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Original Research Article

STUDY OF LATERAL PTERYGOID MUSCLE AND ITS RELATION WITH THE MAXILLARY ARTERY AND BUCCAL NERVE AND AN ANATOMICAL CLASSIFICATION BASED ON ITS INSERTION

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ABSTRACT

Background: Lateral pterygoid muscle plays an important role in the mandibular movements and dynamics of temporomandibualr joint. Anterior displacement of the disc and temporomandibular dysfunction has been related to the insertion of upper head of LPM in the TMJ disc.

Materials and Methods: A study was conducted on forty specimens from formalin fixed cadavers in the department of Anatomy , BMCRI, Bangalore.

Results and Discussion: In 72.5% of cases the upper head of LPM insert to the disc and blend with the capsule and lower head inserts to the inferior aspect of the disc, to the capsule and the condyle of mandible.

Conclusion: Though there is no clear demarcation between the heads of LPM majority of the upper fibers insert to the disc and to the capsule.

KEY WORDS: Lateral pterygoid muscle, Articular disc, Temporomandibular joint.

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INTRODUCTION

Lateral pterygoid muscle is a craniomandibular muscle and is one of the muscle of mastication derived from first pharyngeal arch. It is the key muscle of the infratemporal region as the vessels and nerves of the infratemporal region are explained in relation to the lateral pterygoid muscle. Its formation is classically described as biceps muscle, in which the fibres originate from two muscle fascicule [1]. Thus the muscle normally comprises of two heads-upper and lower. The upper head arises from the infratemporal surface and infratemporalcrest of the greater wing of sphenoid bone. The lower head arises from the lateral surface of the lateral pterygoid plate. Early in the third month of intrauterine life the muscle inserts into the mesenchyme that condenses around the developing condyle of the mandible, but part of its tendon sweeps above the condyle and inserts into the portion of Meckel's cartilage that latter forms the head of the malleus. A part of the tendon gets incorporated into the articular disc of the temporomandibular joint, its attachment to the malleus does not persist [2]. The fibres of LPM proceed backwards and laterally to get

inserted onto the capsule and articular disc of temporomandibular joint, otherwise called as disc-capsule complex [DCC], also to the pterygoid fovea and condyle of the mandible.

The innervation to the muscle is by the pterygoid branches from the anterior division of the mandibular nerve from its deep surface. The action of the muscle is different from other masticatory muscles which helps in depressing the lower jaw, when ipsilateral LPM and MPM act together they bring about chewing movements, whereas combined actions of lateral and medial pterygoid muscles of both the sides protrude the mandible. The muscle is closely related to few structures viz, deep temporal and massetric nerves and vessels which emerge from the upper border of upper head, beneath the lower border of lower head pass the lingual nerve, inferior alveolar nerve and vessels, medially it is related to sphenomandibular ligament and middle meningeal artery. The second part of maxillary artery courses between the two heads to enter the pterygomaxillary fissure and the buccal branch of anterior division of mandibular nerve emerges out [3].

Insertion of upper head of LPM has been debated in the literatures and till now there is no satisfactory information in this regard. In this study an attempt has been made to look into the insertion of LPM.

MATERIALS AND METHODS

Forty head halves, from formalin fixed cadavers were obtained from the department of Anatomy, Bangalore Medical college and Research Institute, Bangalore, Karnataka , India.

The objective of the study is to find the number of heads of lateral pterygoid muscle, its insertion, width of the heads of lateral pterygoid muscle and the relation of maxillary artery with the LPM. None of the specimens had any disc-condyle complex derangement. Dissection method was followed on all the specimens. During the process the skin, superficial fascia, parotid gland, zygomatic arch with the masseter muscle and temporalis muscle with the coronoid process were removed. Infratemporal region was approached and the lateral pterygoid muscle was exposed. The heads of the muscle and their attachments were determined. Width of the heads of the muscle were measured using digital vernier caliper, which was taken from the midpoint between its origin and insertion. Its relation with the maxillary artery and branches of mandibular nerve were also observed.

OBSERVATIONS AND RESULTS

1. Number of heads of lateral pterygoid muscle:

a) In 95.5% the lateral pterygoid muscle possessed two heads, the second part of maxillary artery entering the pterygopalatine fossa passing superficial to the LPM and the buccal branch of anterior division of mandibular nerve emerging out between the two heads [Fig.1].

b) In 2.5% the lateral pterygoid muscle possessed three heads, the second part of maxillary artery lying along the lower border of lower head, then lying superficial to the intermediate head & then entering the pterygopalatine fossa between the upper and intermediate/lower head, the buccal branch of mandibular nerve emerging out between the upper head and middle head. The lower head fibres originated from the tuberosity of maxilla [Fig.2].

c) In 2.5% the lateral pterygoid was single headed, the fibres converging to the disc and the condyle near the point of insertion [Fig.3].

2. Width of the heads of lateral pterygoid muscle:

a) In 72.5.% the width of upper head was less than that of the lower head and ranged from 5.0 to15 mm and width of the lower head ranged from 15 to 20mm [Fig.4].

b) In 27.5% the width of both heads was equal to15mm±2 mm [Fig.5].

3. Insertion of of lateral pterygoid muscle:

I. A). In 72.5% the UH fibres inserted into the capsule of TMJ and to the anteromedial aspect of disc.[DCC]. LH inserted to the pterygoid fovea and condyle [Fig.6].

II. B). In 17.5.% the UH fibres inserted to the capsule of TMJ, the disc and to the condyle. LH to the pterygoid fovea and condyle [Fig.7].

III. C) In 10% UH fibres inserted to the DCC and condyle.

LH to the condyle, capsule and to the inferior aspect of disc [Fig.8].

4. In relation to the maxillary artery

a) In 90% the second part of maxillary artery coursed superficial [lateral] to the lateral pterygoid muscle to enter the pterygo maxillary fissure [Fig.1].

b) In 7.5% the second part of maxillary artery coursed deep/medial to the lateral pterygoid muscle to enter the pterygomaxillary fissure [Fig.9].

c) In 2.5% the second part of maxillary artery coursed along the lower border of the lateral pterygoid muscle pierced the inferior alveolar nerve runs deep to the lower head and then lies superficial to the intermediate/middle head and then the artery entered the pterygomaxillary fissure between the upper and middle head [Fig.2].

5. Other variations:

a) In 2.5%Buccal branch of anterior division of mandibular nerve, emerges between two heads of LPM provides 4-5 minute branches to the lateral pterygoid muscle [Fig.10].

b) In 2.5% buccal nerve bifurcates and pierces Temporalis Muscle [Fig.11].

c) In 2.5%The second part of maxillary artery splits the inferior alveolar nerve into anterior & posterior part [Fig.2]. Based on the insertion of LPM the following classification is given:

TYPE A:

UH fibres inserting into the capsule of TMJ and to the disc [DCC].

LH inserting to the pterygoid fovea and condyle.

TYPE B:

UH fibres inserting to the capsule of TMJ, the disc[DCC] and to the condyle

LH inserting to the pterygoid fovea and condyle.

TYPE C:

UH fibres inserting to the disc and capsule [DCC].

LH to the condyle and DCC.

Fig. 1: Showing the 2 Heads of LPM.

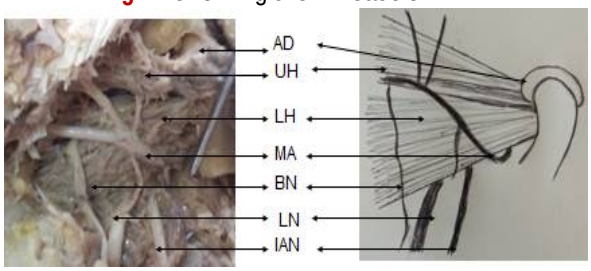


Fig. 2: Showing the 3 Heads of LPM.

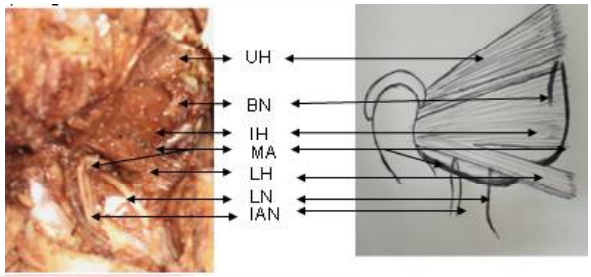


Fig. 3: Showing the Single Head of LPM.

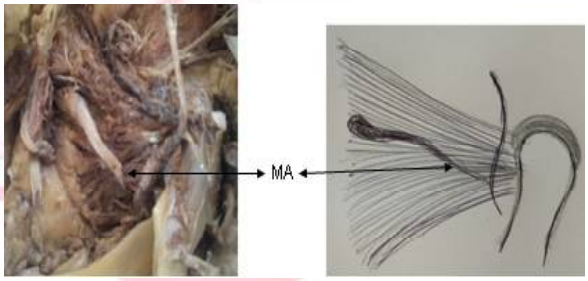


Fig. 4: Showing the Width of the UH<LH.

Fig. 5: Showing the Width of UH & LH.

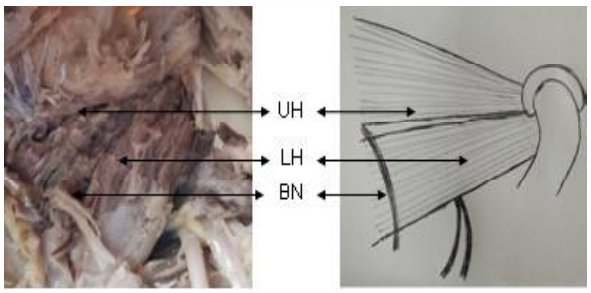


Fig. 6: Showing the UH inserting to the DCC, LH to Condyle.

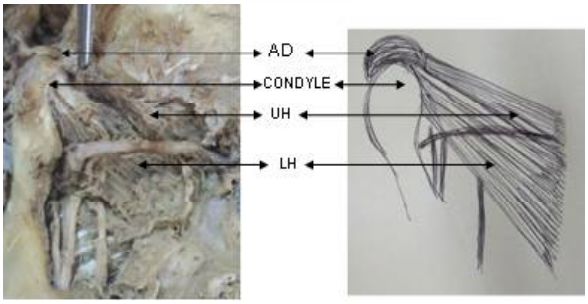


Fig. 7: Showing UH inserting to the DCC and Condyle.

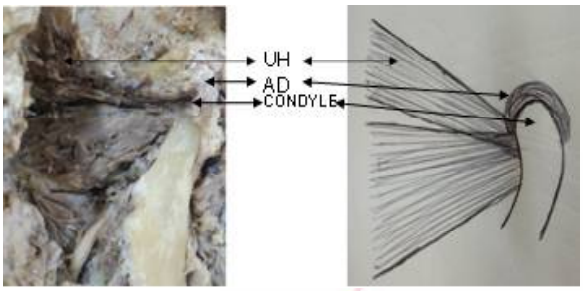


Fig. 8: Showing UH and LH inserting to DCC and condyle.

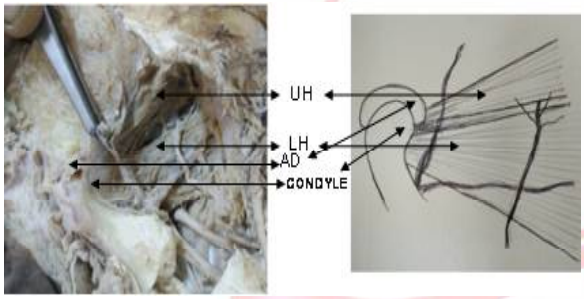


Fig. 9: Showing the Maxillary Artery deep to LPM.

Fig. 10: Showing the Buccal nerve giving 4-5 pteygoid branches.

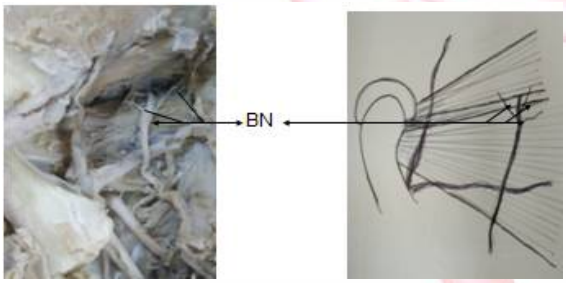
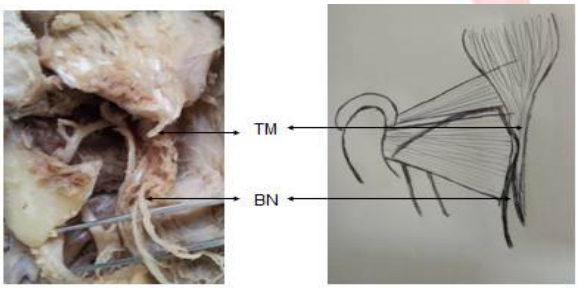


Fig. 11: Showing the Buccal nerve piercing the Temporalis.



DISCUSSION

Variation in the number of heads of lateral pterygoid muscle is not infrequent. Anatomical variations have been reported time and again by different authors from different parts of the world. Considering the lack of information in the literatures and importance of its insertion on the disc and risk factors on the anterior displacement of disc, was the guiding force to take up this study.

The fan shaped arrangement of fibres and the difficulty in determining the boundaries between the heads seem to consider LPM as being a multipeniform muscle[1]. The presence of third head showed a great variability when compared to our observations. The presence of third head could participate in the development of alterations in the disc function and in the presence of anterior disc displacement [1,4]. Three heads of LPM was found in 20.22% [1], 34.06% and 20% respectively[4,5]. Which is 2.5% in the present study The attachments of UH of LPM were categorized into four different types in which 36.7%of the fibres get inserted into the DCC and condyle [4]. Where as in our study 17.5% of fibres get inserted to the disc, capsule and also to the condyle. Another study indicated that only 6% of the fibres of UH get inserted to the capsule and disc [6]. In our study in 72.5% the UH fibres inserted to the DCC. In all the two headed specimens observed in our study , 90% of LH fibres insert to the pterygoid fovea and to the condyle. 10% of the fibres inserted to the inferior aspect of the capsule, articular disc and to the condyle. Study through imaging reported that insertion percentage of the UH in the disc is 69.8% [7].

In 2.5% of our study buccal nerve provide the pterygoid branches, this observation is similar to the study done by [8] which was seen in about 4.4% of cases. Buccal nerve pierced the Temporalis muscle in 13.3% whereas in our study it was seen in 2.5%. In the EMG studies the LPM is considered as a single muscle having two different functions. The muscle frequently shows not only a double head pattern but also a single head and triple head pattern[8]. Single head was seen in 7.7%[9]. In the present study it was seen in 2.5%. Both the heads may function differently but they are not antagonistic to one another [9] Internal derangement of the temperomandibular joints can lead to change in the thickness of the LPM. MRI studies reveal that there is significant hypertrophy of LPM in temporomandibular disorders.

Changes in thickness of the LPM may aggravate the internal derangement of TMJ or vice-versa [10]. The relation of the maxillary artery is superficial or lateral to LPM in 69.5%[11].

CONCLUSION

There is actually no clear demarcation seen between the heads of the lateral pterygoid in majority of the specimens, since the buccal nerve emerges out of the pterygoid muscles a cleft is created between the fascicule. In majority of the specimens the UH fibres insert to the disc and later blend with the adjacent capsule and LH fibres insert only to the condyle and pterygoid fovea, In 27.5% of cases there is intermingling of fibres of both upper and lower head near the border margins and get inserted to the disc, condyle and fovea. Buccal nerve which is considered as a pure sensory branch of anterior division of mandibular nerve also provided minute branches to the lateral pterygoid muscle which says that few motor fibres travel through the buccal nerve. In majority of the specimens the width of the upper head was less than the width of the lower head. Hypertrophy of the upper head muscle may be correlated with the pathological changes in the disc.

ABBREVIATIONS

UH - Upper Head.
LH - Lower Head.
AD - Articular Disc
BN - Buccal Nerve
MA - Maxillary Artery
LN - Lingual Nerve
IAN - Inferior Alveolar Nerve
IH - Intermediate Head
TM - Temporalis Muscle
EMG - Electromyograph
MRI - Magnetic Resonance Imaging
LPM - Lateral Pterygoid Muscle
MPM - Medial Pterygoid Muscle
DCC - Disc Capsule Complex
TMJ - Temporomandibular Joint

Conflicts of Interests: None

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