral pterygoid plate (LPP) and infra temporal surface of greater wing of sphenoid and its enclosed probed foramen crotaphitico porus buccinatorius (CR.BU).

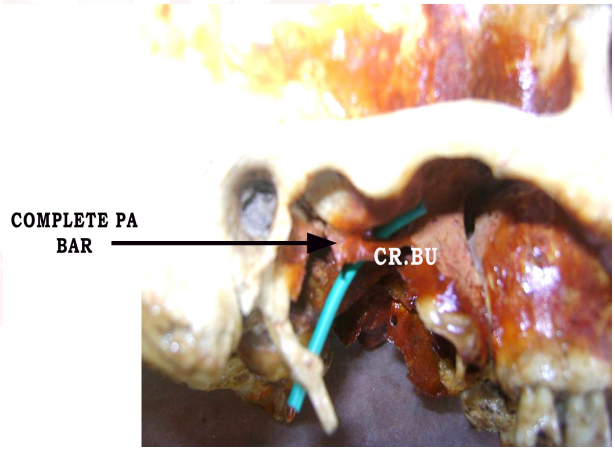


Fig. 2: Lateral view of skull showing Type – IV incomplete pterygoalar bar extending between the lateral pterygoid plate (LPP) and infratemporal surface of greater wing of sphenoid.

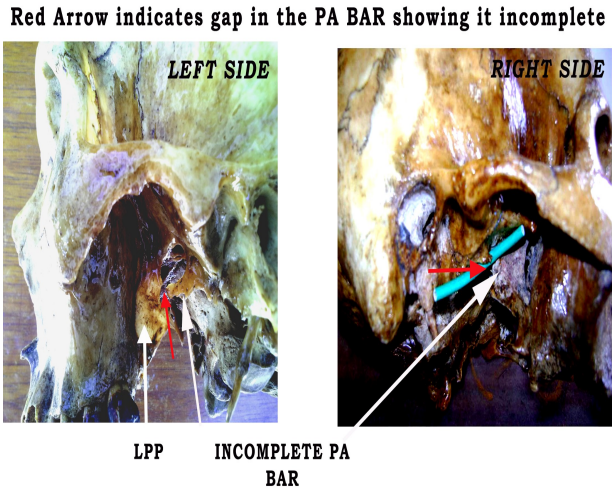


Fig. 3: Radiograph showing completely ossified pterygoalar ligament – basal view.

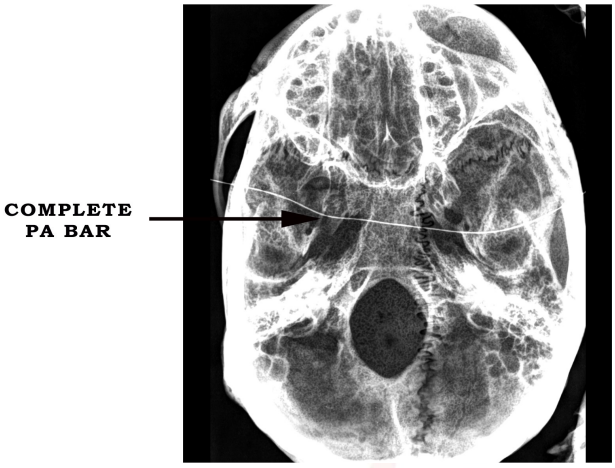
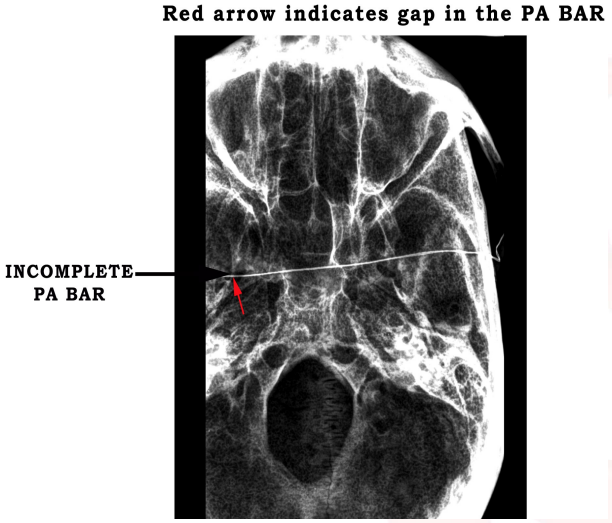


Fig. 4: Radiograph showing incompletely ossified pterygoalar ligament – basal view.



DISCUSSION

The pterygoalar bar and pterygoalar foramen are rare clinical features but their presence may be of clinical importance in the event of trigeminal nerve injection or anaesthesia. Little is known of the incidence of the anatomical formations in the human population and there is only scarce information on the morphology of the literature [7, 8]. A complete pterygoalar bar has been found in 5% of Anatolian skulls and with greater frequency in Negro. In the current study, we presented only one skull with unilateral complete pterygoalar bar and 11 skulls with unilateral incomplete pterygoalar bar. While the incidence of the bilateral pterygoalar bar reported is very low (1%) also noticed in the present study as there is none with bilateral presence of pterygoalar bar. Thus, the occurrence of the pterygoalar bar and foramen may vary from 1% to 10% [3, 10].

Incidence and Prevalence: [11] – Table 2: In our cranial material we found different variants of the accessory osseous trabeculae that exist close to the foramen ovale. They always arise from the posterior border of the lateral pterygoid plate but project to different regions of the inferior surface of the greater wing of the sphenoid bone. We presented rather low incidence of presence of pterygoalar bar as it was clearly identified among the other types of osseous bars (pterygospinous & pterygopetrosal bar) which has already been reported by us [12].

Either the caudal extension of the lateral pterygoid plate or the entire pterygoalar bar passing laterally to the foramen ovale may interrupt the injection of the trigeminal ganglion or mandibular nerve by blocking it [13].

In the case of anaesthesia within the foramen ovale, to access these neural structures, one should be aware of anatomical impediment because of the possible presence of the complete or incomplete form of the pterygoalar bar. Percutaneous procedures for the treatment of trigeminal neuralgia involve the penetration of the foramen ovale [9]. This approach to the trigeminal ganglion may be difficult when the pterygoalar bar envelop the foramen ovale. Radiological guidance is thus required to visualise the foramen ovale and its related structures, which makes puncture easier and more precise [10,14]. Otherwise, a higher dosage of the anaesthetic agent is recommended to influence effectively the trigeminal nerve or its branch.

Unusual unilateral ossified pterygoalar ligament and its enclosed foramen porus crotaphitico buccinatorius obscure / partition the foramen ovale into two compartments [13] and thus some branches of the mandibular nerve like masseteric nerve, deep temporal nerve, lingual nerve, chorda tympani nerve may escape through this smaller pterygoalar foramen and may result in nerve entrapment injury leading to muscle weakness, loss of both general and taste sensation in the anterior 2/3rd of the tongue, decreased salivation. Hence a detailed radiography of the base of the skull and thorough knowledge of these abnormal bony outgrowths would result in a differential diagnosis for the better clinical approach.

CONCLUSION

The incidence of the pterygoalar bar and the pterygoalar foramen is low in the human population, it would seem important to extend our knowledge of the morphology and topography of these structures. To improve surgical, diagnosing and therapeutic performance medical progress currently needs more accurate knowledge concerning the variability of human morphology. Therefore, the anatomical and radiological knowledge of ossified pterygoalar ligament and presence of its enclosed foramen porus crotaphitico buccinatorius may be highly valuable for medical professionals in cases of trigeminal neuralgia, anaesthetists, dental and maxilla – facial surgeons in day to day clinical practice.

Conflicts of Interests: None

REFERENCES

[1]. Rouviere, H. & Delmas, A. Anatomía Humana Descriptiva, Topográfica y Funcional. Barcelona, Masson, 1999; V. 3.

[2]. Antonopoulou, M.; Piagou, M. & Anagnostopoulou, S. An anatomical study of the pterygospinous and pterygoalar bars and foramina - their clinical relevance. J. Craniomaxillofac. Surg., 2008; 36(2):104-8.

[3]. Janusz Skrzat, Jerry Walocha, Robert Srodek. An anatomical study of the Pterygoalar bar and Pterygoalar foramen. Folia Morphol. 2005; vol. 64, No.2, 92 – 96.

[4]. Chouke KS, Hodes PJ. The pterygoalar bar and its recognition by Roentgen methods in trigeminal neuralgia. Am J Roentgenol 1951; 65:10-12.

[5]. Das, S. & Paul, S. Ossified pterygospinous ligament and its clinical implications. Bratisl. Lek. Listy, 2007; 108(3):141-3,

[6]. Suazo Galdames I, Zavando Matamala D, Smith RL. Anatomical Study of the Pterygospinous and Pterygoalar Bony Bridges and Foramens in Dried Crania and its Clinical Relevance. International Journal of Morphology, 2010; vol. 28, n. 2: 405-8.

[7]. Patnaik VVG, Singla Rajan K, Bala Sanju Bilateral pterygo-alar bar and porus crotaphitico buccinatorius — A case report. J Anat Soc India, 2001; 50: 161–162.

[8]. Peker T, Karakose M, Anil A, Turgut HB, Gulekon N The incidence of basal sphenoid bony bridges in dried crania and cadavers: their anthropological and clinical relevance. Eur J Morphol, 2002; 40: 171–180.

[9]. Gerber AM Improved visualization of the foramen ovale for percutaneous approaches to the gasserian ganglion. Technical note. J Neurosurg, 1994; 80: 156–159.

[10]. Kapur E, Dilberovic F, Redzepagic S, Berhamovic E Variation in the lateral plate of the pterygoid process and the lateral subzygomatic approach to the mandibular nerve. Med Arh, 2000; 54: 133–137.

[11]. Kalyan Chakravarthi, Sarath Babu. An anatomical study of the Pterygoalar bar and Porus Crotaphitico Buccinatorius. Int. J. Med. Health Sci. 2012; Vol., Issuse 3.3-9.

[12]. Thomas Jones Ebenraj and Nagarajan Vishali, Pterygospinous bar and Multiple Civinini Foramen – A rare anatomical variant and its clinical implications. International Journal of Current Research and Review 2014; 6(10): 126 – 133.

[13]. Stajcic Z, Stojcev Lj, Mileusnic I, Djuric-Srejic M Mandibular nerve block at the foramen ovale using reliable landmarks: refinement of a previously described procedure. Int J Oral Maxillofac Surg, 2002; 31: 423–426.

[14]. Tebo, H. G. The pterygospinous bar in panoramic roentgenography. Oral Surg. Oral Med. Oral Pathol., 1968; 26(5):654-7.

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