

Marginal mandibular nerve injury during neck dissection level IIa, and influence of different types of dissection: diathermy versus cold knife

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Article history: Received: 30.03.2018 Accepted: 15.05.2018 Published: 31.08.2018

ABSTRACT:

Introduction: Postoperative injury of the marginal mandibular branch of the facial nerve is considered a complication in neck dissection and can be related to different factors including traction, devascularisation or conduction block due to diathermy.

Material and Methods: A prospective, crossover study including patients treated via bilateral selective neck dissection level IIa during a 12-month period, was performed to evaluate efficacy of the Hayes-Martin manoeuvre to prevent nerve injury during use of cold or monopolar diathermy dissection.

Results: 20 patients met the inclusion criteria (40 neck dissections). Just one case of right temporal MMN weakness in the postoperative period was observed (1/40 = 2.5%). There were no cases of permanent marginal mandibular nerve weakness when using the Hayes-Martin manoeuvre.

Conclusion: The Hayes-Martin manoeuvre is a safe method to preserve MMN during neck dissection level IIa, regardless of the type of dissection.

KEYWORDS:

Neck, Dissection, Marginal Mandibular Nerve, Diathermy, Cold Knife

INTRODUCTION

The facial or cranial nerve VII is a mixed nerve composed of both motor and sensory branches which is responsible for motor innervation of facial expression muscles, lachrymal secretion and partial control of the gustatory sensation. It has five main motor branches, temporal, zygomatic, buccal, marginal mandibular and cervical. The marginal mandibular branch of the facial nerve is known to be at particular risk during surgical procedures of the face and neck.

The marginal mandibular nerve (MMN) is a branch of the facial nerve which emerges from the anterior border of the parotid gland's lower part into the neck where it lies deep in the platysma and the investing layer of deep fascia. During its course,

marginal MMN extends into the neck passing over the mandibular angle and traveling superficially to the facial artery and vein. It enters the face again, crossing the lower border of the mandible to innervate the muscles of the lower part of the face and lower lip. However, the course of the marginal mandibular nerve is usually variable[1].

As cervical neck metastasis is the most significant prognostic factor in head and neck cancer[2]; cervical neck dissection is the most valuable tool to examine the neck. However, the extent of neck dissection has evolved across the last century, with various groups advocating procedures ranging from radical neck dissection to, more recently, selective or functional neck dissection[3].

During neck dissections, there may occur neurological compli-

cations. One of them, which is well-documented, is postoperative weakness of the depressor anguli oris or triangular muscle, due to an underlying injury of the marginal mandibular branch of the facial nerve⁴. Complete nerve neurotmesis or transient neuropraxia related to nerve stretching^[5] may result in clinical weakness or asymmetry of lower lip mobility. Previous reports on MMN lesion describe injury of the nerve following neck dissection level Ib in 18% to 21%^[6]. When performing level IIa dissection, 1.26% of cases could be associated with MMN paralysis^[7]. However, postoperative weakness may be related to different factors including traction, devascularisation or conduction block due to diathermy current during flap elevation or neck dissection^[5].

Hayes Martin described a manoeuvre for preventing injury to MMN, which involves ligating the facial vein at a level approximately two fingerbreadths below the mandible and then retracting the superficial layer of the deep cervical fascia with the subplatysmal plane as far as the mandibular ramus^[8].

As described above, in cases when there is no need to dissect level I, an MMN lesion is negligible, but it can occur. For that reason, the purpose of this study was to analyse the incidence of MMN injury following bilateral neck dissection for those patients with larynx and pharynx cancer, as well as the efficacy of the Hayes-Martin manoeuvre as a tool to protect MMN during dissection level IIa, and the influence of cold or monopolar diathermy during dissection.

MATERIAL AND METHODS

A prospective, crossover study was performed on patients diagnosed with squamous cell carcinoma (SCC) of the larynx, oropharynx or hypopharynx, N -/+, according to the criteria of the Union for International Cancer Control (UICC) and the American Joint Committee on Cancer (AJCC), treated by surgery (primary or salvage) of the primary site and bilateral selective neck dissection level IIa, IIb, III, IV and V between July 2016 and July 2017. Demographic data (age, sex), comorbidities, stage, were obtained by anamnesis, physical exploration and radiologic evaluation. Patients who required a level Ia, Ib, radical modified or comprehensive neck dissection were excluded. Patients receiving unilateral neck dissection were also excluded. This study was approved by the ethics committee of our centre.

Surgery was undertaken by an experienced ENT - Head and Neck surgeon or by trainees under their supervision and the nerve was not monitored during operation. In all patients, both MMNs were protected using the Hayes-Martin manoeuvre.

However, right neck dissection level IIa was done using monopolar diathermy and the left side was done using cold knife dissection.

Postoperative injury of the MMN was diagnosed on a clinical basis. We evaluated the presence of elevation of the ipsilateral oral commissure and facial asymmetry at rest as well as spontaneous and voluntary facial motion. All patients were examined 24 hours after surgery and during routine clinical control 2 weeks after the operation. Follow-up examinations were performed either by the authors using the lower lip domain of the facial nerve grading system as described by the House-Brackmann scale.

Data analysis was performed using the SPSS program for Windows, Version 20.0 (SPSS, INC. Illinois, EE.UU). Quantitative variables in the study were expressed as mean \pm standard deviation. Pearson's chi-squared test was used and significant level was set at $p < 0.05$ (two-tailed tests).

RESULTS AND ANALYSIS

Twenty patients met the inclusion criteria (40 neck dissections); 17 (85%) patients were male and 3 (15%) were females. Mean age was 62.8 ± 10.7 years (Min: 40/Max: 81). Three patients (15%) were diabetics, 7 (35%) were hypertensive, 19 (95%) were smokers, consuming more than 40 packs of cigarettes per year and 9 (45%) consumed alcoholic beverages (more than 70 g per day). Surgery for the primary tumour was total laryngectomy in 13 (65%) cases, oropharyngectomy in 4 (20%) cases and supraglottic endoscopic resection using CO₂ laser in 3 (15%) cases. Tumoral stage of the patients included 3 T2 (15%), 4 (20%) T3 and 13 (65%) T4a. Twelve (60%) patients were classified as N0, 3 (15%) as N1, and 5 (25%) as N2A. There were no cases of distant metastases. Two patients (10%) had received previous radiotherapy (Tab. I).

The mean hospital stay was 21.5 ± 41.8 days (Min: 5/Max: 191). Regarding postsurgical complications, 6 (30%) patients developed salivary fistula, 2 (10%) patients had postoperative bleeding, 2 (10%) patients had cervical abscess, 1 (5%) patient suffered aspiration pneumonia and 1 (5%) patient suffered a heart attack on his fifth postoperative day.

The type of neck dissection performed was a bilateral functional anterior neck dissection including levels IIa, IIb, III and IV in all patients. In all right neck dissections, the neck nodes of level IIa were removed using monopolar diathermy; on the left side, the same procedure was performed using a cold knife. There was a case of right temporal MMN weakness in the

postoperative period that was resolved after 3 months (1/40 = 2.5%). There were no cases of permanent marginal mandibular nerve weakness using the Hayes-Martin manoeuvre (Tab. II).

DISCUSSION

Neck dissection is an important technique for controlling regional disease. Oncological results of this surgery have been proven to be equal despite the lesser aggressive approaches to the nodal disease. Therefore, it must be the surgeons' concern to prevent as much morbidity as possible when performing a neck dissection. Minor complications or sequelae such as the cervical scar or aesthetic impairment of facial mobility must be taken into account. However, temporary or permanent marginal mandibular weakness following neck dissection continues to be an underreported complication.

In this sense, there are different techniques described to ensure marginal mandibular nerve preservation. These include identification of the nerve in the subplatysmal plane, aided by loupe magnification and superior reflection of the nerve trunk, and the Hayes-Martin manoeuvre. However, dissection of the marginal mandibular nerve can result in postoperative weakness, even with anatomical and neurophysiological confirmation of its integrity, due to factors including traction, devascularisation or conduction block due to diathermy current during flap elevation[5].

The reported prevalence of injury ranges from 11% to as high as 43%, depending on parameters utilised and including different types of neck dissections, most of them including dissection level I,6,8. Weakness can result even after apparent gross anatomical preservation of the nerve, as evidenced by one study which found that up to 23% of patients had a reduced number of functional motor units in the orbicularis oris muscle despite clear nerve preservation[9]. Moreover, elderly people with lax and atrophic tissue have an even more inferior run of the MMN. Therefore, precaution during neck incision is important; in such patients, transection of the platysma muscle should be at least 4 cm to 5 cm below the border of the mandible to reduce the risk of damage of MMN[8].

Furthermore, malfunction of the lower lip can be related to transection of the platysma muscle, and function can be restored when the muscle is successfully healed[10]. In this way, recent studies show evidence of communication between marginal mandibular and cervical nerve branches, which could also explain cases of lip depressor deficiency after dissection on level III and IV[11].

To the best of our knowledge, this is the first prospective stu-

Tab. I. Demographic data.

Sex		
Male	17	85%
Female	3	15%
Mean Age		
	62,8 ± 10,7 years	(min. 40, max. 81)
Comorbidities		
DM	3	15%
HTA	7	35%
Smoker	19	95%
Alcohol	9	45%
Mean Hospital Stay		
	21,5 ± 41,8 days	(min. 5, max. 185)
Type of Surgery		
Total Laryngectomy	13	65%
Oropharyngectomy	4	20%
Supraglottic endoscopic Laryngectomy	3	15%
T Stage		
T2	3	60%
T3	4	15%
T4	13	25%
N Stage		
N0	12	60%
N1	3	15%
N2a	5	25%
M Stage		
M0	20	100%

Tab. II. Side and technique comparison according to the rate of temporary or permanent MMN weakness.

Side/Technique	Diathermy (Bovie Cautery)	Cold Knife	Number of neck dissected
Left	10	10	20
Right	10	10	20
Temporary MMN weakness (HB Scale)	1	0	0
Permanent MMN weakness (HB Scale)	0	0	
P	0	0	

dy performed to evaluate the efficacy of the Hayes-Martin manoeuvre to preserve MMN during level IIa neck dissection, including the type of dissection performed (diathermy vs cold knife). In just 1 of 40 neck dissections, a transient MMN weakness was evidenced. None of these patients showed permanent weakness of MMN, confirming the safety of this technique for these selected cases. However, previous retrospective data suggest the risk of MMN lesion during

functional, selective or radical neck dissection and for that reason, it is necessary to explain potential neurological complications following neck dissection to each patient, including provision of this information during preoperative counselling about the expected frequency of this kind of postoperative complication. Some limitations of our study are the limited number of patients, and lack of a questionnaire report about postoperative patient perception.

CONCLUSION

The Hayes-Martin manoeuvre is a safe way to preserve MMN during neck dissection at level IIa regardless of the type of dissection performed, whether monopolar diathermy or cold knife. Nevertheless, it is always important to proceed carefully during the dissection of neck structures to prevent any potential complication.

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Word count: 1860 Tables: 2 Figures: – References: 11

Access the article online: DOI: 10.5604/01.3001.0012.0483 Table of content: <https://otolaryngologypl.com/issue/11348>

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Competing interests: The authors declare that they have no competing interests.

Cite this article as: Estomba C. M. C., Suárez J. A. S., García J. A. G., Sarasola E. L., Arrizabalaga I. T., Mariezcurrena X. A.; Marginal mandibular nerve injury during neck dissection level IIa, and influence of different types of dissection: diathermy versus cold knife, *Otolaryngol Pol* 2018; 72 (4): 21-25

