Oral Oncology 61 (2016) 142–145

Contents lists available at ScienceDirect

Oral Oncology

journal homepage: www.elsevier.com/locate/oraloncology

# Comparison of spinal accessory dysfunction following neck dissection with harmonic scalpel and electrocautery – A randomized study

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ARTICLE INFO

*Article history:*
Received 8 July 2016
Received in revised form 8 August 2016
Accepted 24 August 2016

*Keywords:*
Harmonic scalpel
Selective neck dissection
Oral squamous cell carcinoma
Shoulder pain and shoulder function and randomized clinical trial

ABSTRACT

*Introduction:* Harmonic scalpel is being increasingly used in neck dissection as alternative to conventional electro-cautery for achieving haemostasis. Use of harmonic scalpel has been shown to significantly reduce intra operative blood loss and intra operative time in neck dissection. But how safe is it with regards to nerve injury (spinal accessory nerve and other nerves) during neck dissection. We intended to study the spinal accessory nerve injury during neck dissection by both harmonic scalpel and electro cautery technique and compared postoperative recovery of shoulder function after neck dissection.
*Methods:* 40 patients undergoing selective neck dissection for primary oral malignancy were enrolled in this study. The Harmonic scalpel (HS) group consisted of 20 patients, and the electo cautery technique (ET) group had 20 patients. The following variables were examined: shoulder pain by visual analog scoring and shoulder function by means of degree of abduction and graded was grade I-0–90°; grade II-90–135°; grade III-135–180°. They assessment was done at the time of discharge, 1 month and 3 month and six month after surgery.
*Results:* Though shoulder pain was almost similar at 1st week and 1 month, however at 2nd and 6th month shoulder pain was found to be significantly lesser in harmonic scalpel group as compared to electro cautery. At 1 week more no of patients had restricted shoulder mobility in HS as compared to EC group. But at 6 months the shoulder function was found to be significantly better in HS group as compared to EC group (p value < 0.05).
*Conclusion:* Spinal accessory nerve function recovery after selective neck dissection is better in HS group as compared to the electro cautery group.



## Introduction

Advancement in surgical techniques focuses not only on improving the outcomes of surgery but also on the methods and ways to reduce surgical morbidities and mortality. Since the introduction of mono polar electro cautery by Bovie in 1926 [1], several instruments have been developed like bipolar cautery, radiofrequency ablator, hemo clips etc with aim to reduce the blood loss and intra operative time during head neck surgery [2]. Harmonic scalpel (HS) uses ultrasonic energy and has become popular in head and neck surgeries since its introduction in 1990 [3,4]. It was found to be especially useful in thyroid surgery, parotid surgery and tonsillectomies after several authors had proved its safety and efficacy [5,6]. It has been shown that use of harmonic scalpel significantly reduces blood loss and intra operative time in thyroid and parotid surgery.

Use of harmonic scalpel for neck dissection is slowly becoming popular after few authors have proven its efficacy and safety [7,8]. It has been shown that harmonic scalpel does reduce the blood loss and intra operative time for neck dissection. However harmonic data for neck dissection is still questionable with regards to injury to the various nerve injuries that can occur in neck dissection especially the spinal accessory nerve (SAN). There are many nerves that a surgeon can encounterduring neck dissection. Spinal accessory nerve is one of the most important and commonly injured nerve during neck dissection and can cause shoulder pain, shoulder drop and restriction of shoulder movements especially abduction at shoulder joint. Experimental studies have described thermal spread with use of harmonic scalpel to be 2–6 mm [9]. There is very limited data comparing the harmonic scalpel and conventional electrosurgical techniques with regard to nerve injury and its morbidity postoperatively after neck dissection. Shin et al. in his study says there is no difference with regard to shoulder function by Harmonic scalpel and conventional Technique [10].

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http://dx.doi.org/10.1016/j.oraloncology.2016.08.010
1368-8375/

In this prospective randomized study, we have compared the efficacy of the HS and electrosurgical technique, with regards to spinal accessory nerve injury after selective neck dissection for oral cancer. We have assessed the shoulder function and shoulder pain immediately following neck dissection and in the subsequent follow up visits.

## Material and methods

This was a randomized prospective clinical case control study done in 40 consecutive patients of oral cancer requiring selective neck dissection. Patients of oral carcinoma older than 18 years and who required selective neck dissection (I–IV) as part of treatment plan were included in the study. Patients who had received prior radiotherapy or had undergone prior surgery, who did not give informed consent and who had restriction of shoulder movements were excluded from the study. 40 consecutive patients of oral carcinoma who required neck dissection between July 2014 and December 2015 were eligible for the study. The study was reviewed and approved by institute ethics board. The patients were randomly divided into control and experimental group based on computerisation table. The experimental group consisted of 20 neck dissections performed on patients of oral carcinoma by using harmonic scalpel and control group consisted of 20 neck dissections done for treatment of oral carcinoma in which standard neck dissection technique (sharp dissection and using mono polar and bipolar cautery).

All the patients selected for the study underwent detailed clinical examination of the primary and the metastatic neck nodes. All patients were subjected to biopsy of the primary lesion, fine needle aspiration cytology of the clinically palpable lymph nodes and CT scan for the details of the disease extension. All Patients were operated by single head neck oncologic surgeon. In all the neck dissection a transverse cervical incision was given and the skin flaps in both the groups were raised using mono polar electro cautery. Based on the randomisation table cases were assigned to either of the control and experimental group. 16FR suction drains were placed after neck dissection and wound was closed in layers. Patients were given diclofenac sodium 75 mg IV 12 hrly for first 48 h; there after pain management drugs were given only if symptomatic. Pain was measured by visual analogue scale (continuous scale usually 10 cm (100 mm) in length, anchored by 2 verbal descriptors, 0 for normal and 5 for moderate pain and 10 for extreme pain) was assessed at day 1, day 2, day 7 and 1 month, 3 month and 6 month.

The spinal accessory nerve function and shoulder pain was evaluated at day 1, 1st week, 1st month, 3 month and 6 months to asses for recovery of shoulder function in both groups. Shoulder movements were assessed by means of degree of abduction and graded as grade I-0–90; grade II-90–135; grade III-135–180.

The data recorded were analysed by statistical package for social sciences (SPSS for windows). The measurable data was checked for their Normality by Kolmogorov Smirnov test. The parameters was compared for two groups by Student's *t*-tests (if Normal) and Mann Whitney *U* test (if skewed and other ordinal data). Qualitative (Classified or categorical) data was analyzed for its association with the groups using Chi-square test. For follow ups, within groups the measurable data was compared using Student's Paired *t*-test (normal data) and Wilcoxon Signed Rank test (for skewed data).

## Results

All patients of oral carcinoma enrolled in the study underwent SND (level I-IV) in addition to resection of the primary and reconstruction of the oral defect. Clinical and pathological correlates of the primary tumour are shown in Table 1. Nodal status and type of neck dissection done are shown (Table 2). Both the Harmonic scalpel (HS) group and control group (EC) were homogenous and comparable with regards to age, sex, TNM staging, type of tumour and surgical technique and surgeon.

Shoulder pain in immediate post operative period was assessed. Pain measurement at 24 h in HS group was 4.40 (2.765–6.035) and in the EC group was 4.20 (2.658–5.742), p value 0.609 which was statistically non significant. At 48 h, shoulder pain in HS group was 2.55 (1.118–3.982) and in the EC group was 2.50 (1.067–3.933), the p value was 0.456 which was also non significant. (Fig. 1) Shoulder function in immediate post operative period was also assessed at 48 h after surgery. In HS group 4 patients had grade I, 7 patients had grade II and 9 patients had grade III abduction while in the EC group no patient had grade I abduction, 7 had grade II and 13 had grade III shoulder abduction, with p value 0.94 which was also statistically not significant (Fig. 2).

**Table 1**
Patient demographics.

| | HS (n = 20) | EC (n = 20) | Total (n = 40) |
|---|---|---|---|
| AGE (years) | 45.35 | 48 | |
| Male | 16 | 15 | 31 |
| Female | 4 | 5 | 9 |
| *Primary tumour* | | | |
| Tongue | 16 | 5 | 21 |
| Buccal mucosa | 3 | 11 | 14 |
| Alveolus | 1 | 1 | 2 |
| Lip | 0 | 3 | 3 |
| *Stage* | | | |
| I | 0 | 0 | 0 |
| II | 3 | 0 | 3 |
| III | 2 | 1 | 3 |
| IV | 15 | 19 | 34 |

**Table 2**
Nodal status and the type of neck dissection performed.

| Nodal status (pathological) | Number of patients | | Type of neck dissection performed |
|---|---|---|---|
| | HS | EC | |
| No | 2 | 1 | Elective neck dissection |
| N1 | 1 | 2 | Therapeutic neck dissection |
| N2 | 17 | 17 | Therapeutic neck dissection |
| N3 | 0 | 0 | 0 |

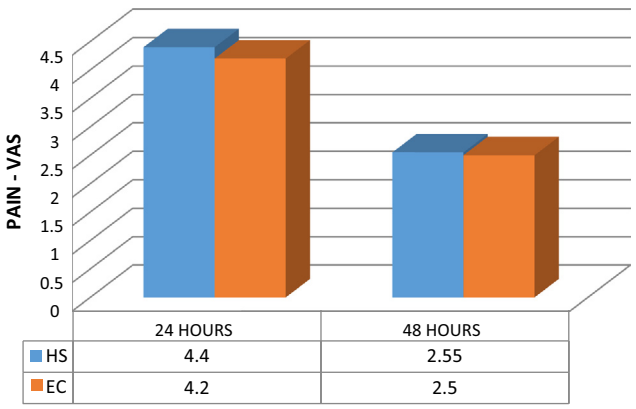


**Fig. 1.** Pain Score (VAS) in immediate postoperative period of both groups.