NUMBER OF RAMI OF MARGINAL MANDIBULAR NERVE AND ITS COMMUNICATION WITH OTHER TERMINAL MOTOR BRANCHES OF FACIAL NERVE IN ADULT UNCLAIMED CADAVERS – AN ANATOMICAL STUDY

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ABSTRACT

Marginal mandibular nerve is one of the five terminal motor branches of facial nerve given in the substance of parotid gland. Injury to this nerve during surgical procedures hampers the actions of muscles of the lip and chin causing functional and aesthetic impairment.

This study on number of rami and communication of marginal mandibular nerve will benefit maxillofacial, general, cosmetic/plastic surgeons to safely prevent iatrogenic injury to this important branch of facial nerve.

Dissection of one hundred (100) hemi-faces of adult unclaimed cadavers of both genders was done (from September 2009 to March 2010) in Forensic and Anatomy departments of King Edward Medical University, Lahore. Cadavers with any scar or mutilated face/neck were excluded from this study.

In 100 hemi faces, number of rami of marginal mandibular nerve varies from 1-3. Single branch is most common (74%) followed by two (20%) and three rami (6%). In 36% of cases communication was seen with buccal branch, 1% with cervical branch, with both buccal and cervical branches in 1% of cases. No communication with either buccal or cervical branch of facial nerve was seen in 62% of cases. Frequency of communication increases with number of Rami of marginal mandibular nerve.

In our population single marginal mandibular nerve is most common (74%) which does not communicate with other branches of facial nerve frequently (74.3%). Therefore transection of this nerve during surgical procedures can result in permanent paralysis.

Key Words: Marginal mandibular nerve, facial nerve, rami, communication, mandible, anatomy.

INTRODUCTION

The marginal mandibular nerve is the most frequently injured motor branch of facial nerve during surgical and cosmetic procedures.1 Misguidedly done surgical exploration increases the risk of iatrogenic injury to marginal mandibular nerve and also increases the likelihood of post operative scarring. It may get injured in a number of surgical/cosmetic procedures namely parotidectomy, submandibular gland excision, deep dissection of the neck, carotid endarterectomy, mandibular advancement surgeries, rhytidectomy and liposuction surgery.2-8 The marginal mandibular nerve innervates risorius and muscles of the lower lip and chin namely depressor anguli oris, depressor labii inferioris, the inferior fibers of the orbicularis oris and mentalis.1,9-11 Damage to this nerve can cause functional and aesthetic impairments such
as difficulty in eating and speaking, and an asymmetrical smile due to an alteration in the balance of the muscles preventing lateral and downwards movements of the lower lip on the affected side.\textsuperscript{12-14}

If marginal mandibular nerve is commonly present as single nerve, damage to this nerve hampers the activity of the lower lip and chin muscles. More rami provide an alternate route for supply to the mimetic lip muscles. The number of rami of marginal mandibular nerve can range from 1 to 4; where 2 rami are most commonly reported in studies.\textsuperscript{15-21}

Studying the various communication pattern of marginal mandibular nerve with other motor branches of facial nerve will give the surgeons an idea about the consequence of injury to this nerve. If less intercommunication between nerves is present it means that in case of injury chances of permanent paralysis of the lip muscles are high. If communication with other motor branches of facial nerve is frequent then it means that even if marginal mandibular nerve is injured during surgical procedures, muscles of the lower lip will not be paralyzed. Marginal mandibular nerve along with buccal branch of facial nerve supplies risorius muscle therefore in case of injury to both nerves there is failure to retract the angle of the mouth.\textsuperscript{22} Marginal mandibular and cervical branches of facial nerve may also co-innervate the depressor muscles of the lip.\textsuperscript{23}

Anatomical studies on marginal mandibular nerve have been conducted on cadavers in different parts of the world. To our knowledge no such studies have been reported in our population. This study on the anatomical localization of marginal mandibular nerve will increase our understanding about the location and relations of this nerve in our population so that damage to this nerve during surgical intervention can be avoided.

**METHODOLOGY**

This cross sectional study was carried out from September 2009 to March 2010 in the mortuary of Forensic Medicine department and dissection hall of Anatomy department of King Edward Medical University, Lahore. A total of 100 adult cadaveric facial halves were included in this study selected by non-probability convenience sampling. Unclaimed dead bodies from both genders and of 18 years or above age were included. Cadavers with any scar or mutilated face/neck were excluded from this study. Side of the face to be dissected was chosen randomly, the dead body when placed on the dissection table, side of face which was more approachable and easy to evaluate was chosen for dissection. All dissections were done on unclaimed dead bodies for which consent from the concerned Police Station and ethical committee was taken by the departments of Forensic Medicine and Anatomy.

Cadavers were placed in supine position with head tilted laterally. In each case a skin incision was made with surgical blade no. 23 about 3 cm below and parallel to the level of lower border of mandible from the mid line of the neck to the anterior border of the sternocleidomastoid muscle. The incision was continued upwards passing about 1 cm behind the level of angle of the mandible passing anterior to the tragal point up to the zygomatic arch.

The skin and the underlying attached subcutaneous tissue was held and stretched outward and superiorly with the help of Addison tissue forceps and separated from the underlying fascia by giving horizontal strokes with surgical blades no 23 and 12 up to the level of zygomatic arch superiorly and up to the angle of mouth anteriorly. Platysma muscle was incised along the level of the lower border of mandible and reflected downwards. Buccal and marginal mandibular branches of facial nerve were identified exiting from the parotid gland.

The number of rami of marginal mandibular nerve at the site of emergence from parotid gland was recorded and each ramus of marginal mandibular nerve was traced from its emergence from the parotid gland until its termination in the muscles of the lower lip. If two or more rami are present, they are labelled as A, B and C on the basis of their relation/position with respect to each other; irrespective of their position with respect to the level of lower border of mandible. If 2 rami are present, the lower lying ramus of marginal mandibular nerve is labelled as A and the upper is labelled as B. If three rami are present, inferior ramus is labelled as A, middle as B and superior ramus as C (Figure 3 and 4).
The parotid gland was removed in bits to further reveal the origin of the marginal mandibular nerve from the lower division (cervicofacial) of the facial nerve trunk to confirm that the branch being studied was the marginal mandibular nerve. Communication between marginal mandibular, buccal and cervical branches of facial nerve was noted.

Fig 1: Pie chart showing Number of Rami of marginal mandibular nerve in percentage.

Fig 2: Cervicofacial division of facial nerve. Marginal mandibular nerve present as a single ramus.

Fig 3: Two rami of Marginal mandibular nerve along the lower border of mandible piercing the depressor muscles of lip.
Dissections were done with naked eye and with the help of magnifying loop (Neitz instruments co. ltd. BLS-3 magnification 2.5x to 3x working distance 350 to 550mm).

The data was processed with SPSS® 15.0 for windows statistical software (SPSS Inc., Chicago, IL, USA). Categorical variables were expressed as frequency, proportion and percentages. Chi-square test was used to analyze the association between categorical variables. For all statistical analyses probability levels of \( p < 0.05 \) were considered statistically significant.

**RESULTS**

The sample comprised of 95 (95%) male and 5 (5%) female adult cadavers with mean age of 44.61 ± 15.024 years (range 20-75 years). The mean age of male cadavers was 43.91 ± 14.83 years and that of female cadavers was 58 ± 13.51 years. 42 right and 58 left facial halves were dissected.

74% of the cases had single marginal mandibular nerve on exit from parotid gland. No subject had more than three rami (Figure 1).

Marginal mandibular showed no communication with either buccal or cervical branches of facial nerve in 62 % of the cases. Communication with buccal branch of facial nerve was seen more frequently (36%) than with cervical branch of facial nerve (1%). Mar-
Number of rami of marginal mandibular nerve ramii communicated with both buccal and cervical branches of facial nerve in 1% of cases.

There is positive correlation between the number of rami and communication with other motor branches of facial nerves. P value is significant (P = 0.000). When the number of rami is increasing, communication of marginal mandibular nerve with other motor branches of facial nerve is also increasing (Table 1).

DISCUSSION

Marginal mandibular nerve is at risk of injury during maxillofacial and cosmetic surgical procedures in the region of parotid gland, mandible and peri-oral region. This demands detailed knowledge of the anatomy of marginal mandibular nerve. At present, to our knowledge, no such studies have been published till now in Pakistan. The present study was designed to evaluate the anatomy of marginal mandibular nerve in our population.

In the present study, single ramus of marginal mandibular nerve was more commonly seen in the cadavers as compared to multiple rami.

Batra et al. 24 also reported that marginal mandibular nerve was more commonly present as a single nerve (88%). He found two rami of marginal mandibular nerve in the remaining 12% of their sample. Multiple rami were not reported by Batra et al. 24 Where as in this study although rare but three rami were seen in few cases. Liu et al. 17 also reported that one or two rami (95.9%) were commonly seen than three or more rami.

There was higher incidence of 2 rami reported by Woltmann et al. 18 and Basar et al. 25 i.e. 60% and by Al-Hayani 26 i.e. 40%. Two rami were also reported as the commonest type in study by Kim et al. 15 i.e. 52%.

According to Savary et al. 26 marginal mandibular nerve was present as two or three rami and did not occur as a single nerve. Three rami were present in majority of their cases (72.7%) followed by two rami in 27.3% of cases. Four or more rami were also reported by Basar et al. 25 However, in this study, four rami were not seen in any of the facial halves.

When nerve is present as a single ramus in majority of cases such as in this study, there are more chances of post operative lip deformity if the nerve is damaged during surgical procedures because of absence of alternate nerve supply to the lip depressor muscles. Chances of deformity are further increased if communication with other motor branches of facial nerve is not present.

In the present study, single marginal mandibular nerve is most common which does not communicate with other branches of facial nerve frequently (Table 1). Communication with buccal branch of facial nerve was more common as compared to cervical branch of facial nerve. Similar results were reported by Kim et al. 15 where no communication was reported in 60% of cases. Study done by Batra et al. 24 showed higher cases where no communication was present (88%). Woltmann et al. 18 study showed 64.44% of cases where communication with buccal or cervical branches of facial nerve was present whereas Tzafetta and Terzis 27 found communication with buccal branch of facial nerve in half of their sample.

In this study communication was seen more commonly when two or more rami were present. When marginal mandibular nerve was present as a single branch it either communicated with buccal nerve or had no communication with either buccal or cervical nerve. Communication of marginal mandibular nerve with other motor branches of facial nerve is not commonly seen therefore transection of marginal mandibular nerve during surgical procedures can result in permanent paralysis of lower lip depressor muscles causing aesthetic and functional impairment.

CONCLUSION

In our population single marginal mandibular nerve is most common (74%) which does not communicate with other branches of facial nerve frequently (74.3%). Communication with other branches of facial nerve is not frequently seen. If anatomy and anatomic variations are known to the surgeons, iatrogenic injuries can be avoided.

REFERENCES

2 Nason RW, Binahmed A, Torchia MG, Thiliversis J. Clinical observations of the anatomy and function of the marginal