

RESEARCH ARTICLE

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Study on the Anatomical Variation of Marginal Mandibular Nerve and its injury during neck dissection

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Abstract

Facial, especially mouth and lips, expression of human is a tool to read his emotions. It is controlled by marginal mandibular branch of facial nerve. This nerve often gets injured during surgery by the surgeon's due to disease complications. An injury in marginal mandibular nerve (MMN) during the surgery can distort the facial expression. Thus, present study aimed to explore the anatomical variation of MMN and injury following surgery in patients with neck cancer. This study was included 51 patients with neck cancer and was operated by our expert surgeon's team. Out of these, 48 patients (94.11%) had one branch and 3 patients (5.9 %) had two branch of MMN. The distance below mandible was less than 5mm in 48 subjects (94.11%), while in 3 patients (5.9 %), it was between 5-10 mm. In 21, 3, 16, 8, 2 and 1 patients loop angle were 110°, 120°, 130°, 140°, 150° and 160° observed, respectively. In 9 patients (17.65%), MMN facial nerves were sacrificed due to malignancy reason. In our present study, injury of MMN facial nerve due to malignancy and results of surgical approaches for healthy nerve with zero percent injury were documented.

Keywords: Marginal Mandibular Nerve, Neck dissection, Neck cancer

INTRODUCTION

Facial expressions and their muscles contraction are coordinated through major five branches of facial nerve. Out of these major five branches of facial nerve, one is the marginal mandibular nerve (MMN) coordinated with muscles of the lower lips. Frequent iatrogenic injury that cause paralysis of MMN nerve is observed during the surgical operations in mandibular and parotid regions [1-3]. Zero to 4% permanent injury of MMN facial nerve has been reported after fixation and open reduction of subcondylar fractures and angle mandibular fractures, respectively [4-6]. The risk of MMN facial nerve damage during excision of the submandibular gland has been well recognized. Surgical operation of benign and malignant parotid gland tumors can cause injury of facial nerve [7-11]. Injury in MMN facial nerve resulted in very conspicuous distortion in smiling, grimacing or opening of mouth and this is due to paralysis of muscles of the lower lip. This deformity is corrected by transfer of anterior belly of digastrics muscle or extensor digitorum brevis [12]. To prevent the injury in MMN facial nerve during the surgical procedure more attention and knowledge of variations of MMN nerve in population can be required. There are limited works on the MMN facial nerve variation has been reported in the literature. Thus, in present study we aimed to explore the

anatomical changes and operational injury in marginal mandibular facial nerve.

MATERIAL AND METHODS

This study was conducted in the Department of Surgical Oncology in association with Department of Neurology, Sir Sunderlal Hospital, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India from July 2010 to July 2012. The study was ethically approved by institutional ethical committee. Signed informed consent was taken from every subject.

Total 51 patients with neck cancer (45 male and 6 female with mean age 53 years) were included in the study. Pregnant and lactating women, patients with synchronous primaries, previous surgery on neck, patients undergoing salvage neck treatment were excluded from the study.

The resections of the primary site and neck dissection were done by departmental expert surgeon's team with his associate trainees as per standard techniques with neck in hyper extended position. Supraomohyoid, functional, radical and modified radical neck dissections were performed in 14, 6, 7 and 24 patients respectively. The type of neck dissection

performed was duly recorded with special emphasis on the structures preserved. During operation marginal mandibular nerve was identified. Course and number of branches of MMN facial nerve, distance from lower border of mandible and loop angle (angle between descending segment of MMN and ascending segment toward mandible) were recorded.

RESULTS

Out of 51 patients with neck cancer enrolled for the study, 45 were male and 6 were female. Site of primary lesion and their numbers in study population were represented in Table-1.

In 48 patients (94.11%) only one branch of marginal mandibular nerve was found, while 3 patients (5.9 %) had 2 branches. In all 51 subjects (100%), it emerged from anterior-medial surface of parotid and was superficial to facial vein and artery. In 48 subjects (94.11%) distance below mandible was less than 5mm, while in 3 patients it was between 5-10mm. In 21, 3, 16, 8, 2 and 1 patients loop angle were 110°, 120°, 130°, 140°, 150° and 160° observed, respectively with the mean loop angle was 124±14° (Table-2, Figure-1 & 2).

MMN facial nerve ran deep into the muscles of the lower lip in all the 51 patients (100%).

Among 51 patients, MMN facial nerve was sacrificed in 9 patients during neck dissection, of these 3 were radical neck dissection and 6 were modified radial neck dissection.

DISCUSSION

Present study included 51 patients with neck cancer (45 male and 6 female), presenting approximate 7:1 male and female ratio. Neck cancers show a higher preponderance for male than female. A study by Ridge et al, 2011, represented 3:1 male and female ratio for the patients with oral cavity and pharyngeal cancers [13]. It has been observed that the most common site of primary lesions in our study was buccal mucosa (41.7%), followed by alveolus (19.6%), tongue (13.7%), and lip (7.8) and retromolar trigone (RMT) (7.85), (Table-1). This high incidence of cancer of the buccal mucosa and alveolus is partly attributable to the habit of keeping the quid and/or tobacco in the gingivobuccal sulcus prevailing in this region. In Indian population tobacco chewing ratio are more common in male than female [14]. Thus it seems that a very high male preponderance in our series could be due to most of our being of buccal mucosa and alveolus.

Marginal mandibular branch of the facial nerve injury results in a significant enhancing misrepresentation of facial expression due to paralysis of the muscles of the lower lip and it is very difficult to correct. Exact understanding of the anatomical correlation of the nerve with its surroundings will allow safe and sound identification and preservation of its structure [15]. In the present study, during the operational dissection of 51 patients with neck cancer, the MMN facial nerve was represented by one branch in 94.11 %, and two branches in 5.89 % of the patients (Table-2, Figure-1). Dingman and Grabb, 1962, observed MMN facial nerve branching in their study, he found single branch in 20%, two branch in 67%, three branches in 9%) and 4 branches in 4% of study population. [16]. Same study was done by Al-Hayani, 2007, on MMN facial nerve, he observed that this nerve begin with single branch in 32%, two branches in 40% and three branches in 28% of cases [15].

Present study represents that in all patients (100%), MMN facial nerve originated from anterior medial surface of parotid (Table-2). Out of 51 patents, in 94.11% patients the distance of MMN facial nerve below the mandible with neck was less than 5mm, while in 5.89% patients it was between 5-10 mm. The nerve represents loop angle 110° in 41.11%, 120° in 5.89 %, 130° in 31.37%, 140° in 15.6 %, 150° in 4.96%, 160° in 1.96% of patients. The mean of loop angle was 124±14° (Table-2, Figure-2). A study done by Batra et al, 2010, observed that in 52% of subjects MMN facial nerve run the length of the angle and the lower border of the mandible, while in 32% of subjects, it was found below and inferior border of the mandible. Maximum distance of this nerve from the mandible was 1.6 cm below the angle and 1.4 cm body of the mandible [16]. However, some other researchers observed that the MMN facial nerve crossed the inferior border of the mandible middle between its angle and its mental protrusion [17, 18]. Chatterjee, 2010, observed that the average distance of the loop of the MMN facial nerve was 1.2 cm below the lower border of the mandible.

Neck surgery has possibility for many complications due to existence of large numbers of major facial nerves. Carefully performed surgery is the basis of success, it required step by step surgical approach with attention and a methodical check after completion of the procedure will guarantee for optimal surgical results. Presence of malignant tissue will decrease the optimal results of surgical approaches. Our surgical expert team provides his best and maintains the attention to minimize the nerve injury in patients with healthy MMN facial nerve with their surrounding muscles. But complication of MMN facial nerve injury during neck dissections for malignant disease has not expected much attention. In present study, MMN facial nerve was sacrificed in 9 patients (17.65%) during the surgical operation. All these scarifications were done due to malignancy reason.

This study concluded that branches, distance from the mandible and loop angle of MMN facial nerve can be used as sight for avoiding to injury of this nerve during the course of surgery, but the complications of neck cancer increase the chance of injury to this nerve. The study has the limitation on the point that it was not based on cadaver subjects. Thus, study was limited to no more exposure of nerve due to patient safety purposes.

Conflict of Interest

The authors declared no conflict of interest.

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Table-1: Representation of site of primary lesions in study population.

Site of primary lesion	Numbers	Percentage
Buccal mucosa lesion	21	41.7
Lesion on tongue	7	13.7
Alveolus lesion	10	19.6
Lip lesion	4	7.83
RMT lesion	4	7.83
Thyroid lesion	3	5.88
Submandibular gland tumor	1	1.96
Unknown origin	1	1.96

Table-2: Anatomical variation of MMN facial nerve in study population.

Variations	Numbers of observation	Percentage
1. Branches of MMN-		
One Branch	48	94.11
Two branches	3	5.89
2. Origin of MMN-		
-Anterior medial surface of parotid	51	100
3. Distance of MMN below the mandible with neck-		
< 5mm	48	94.11
Between 5-10 mm	3	5.89
4. Loop angles* -	110°	41.11
120°	3	5.89
130°	16	31.37
140°	8	15.6
150°	2	4.96
160°	1	1.96
Mean of loop angle= 124±14°		

*Loop angle: angle between descending segment of MMN and ascending segment toward mandible

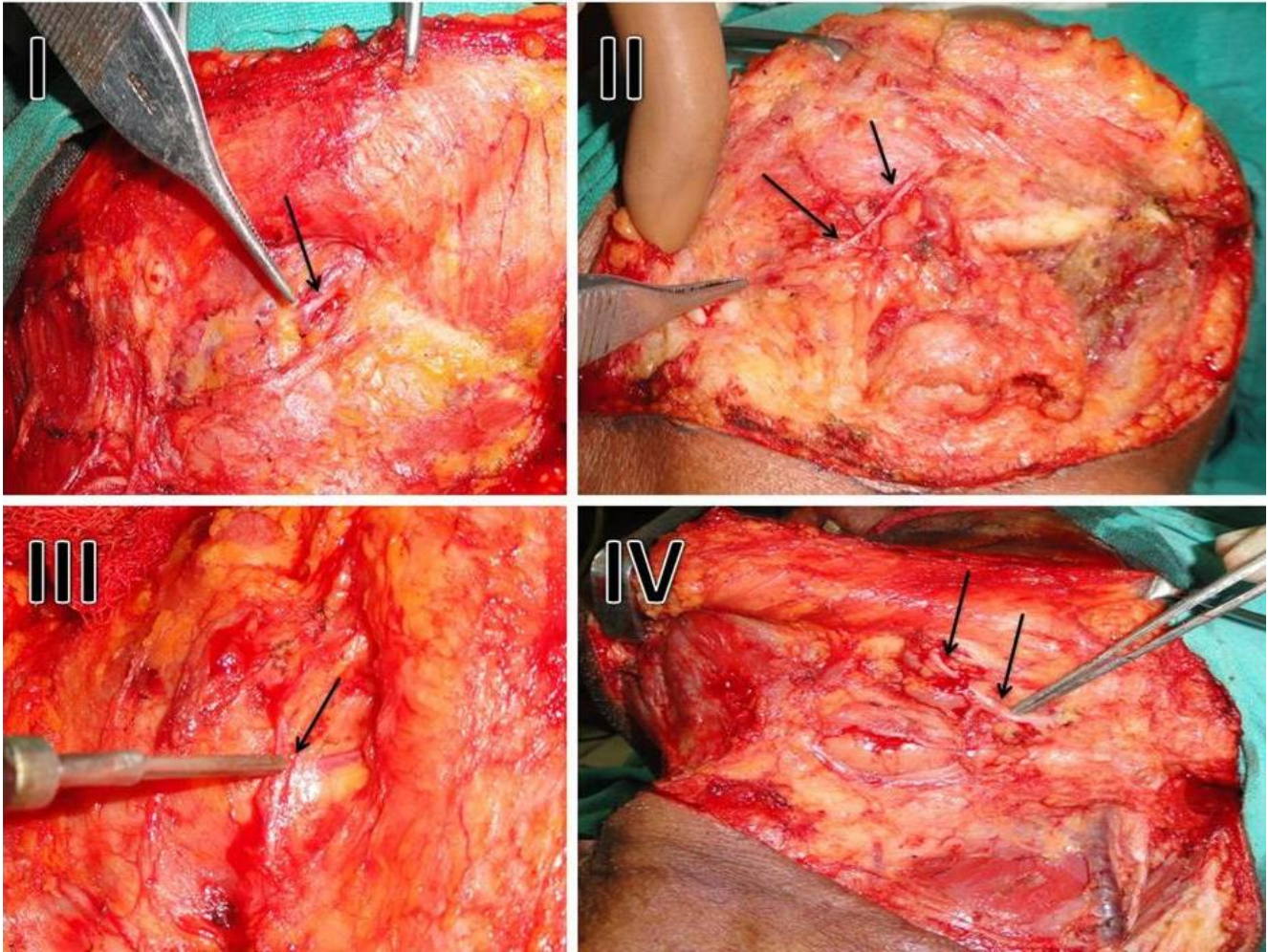


Figure-1: Fig. I, II, III and IV represented MMN facial nerve during the surgery in different patients. Black arrow indicated to presence of MMN facial nerve.

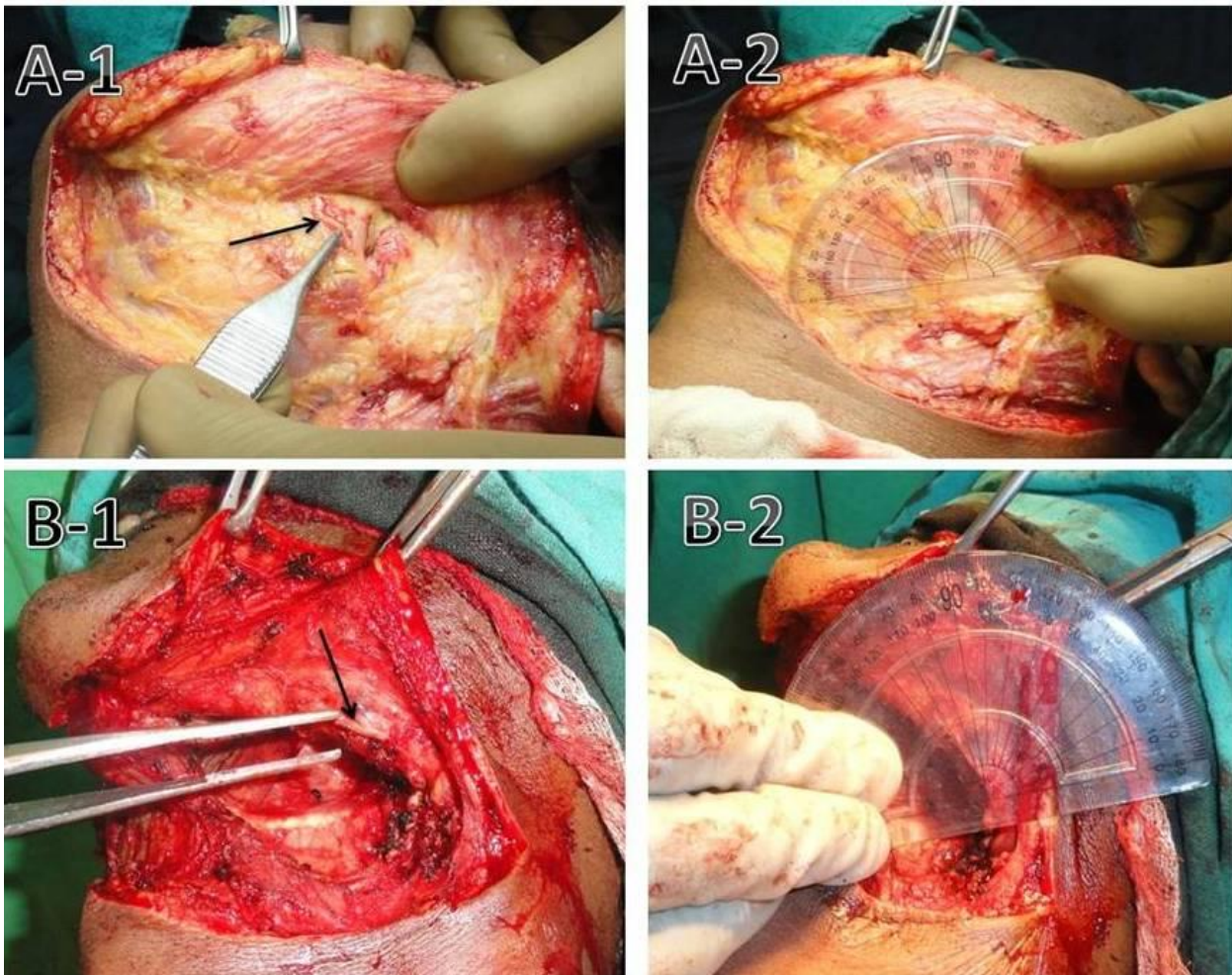


Figure-2: Representation of MMN facial nerve and measurement of their loop angle (angle between descending segment of MMN and ascending segment toward mandible). In Fig A-1 and B-1, black arrow pointed to presence of nerve and Fig A-2 and B-2 showed measurement of loop angle.

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