Original Research Paper

Volume - 11 | Issue - 01 | January - 2021 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anatomy

ANATOMICAL AND RADIOLOGICAL EVALUATION OF MEDIAL PTERYGOID MUSCLE

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ABSTRACT **INTRODUCTION:** Medial pterygoid is one of the muscles of mastication among the four principal muscles of mastication. The architecture of the medial pterygoid muscles needs to be defined both anatomically and radiologically as limited methods are available to expose them due to the complex anatomy of the infratemporal fossa. This fossa is of immense clinical importance for dental and maxillo-facial surgeons while performing their surgeries. **MATERIALS AND METHODS:** Thirty embalmed adult human cadaveric head-halves were dissected. MRI was performed on head region of thirty adults. The attachments of the muscles was observed keeping in view, the variations related to it. Maximum thickness of the mucle was evaluated at the level of second cervical vertebrae in MRI scanned patients. **RESULTS:** The observations recorded entail both the anatomical and morphometric assessment of the medial pterygoid muscle on cadaveric dissection and MRI scans of the adult patients. It consists of two heads – superficial head which arises from the tuberosity of the maxilla and the deep head originating from the lateral pterygoid plate of the sphenoid bone. Insertion was observed into the medial surface of the angle of the mandible. **CONCLUSION:** This study hopes to provide detailed information pertaining to anatomical profile of medial pterygoid muscles, thereby helping oral and maxillo-facial surgeons in their operative manoeuvres.

KEYWORDS : Medial Pterygoid Muscle, Infratemporal Fossa, Cadaveric Study, MRI Study

INTRODUCTION

Medial pterygoid is one the four principal muscles of mastication. Medial pterygoid muscle originated from the cranium and inserted on the mandible. It consists of two heads – superficial and the deep head. The superficial head arises from the tuberosity of the maxilla whereas the deep head originates from the medial surface of lateral pterygoid plate of the sphenoid bone. The fibres run downwards and laterally and was inserted into the medial surface of the angle of the mandible.[1] It helps in elevating the mandible and closing the jaw. In conjunction with the lateral counterpart, it protrudes the mandible. Furthermore, medial pterygoids cause side-to-side movements by their alternate contraction.[2]

The attachments of the medial pterygoid muscle needs to be defined both anatomically and radiologically as their exposure is difficult due to complex anatomy of the infratemporal fossa. The infratemporal fossa is a continuation of the temporal fossa between the inner surface of zygomatic arch, temporal bone and greater wing of sphenoid bone beneath the ramus of the mandible.[3] Knowledge about the topography of the contents of the infratemporal fossa has paramount importance as many surgical procedures are carried out in this area[8]. It is crucial for the dental surgeons to take care of the medial pterygoid muscle during the removal of third molar tooth as it can easily get displaced into ptrygomandibular space. Inferior alveolar nerve block injection occasionally causes haemorrhage into the medial pteryoid muscle which may give rise to the painful trismus.[4] There is also few literature on topography of the medial pterygoid muscles in Indian subjects. Therefore, present study was performed to examine the attachments and orientation of the fibres of medial ptergoid muscles through cadaveric dissections and MRI scans of the subjects of Indian origin, thereby helping oral and maxillo-facial surgeons in their operative manoeuvres.

MATERIALS AND METHODS

The study was conducted in the Department of Anatomy in collaboration with the Department of Radiodiagnosis, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi.

Thirty embalmed adult human head-halves were taken and head region of thirty adult patients were scanned by MRI. Cases showing evidence of trauma, deformity and inflammatory lesions of medial pterygoid muscle were excluded. Medial pterygoid muscles were dissected carefully preserving the maxillary artey, lingual nerve, inferior alveolar nerves and vessels . MRI scans of thirty adult patients were obtained using standard head protocols which included axial images in T1 and T2 FLAIR sequences. Images were obtained using 1.5 Tesla Philips Achieva Scanner with sense head coil. Maximum thickness of the muscle was evaluated at the level of second cervical vertebrae. All the data obtained was entered in MSExcel and statistical analysis was performed using SPSS version 21. Quantitative data was presented as table and bar diagram.

OBSERVATIONS AND RESULTS

(I) Observations in cadaveric dissection

Medial pterygoid muscle was observed as a thick quadrilateral muscle. It consists of two heads – superficial and the deep head. However, the deep head contributed to the main bulk of the medial pterygoid muscle. The two heads of the medial pterygoid muscles were observed to have the different cranial attachments in all of the specimens examined. The cranial attachment of the superficial head of the medial pterygoid muscle was found at the tuberosity of the maxilla and pyramidal process of the palatine bone. This superficial head was overlying the lower head of the lateral pterygoid muscle. The cranial attachment of the deep head of the medial pterygoid muscle was found at the medial surface of the lateral pterygoid plate of the sphenoid bone. The mandibular attachment of medial pterygoid muscles was noticed on the posterior and inferior part of the medial surface of the ramus of the mandible below and behind the mandibular foramen. This attachment was found to be musculo-tendinous in appearance in which the fleshy fibres and the tendinous sheets were arranged alternately.

The fibres of both the heads of medial pterygoid muscles were seen to descend backwards and laterally. The lingual nerve was seen to emerge from the lower border of the lateral pterygoid muscle and then it coursed downwards and forwards on the lateral surface of the medial pterygoid muscle. After emerging from the lower border of the lateral pterygoid muscle, inferior alveolar nerves along with the vessels were seen to traverse the posterior border of the medial pterygoid muscle before it entered the mandibular foramen. The medial pterygoid muscle was found to be innervated by the branch of the main trunk of the mandibular nerve.

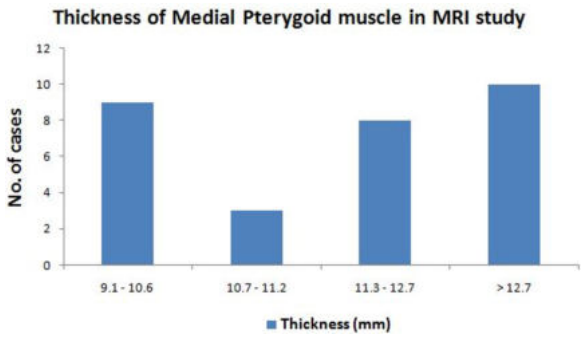
(II) Observations in MRI scan of adult patients

It was present bilaterally in all of the MRI scans of the patients examined. The anterior attachment of the medial pterygoid muscle was found to be at the lateral pterygoid plate of the sphenoid bone. The posterior attachment of the medial pterygoid muscle was found to be at the ramus and angle of the mandible. These attachments were observed in the axial images in T_1 (fig-2) and T_2 (fig-3) sequences. The fibres of medial pterygoid muscle were found to descend backwards and laterally in axial images. The maximum thickness of the medial

pterygoid muscle was measured at the level of the second cervical vertebra in T_1 sequence of axial images (fig-4) in MRI scans of all the adult patients. The morphometric observations of the medial pterygoid muscle are depicted in table – 1 and bar diagram-1.

TABLE- 1. Morphometric measurements of medial pterygoid muscles in MRI

Muscle	Thickness Mean ± SD (cm) Range = Max.- Min.
Medial pterygoid	12.07 ± 2.10 9.1 – 15.4



BAR DIAGRAM – 1

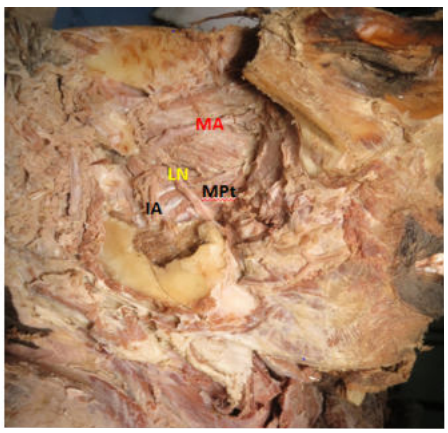


Fig – 1. MEDIAL PTERYGOID MUSCLE SHOWING ARTERIES AND NERVES IN RELATION TO IT
MP – MEDIAL PTERYGOID MUSCLE
IA – INFERIOR ALVEOLAR NERVE AND VESSELS
LN – LINGUAL NERVE
MA – MAXILLARY ARTEY

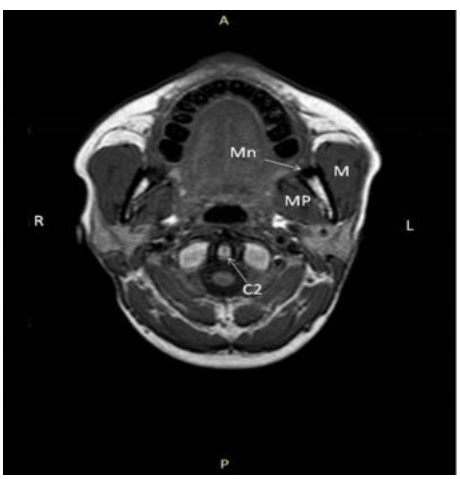


FIG – 2. MRI SCAN OF HEAD REGION (T1 – AXIAL IMAGE)
MP – MEDIAL PTERYGOID MUSCLE
Mn – MANDIBLE
C2 – SECOND CERVICAL VERTEBRA
M – MASSETER

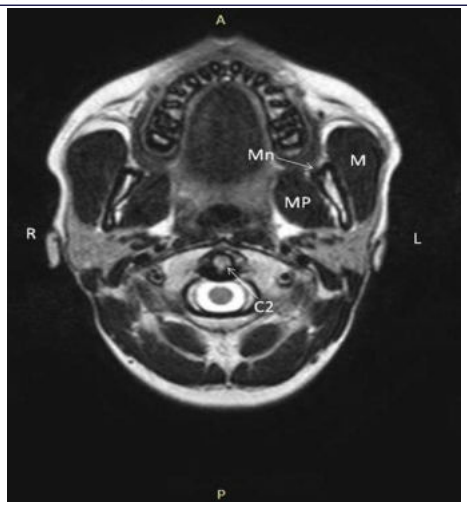


FIG – 3. MRI SCAN OF HEAD REGION (T2 – AXIAL IMAGE)
MP – MEDIAL PTERYGOID MUSCLE
Mn – MANDIBLE
C2 – SECOND CERVICAL VERTEBRA

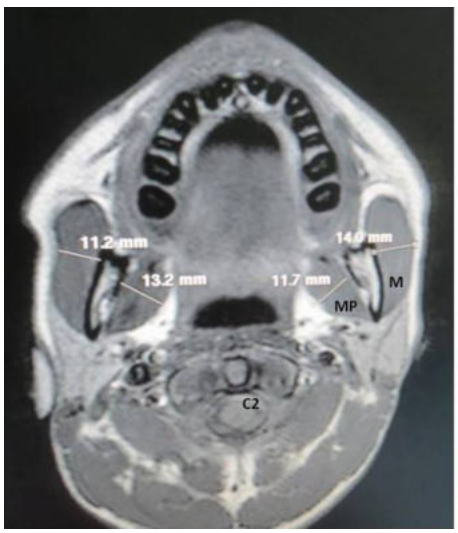


FIG – 4. MRI SCAN OF HEAD REGION MEASURINGING THICKNESS OF
MP – MEDIAL PTERYGOID MUSCLE
C2 – SECOND VERVICAL VERTEBRA

DISCUSSION

Medial pterygoid muscle was observed as a thick quadrilateral muscle consisting of two heads – superficial and the deep head. The fibres of both the heads of medial pterygoid muscles were found to traverse backwards and laterally to gain attachment on the mandible. Similar findings were observed in the axial and coronal images of all the MRI scans of the patients examined. The observations of the present study are quite consistent with observations of the earlier investigators. Haddioui AE and co-workers described that the muscle consists of two parts — an anterior and a posterior part; both parts had different attachments and appearances. The anterior part was directed outwards, downwards and backwards and was attached to the pyramidal process of the palatine bone and postero-inferior part of the tuberosity of the maxilla. The posterior part was brighter in appearance and had its origin in the pterygoid fossa and was inserted on the angle of the mandible.[5]

However, few studies have reported different views regarding the attachments of medial pterygoid muscle, which differs from the present study. Sakomoto Y et al described the origin of medial pterygoid mucle from the medial surface of the lateral pterygoid plate and anteromedial muscle bundle originating from the infratemporal surface of the greater wing of the sphenoid bone and was inserted on the posterior end of the buccinator. Sakomoto Y et al also reported an accessory medial pterygoid muscle which originated from the superior border of the lateral pterygoid plate near the foramen ovale. This

accessory muscle fibres merges with the fibres of medial pterygoid muscle.[6]

Abe S et al classified the origin of medial pterygoid muscle into three types. In the first type, the attachment of this muscle was to the medial pterygoid plate of the sphenoid bone by a strong tendon. In second type, it was attached to the posterior wall of the maxilla by a strong tendon and in third type; the attachment was directly to the periosteum of the inner surface of the lateral pterygoid plate of the sphenoid bone without any tendon.[7]

In the present study, it was found that the lingual nerve emerged from the lower border of the lateral pterygoid muscle and then it coursed downwards and forwards on the lateral surface of the medial pterygoid muscle. Similar findings were also reported by the various authors. They also noted that the medial pterygoid muscle was crossed by the lingual nerve.[6]

CONCLUSION

The results of the present study highlight a variety of anatomical details of medial pterygoid muscles. Precise knowledge of the normal anatomy and morphological variations of medial pterygoid muscles is relevant for dentists and maxillo-facial surgeons. Evaluation of the attachments of medial pterygoid muscles and its related morphological variations are crucial for performing safe surgery. Knowledge of exact topography of the nerves and vessels related to medial pterygoid muscles s is essential since neuro-vascular compression may lead to entrapment neuropathies.

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