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Original Research Article

Morphological Variations of Marginal Mandibular Nerve and Its Relation to Facial Artery: A Cadaveric Study

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ABSTRACT

Background: The Marginal mandibular nerve is a terminal branch of Facial nerve. The nerve runs close to the inferior margin of the mandible, superficial to the facial vessels and supplies the muscles of the lower lip. The proper knowledge on variations along the course of the nerve and its relations to facial vessels play a significant role in determining the success of any surgical intervention in that region.

Materials and methods: This study is a cross-sectional study conducted in the department of anatomy of a private medical college in Tamil Nadu, India. Fifty facial halves from embalmed cadavers are utilised for this study. Descriptive statistics is used to analyse the data obtained from the study

Results: In all the 50 specimens, marginal mandibular nerve emerged from the cervicofacial ramus of facial nerve. 26% specimens showed single branch of the nerve, in 56% specimens, two branches were observed, and in 18% specimens, three branches of marginal mandibular nerve were observed. 76% the nerve coursed inferior to mandible. The average distance of the nerve from the inferior margin of the mandible was 1.4 cm. In 96% of the specimens, the nerve coursed lateral to the facial vessels. In 4% of the specimen, the branches of the nerve were found both lateral and medial to the facial artery. Communication of the nerve with buccal branch was observed in 16% of specimens.

Conclusion: As the marginal mandibular nerve shows lot of variations, a proper anatomical knowledge on the same helps the patients to have a good treatment preventing any iatrogenic complications.

KEY WORDS: Marginal mandibular nerve, Facial artery, inferior margin of the mandible, Facial nerve.

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INTRODUCTION

The Marginal Mandibular nerve is one of the terminal branches of facial nerve. The nerve runs in close proximity to the mandible and

hence has gained the name as marginal mandibular nerve. The branches of anterior division of facial nerve namely the temporal, zygomatic, buccal, marginal mandibular and cervical supply the muscles of face which are responsible for bringing out expressions. The nerve originates from the cervicofacial ramus of the facial nerve in the parotid gland and exits from its anterior border. It is present deep to the Platysma and investing layer of deep cervical fascia. It runs superficial to the facial vessels and runs close to the inferior border of the mandible and supplies depressor anguli oris, depressor labii inferioris and mentalis muscles, which are muscles of lower lip and chin. These muscles are necessary to maintain facial symmetry and they bring out the "smile" expression and hence the nerve is called as "smile nerve". Iatrogenic injury during parotid or mandibular surgeries have been attributed as common causes of paralysis of this nerve [1].

Hence, this study is conducted to study the morphology of marginal mandibular nerve, its relation to facial artery and also to observe the variations of the nerve, thereby contributing to the subject of anatomy and aiding the clinicians during surgical procedures.

MATERIALS AND METHODS

This study is a cross-sectional study conducted in the department of anatomy of a private medical college in Tamil Nadu, India. Fifty facial halves from embalmed cadavers are utilised for this study.

Inclusion criteria: Healthy facial halves from embalmed cadavers are included in this study

Exclusion criteria: Distorted facial specimens, pathological specimens are excluded from this study.

The skin of face and proximal part of neck is carefully reflected. The fascia and platysma are carefully dissected to look into the underlying structures. The facial vessels are identified in relation to anterior border of masseter muscle. The marginal mandibular nerve is identified and traced completely. The relation of the nerve to the parotid gland is observed. The origin, course, number of branches of the nerve, its relation to inferior margin of mandible, its relation to facial vessels and its communication to other nerves are also observed.

Descriptive statistics is used to analyse the data obtained from the study.

RESULTS

In all the 50 specimens, marginal mandibular nerve emerged from the cervicofacial ramus of facial nerve.

The average distance of the emergence of the nerve from the anterior border of parotid gland from the lobule of the ear was 3.6 cm.

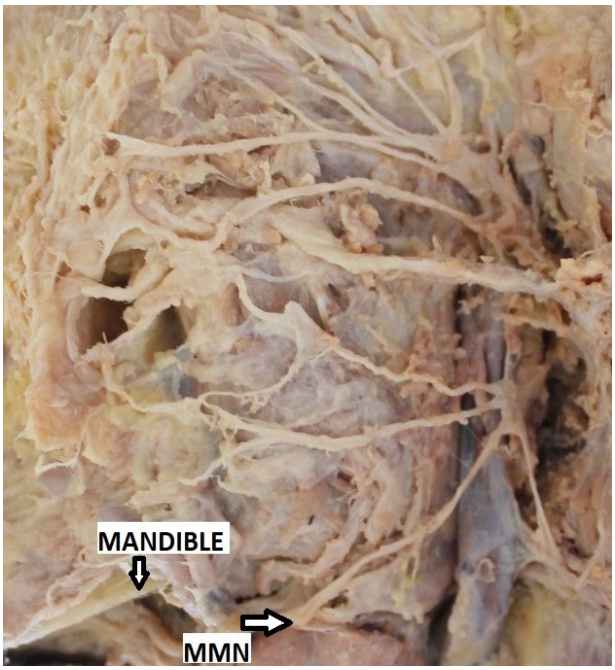
Number of branches of marginal mandibular nerve: At its origin, the nerve was single in all the specimens, and 26% specimens showed single branch of the nerve throughout its course. In 56% specimens, along the course of the nerve, two branches were observed, and in 18% specimens, three branches of marginal mandibular nerve were observed (Table 1) (Figure 1).

Table 1: Percentage of number of branches of marginal mandibular nerve.

No. of branches of Marginal Mandibular nerve	Percentage
One branch	26%
Two branches	56%
Three branches	18%

Fig. 1: Three branches of Marginal mandibular nerve.

Course of the marginal mandibular nerve in relation to the inferior border of mandible: In 24% of the specimens, the nerve didn't descend down from the inferior border of the mandible, whereas in majority of the specimens (i:e) 76% the nerve coursed inferior to mandible. The average distance of the nerve from the inferior margin of the mandible was 1.4 cm. (Figure 2)



MMN- Marginal mandibular nerve

Fig. 2: Marginal mandibular nerve branch coursing inferior to inferior border of mandible.

Relation of the marginal mandibular nerve to the facial artery: In 96% of the specimens, the nerve coursed lateral to the facial vessels. In 4% of the specimen, the branches of the nerve were found both lateral and medial to the facial artery.

Communications of marginal mandibular nerve with other nerves: Communication of the nerve with buccal branch was observed in 16% of specimens.

DISCUSSION

As the facial nerve supplies the muscles of facial expression, iatrogenic injury to the marginal mandibular nerve results in cosmetic deformity as it supplies the muscles of the lower lip, thereby the facial symmetry is distorted. Hence the anatomy of the nerve and its relations with surrounding structures will aid in safe identification and preservation of this nerve [2].

In the present study, 26% of marginal mandibular nerve was single, 56% of specimens showed two branches and 18% of the specimens showed three branches. **Chart 1** shows the comparison of number of branches of marginal mandibular nerve in the present study to other authors.

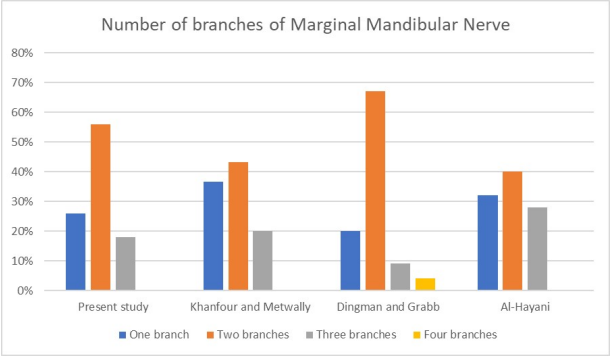


Chart 1: Number of branches of marginal mandibular nerve.

As per the studies, two branches of marginal mandibular nerve are more prevalent and the data is consistent in all the studies. Dingman and Grab [3] have reported four branches of the nerve, which is not found in the present study. In studies by Khanfour and Metwally [4] and Al-Hayani [2], maximum three branches of the nerve were reported which is consistent with the present study.

The course of the nerve in relation to the inferior margin of the mandible has been studied. In the present study, around 76% of specimen showed that one of the branches of the nerve to course inferior to the inferior margin of mandible and 24% coursed above the inferior margin of mandible. Nelson and Gingrass [5] have reported 100% of the nerve to pass inferior to the inferior margin of mandible.

Savary et al [6] have studied the course of the nerve in relation to the facial artery. Their observation stated that in 63% of the specimens, the nerve coursed inferior to the mandibular border posterior to the facial artery and in 27% the nerve coursed inferior to the mandibular border anterior to the artery. In the present study, all the specimens which showed nerve coursing inferior to the inferior margin of the mandible were all posterior to the facial artery.

Batra et al [7] have reported that in 81% of

specimens, the nerve coursed above the inferior border of the mandible and in 19% it coursed inferior to the mandible.

The present study findings about the course of marginal mandibular nerve in relation to the inferior margin of mandible correlate with the findings of Nelson & Grass [5] study and Savary et al [6] study. However, the findings differ with the study findings of Batra et al [7] **(Chart 2)**. Marcuzzo et al [8] in their meta-analysis have reported a 39% prevalence of one of the branches of marginal mandibular nerve to be below the lower margin of mandible which is a significant aspect to be considered in submandibular surgeries.

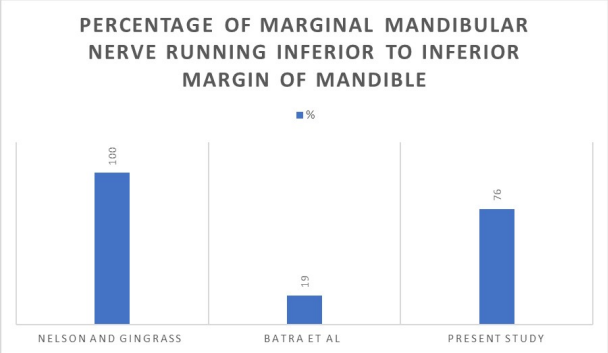


Chart 2: Percentage of Marginal mandibular nerve branches running inferior to inferior margin of mandible.

In the present study in 96% of specimens, the nerve passed lateral to the facial artery, in 4% of the specimens, the branches of the nerve were found both lateral and medial to the facial artery. This similar finding is reported by Khanfour and Metwally [4], where in 93% of the specimens, the nerve coursed lateral to the facial artery and in 7% of the specimens, one of the secondary branches passed medial to the facial artery. However, in study by Singh AP et al [9], in 100% of the specimens the marginal mandibular nerve coursed lateral to the facial artery. Thereby facial artery serves as an important landmark in locating the marginal mandibular nerve.

The average distance of nerve from the inferior margin of the mandible was 1.4 cm. This is consistent with the findings of Baker and Conley [10] that during parotidectomies, the nerve was found 1-2 cm lower to the mandibular margin. This distance gains importance during surgical incisions in the submandibular region to avoid iatrogenic complications. Incisions are preferably given two finger breadth below and parallel to the angle of the mandible, so the marginal mandibular nerve lies in the upper flap [11].

Communication of the marginal mandibular nerve with the buccal branches were present in 16% of the specimens in the present study. Khanfour and Metwally [4] have reported 40% of communication between buccal branch and marginal mandibular branches of facial nerve. Brennan et al [12] have reported a communication between marginal mandibular nerve and greater auricular nerve, and Domet et al [13] have reported a communication between marginal mandibular nerve and transverse cervical nerve. These findings are not present in the present study.

De Bonnecaze et al [14] have reported that marginal mandibular nerve showed fewer communications than other facial nerve branches and lower lip muscles received the least supplemental innervation.

Injury to the marginal mandibular nerve results in facial asymmetry which becomes evident during crying resulting in “Asymmetric crying facies” [15]

CONCLUSION

The marginal mandibular nerve of facial nerve being one of the terminal branches of extracranial course of facial nerve shows multiple variations in terms of branches, its relation to the lower margin of the mandible along its course, its relation to the nearby facial vessels and its communications to the neighbouring nerves. A sound anatomical knowledge on the same helps the patients to get treated in a better comprehensive way thereby preventing any iatrogenic complications.

ABBREVIATIONS

MMN- Marginal Mandibular nerve

Author Contributions

Thamarai Selvi A – concept & design, acquisition of data
Anbumani T L – concept & design, final approval of the draft
Karthick S- analysis of the data
Gnanavel A – acquisition of data
Lalitha R- acquisition of data

Conflicts of Interests: None

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