

Vertical Relation of Marginal Mandibular Nerve Rami with the Lower Border of Mandible as Seen in Cadavers – An Anatomical Study

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Abstract

Introduction: Marginal mandibular nerve is an important motor branch of facial nerve supplying the muscles of lower lip and chin. It is reportedly the most commonly injured branch of facial nerve during surgical and cosmetic procedures.

Objective: The present study was designed to evaluate various positions (highest and lowest) of marginal mandibular nerve in relation to the level of lower border of mandible.

Study Design: Cross sectional study.

Place of Study: King Edward Medical University in Lahore.

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

Results: In 100 hemi faces, the total number of rami of marginal mandibular nerve at the site of exit from parotid gland was 132. 90.9% of which were present above the lower border of mandible. Marginal mandibular nerve coursed between 14.75 mm above to 4.55 mm below the level of lower border of mandible.

Conclusion: In the light of this study it is safe to say that in our population marginal mandibular nerve generally lies above or very close to the level of lower of mandible even when it is below the mandible; therefore it is safe to place the incision 1 cm below the mandible to safe guard this small and aesthetically and functionally important nerve.

Key Words: Marginal mandibular nerve, distance, mandible, vertical relation, facial nerve, rami.

Introduction

Marginal mandibular nerve is given within the substance of Parotid gland as a terminal branch of facial nerve along with four other branches namely: temporal, zygomatic, buccal and cervical. It is an important motor branch which supplies muscles of facial expression around lower lip and chin area.^{1,2}

The nerve is present superficially as it exits the parotid gland; covered only by skin, subcutaneous tissue and fascia.³ At the region of middle of the mandible body, the marginal mandibular nerve is particularly at risk because the superficial musculoaponeurotic system (SMAS) becomes very thin here.²

It is reportedly the most commonly injured branch of facial nerve during surgical procedures.² An injury to marginal mandibular nerve can range in severity from a first – to a fifth degree injury. Type of injury will determine the potential for the patient to regain normal nerve functions over the passage of time.⁴ Marginal mandibular nerve paralysis produces a downward and / or medial drift of the lower lip causing oral incompetence, drooling of saliva and difficulties with annunciation.⁵

Marginal mandibular nerve relation to the lower border of mandible is variable where it may lie above or below it.⁶⁻¹⁰ The nerve courses 13.4 mm above to 12 mm below the inferior border of mandible.^{7,9} The low-

est distance reported is 17.5 mm below the mandible.⁶

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.¹¹⁻¹⁷ This demands detailed knowledge of the precise location and landmark of marginal mandibular nerve so that incisions and surgeries can be planned accordingly. At present to our knowledge no such studies have been published till now in Pakistan. The present study was designed to evaluate various positions (highest and lowest) of marginal mandibular nerve in relation to the lower border of the mandible.

Materials and Methods

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 hemi faces of 100 adult cadavers were included in this study selected by non-probability convenience sampling. Cadavers with any scar or mutilated face/neck were excluded from this study. Most approachable and easy to evaluate side of face was chosen for dissection. All dissections were done on unclaimed dead bodies for which consent from the Police Station and ethical committee was taken prior to all dissections.

Cadavers were placed on the dissection table in supine position with head tilted on one side. An incision was made with surgical blade no. 23 about 3 cm below and parallel to the level of lower border of mandible starting from the mid line of the neck to the anterior border of sternocleidomastoid muscle. The incision was continued upwards passing about 1 cm behind the level of angle of the mandible 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. Marginal mandibular nerve was identified exiting from the parotid gland.

Vertical distances of all rami of marginal mandibular nerve, from the lower border of mandible, were taken with the help of vernier callipers and vertical

distance of each ramus was recorded individually. The reference point from where all vertical measurements were recorded was 1.5 cm anterior to the observed angle of the mandible. Observed angle of the mandible was taken as an imaginary point where the posterior border of the ramus and the lower border of body of mandible met. This angle of mandible was observed by holding two disposable scales one along the posterior border and the other along the lower border of body of mandible. All vertical measurements from the lower border of mandible were taken 1.5 cm anterior to this observed angle of mandible. The relation of each ramus either above or below the lower border of mandible was also noted at the same reference point (Figure 1).

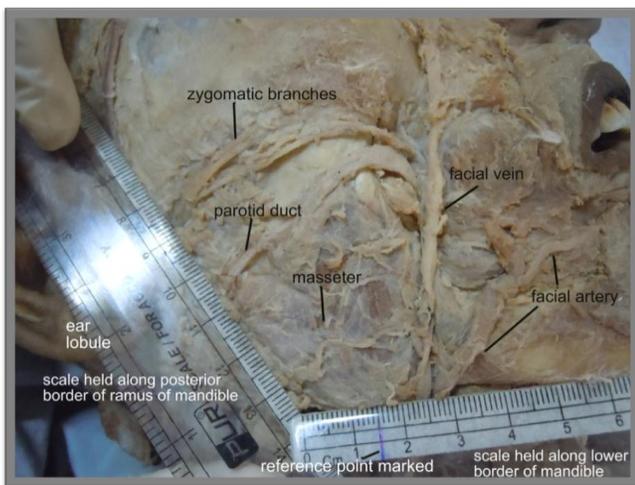


Figure 1: Observed angle of the mandible. 1.5 cm anterior to this observed angle on the lower border of the mandible all vertical measurements were taken.

All dissections were done with naked eye and with the help of magnifying loop (Neitz instruments co. ltd. BLS₃ magnification 2.5 × to 3 × working distance 350 to 550mm) in a well lit dissection rooms.

The data was processed with SPSS® 15.0 for windows statistical software (SPSS Inc., Chicago, IL, USA).Categorical variables (gender, side of face

dissected, relation of nerve with lower border of mandible) were expressed as frequency, proportion and percentages. Quantitative variables (age, vertical distance) were expressed as mean ± standard deviation.

Results

Total 100 dissections were done out of which 95 were males and 5 were females (age range 20 – 75 years). The male to female ration was 19:1. The mean age of the sample was 44.61 ± 15.024 years. 42 right and 58 left facial halves were dissected. The total number of Rami of 100 facial halves at the site of exit from parotid gland was 132. The rami were categorized according to their location with respect to the inferior border of mandible and location of each ramus was seen separately.

Measurements were taken of all 132 rami of 100 hemi faces. Distance was measured in mm. Marginal mandibular nerve coursed between 14.75 mm above to 4.55 mm below the mandible. Out of these 132 rami, 120 were present above the inferior border of mandible and 12 were present below the inferior margin of mandible at the reference point.

Vertical Distance of Rami Present Above the Lower Border of Mandible

Mean vertical distance of 120 rami present above the lower border of mandible was 8.21 ± 2.37 mm from the inferior margin of mandible. Minimum distance from the inferior margin was 1.55 mm and maximum distance was 14.75 mm (Table 1).

Vertical Distance of Rami Present Below the Lower Border of Mandible

Mean vertical distance of 12 rami present below the lower border of mandible was 3.06 ± 1.20 mm from the inferior margin of mandible. Minimum distance from the inferior margin was 1.00 mm and maximum was 4.55 mm (Table 1).

Table 1: Relation and vertical Distance of Rami from the inferior border of mandible.

Relation of Rami from Inferior Border of Mandible	Number of Rami		Mean Distance ± SD (mm)	Range (mm)
	n	% age		
Above	120	90.9	8.21 ± 2.37	1.55 – 14.75
Below	12	9.09	3.06 ± 1.20	1.00 – 4.55

n – number of rami

Discussion

Out of the 132 total rami seen in 100 samples, 120 (90.9%) were present above the mandible and 12 rami (9.09%) were present below the mandible. Marginal mandibular nerve coursed between 14.75 mm above to 4.55 mm below the lower border of mandible. Liu et al⁹ showed similar results to the present study. They reported that marginal mandibular nerve coursed 13.4 mm above to 4.8 mm below the lower border of mandible.

Other studies show different results. Batra et al¹⁸ reported the lowest distance as 16 mm. Nason et al¹⁷ reported the lowest location of the nerve was 15 mm in neutral head and 30 mm in extended head position. Touré et al⁶ found marginal mandibular nerve 17.5 mm below in their study.

Since all measurements and relations were noticed at a common reference point in this study in order to clearly state our methodology (Figure 1), the differences in the measurements from other studies can be due to variable reference points taken by different authors.

In the present study marginal mandibular nerve rami were present above the lower border of mandible in majority of the cases. It is vulnerable to get injured during cosmetic and surgical procedures anterior to masseter muscle where protective barrier of SMAS is thin. Care must be taken in all cosmetic and surgical procedures to prevent irrevocable injury to marginal mandibular nerve.

Marginal mandibular nerve was not found in this study more than 4.55 mm below the lower border therefore, care must be taken during surgical procedures being carried out close to the lower border of mandible. It is safe to place surgical incision 1cm below the level of lower border of mandible.

Conclusion

Reconstruction of paralyzed facial muscles is a challenging problem and iatrogenic injury should be avoided. A thorough and precise knowledge of the anatomy of this nerve is a prerequisite for surgeons operating in these areas to safe guard this small but functionally important branch of facial nerve. While planning the incision placement and surgical exploration, the surgeons should keep in mind that the nerve courses very close to the lower border of mandible. In the light of this study it is safe to say that in our population marginal mandibular nerve generally lies above

or very close to the lower margin of the mandible even when it is below the mandible; therefore it is safe to place the incision 1 cm below the mandible to safe guard this small and aesthetically and functionally important nerve.

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References

1. Hussain G, Manktelow RT, Tomat LR: Depressor labii inferioris resection: An effective treatment for marginal mandibular nerve paralysis. *Br J Plast Surg* 2004; 57: 502-10.
2. Gloster – junior HM: Complications in cutaneous surgery. Springer science and business media. 2008: 21-28, 228-229.
3. Gray H. Gray's Anatomy: The anatomical basis of clinical practice. 39th ed. New York: Elsevier Churchill Livingstone; 2005: 499, 507, 513-516.
4. Jones JK, Van Sickels JE: Facial nerve injury associated with orthognathic surgery. *J Oral Maxillofac Surg* 1991; 49: 740.
5. Pensak ML: Controversies in otolaryngology. Thieme; 2001: 132-133.
6. Touré S, Vacher C, Bertrand JC: Anatomy of the marginal mandibular branch of the facial nerve. *Rev Stomatol Chir Maxillofac* 2004; 105: 149-152.
7. Woltmann M, Faveri R, Sgrott EA: Anatomosurgical study of the marginal mandibular branch of the facial nerve for submandibular surgical approach. *Braz Dent J* 2006; 17: 71-74.
8. Al-Hayani A: Anatomical localisation of the marginal mandibular branch of the facial nerve. *Folia Morphol (Warsz)* 2007; 66 (4): 307-313.
9. Liu AT, Jiang H, Zhao YZ, et al: Anatomy of buccal and marginal mandibular branches of facial nerve and its clinical significance. *Zhonghua Zheng Xing Wai Ke Za Zhi* 2007; 23: 434-437.
10. Saylam C, Ucerler H, Orhan M, et al: Localization of the marginal mandibular branch of the facial nerve. *J Craniofac Surg* 2007; 18 (1): 137-42.
11. Milton CM, Thomas BM, Bickerton RC: Morbidity study of sub-mandibular gland excision. *Ann R Coll Surg Engl* 1986; 68: 148-150.
12. Liebman EP, Webster RC, Gaul JR, et al: The marginal mandibular nerve in rhytidectomy and liposuction sur-

- gery. Arch Otolaryngol Head Neck Surg 1988; 114: 179-181.
13. Pegoraro M, Barile C, Nessi F, et al: Peripheral nerve injuries during carotid endarterectomy. Minerva Cardio angiolog 1990; 38: 211-213.
 14. Assadian A, Senekowitsch C, Pfaffelmeyer N, et al: Incidence of cranial nerve injuries after carotid eversion endarterectomy with a transverse skin incision under regional anesthesia. Eur J Vasc Endovasc Surg 2004; 28: 421-424.
 15. Lanigan DT, Hohn FI: Facial nerve injuries after sagittal split mandibular ramus osteotomies for advancement: a report of 2 cases and review of the literature. American assoc Oral Maxillofac Surg 2004; 62: 503-507.
 16. Barry O, Girish B, Satwant B, et al: Facial nerve morbidity after retrograde nerve dissection in parotid surgery for benign disease: A 10 – year prospective observational study of 136 cases. Br J Oral Maxillofacial Surg 2006; 45: 101-107.
 17. Nason RW, Binahmed A, Torchia MG, et al: Clinical observations of the anatomy and function of the marginal mandibular nerve. Int J Oral Maxillofac Surg 2007; 36: 712-715.
 18. Batra AP, Mahajan A, Gupta K: Marginal mandibular branch of the facial nerve: An anatomical study. Indian J Plast Surg 2010; 43: 60-64.