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Ultracision Harmonic Scalpel in oral and oropharyngeal cancer resection

Giancarlo Tirelli*, Giulia Carolina Del Piero, Fiorella Perrino

University of Trieste, Italy

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ABSTRACT

Objective: The aim of this prospective study was to evaluate the benefits and risks when using an Ultracision Harmonic Scalpel in the surgical treatment of oral and oropharyngeal carcinomas.
Study design: Prospective non-randomized.
Setting: Clinica Otorinolaringoiatrica, Azienda Ospedaliero-Universitaria. Trieste, Italy.
Subjects and methods: In this study, conducted from April 2008 to August 2010, 36 consecutive patients underwent resection of oral or oropharyngeal carcinoma and lateral lymphadenectomy using the Ultracision Harmonic Scalpel. Evaluation criteria included length of the surgical procedure, intraoperative blood loss, quantity of neck drainage on the first, second and third postoperative days, postoperative complications, and a subjective assessment of postoperative pain and lymphatic oedema of the neck. Results were compared with previous surgical procedures carried out between May 2006 and March 2008 using cold knife and bipolar haemostasis ($n = 36$) when the Harmonic Scalpel was not available.
Results: In patients treated with the Harmonic Scalpel, operating time was significantly reduced, both for resection of the carcinoma and the lateral lymphadenectomy. Intraoperative blood loss and neck drainage on the first and second postoperative days were significantly less and pain scores were significantly lower than in the cold knife group. No postoperative complications were noted in the Harmonic Scalpel group. The only disadvantage noted in the Harmonic Scalpel group was the high incidence of lymphatic oedema of the neck.
Conclusions: Use of the Harmonic Scalpel during resection of oral cancer and lateral lymphadenectomy is safe and confers some advantages over conventional methods.
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1. Introduction

The Ultracision Harmonic Scalpel (UHS) is a surgical instrument which uses ultrasound technology to simultaneously cut and coagulate. The UHS System consists of a portable generator, a handpiece, a double pedal, and a wide range of surgical instruments. The generator provides electricity which is transformed into mechanical energy via a system of piezoelectric crystals: expansion and contraction of these crystals set the axial vibration of the blade at a constant frequency of 55.5 kHz.

Use of the UHS in head and neck oncological surgery has been discussed by various authors (Jackson et al., 2005; Blankenship et al., 2004; Kos and Engelke, 2007; Salami et al., 2008a, 2008b; Prgomet et al., 2009; Miccoli et al., 2009). Specifically, for use in the oral cavity and oropharynx, procedures of partial and total glossectomy using UHS have been described (Sherman and Davies, 2000; To et al., 2001; Metternich et al., 2002; Yuen and Wong, 2005; Pons et al., 2009), as well as, more recently, tumour resections of the oral-oropharynx cavity and neck dissections through submandibular monoblock (T + N) (Barzan et al., 2010).

2. Materials and methods

A non-randomized prospective study was undertaken at the Otolaryngology Clinic in Trieste between April, 2008 and August, 2010. The 48 consecutive patients in the study had resection of a carcinoma of the oral cavity and/or oropharynx and neck dissection using the UHS, except for vessels exceeding 5 mm, where classical

Abbreviations: UHS, Ultracision Harmonic Scalpel; CK, cold knife.

* Corresponding author. ENT Department, University of Trieste, U.C.O. di clinica Otorinolaringoiatrica, Ospedale di Cattinara, 34149 Trieste, Italy. Tel.: +39 040 3994747; fax: +39 040 3994180.
E-mail address: tirelli.giancarlo@gmail.com (G. Tirelli).

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ties were used. Ten patients were excluded from the study, having had previous surgery and/or radiotherapy on the cervico-cephalic area, and two obese patients were excluded as the circumference of the neck was >43 cm. Results from the study group (UHS $n = 36$) were compared with those obtained in the same number of patients from a control group of patients who had the same type of surgical procedure using conventional techniques between May, 2006 and March, 2008. Conventional techniques consisted of resection and dissection by cold knife (CK) and/or scissors, and haemostasis using bipolar forceps or traditional binding of the blood vessel (CK $n = 36$). All surgical procedures in the study were performed by the same surgeon. Comparison of both types of procedures was possible because, while the technique and surgical steps as well as approach (transoral vs transmaxillary) remain unchanged, UHS completely replaces traditional instruments for resection. Procedures performed in the two study groups are shown in Table 1.

In 32 out of 36 patients in the UHS group, and in 28 out of 36 in the CK group, neck dissection was performed at the same time as the tumour resection. Bilateral neck dissection was necessary in fourteen patients in the UHS group and twelve patients in the CK group. Data collected for each parameter considered in the present study refer to a hemineck. The total of hemenecks is therefore 46 in the UHS group and 40 in the CK group. The neck dissections performed in the surgical case study are presented in detail in Table 2.

The parameters evaluated in the study group (UHS) and in the control group (CK) were: operating times (recorded separately for the different phases of the procedure: tumour resection and neck dissection), intraoperative blood loss, blood drainage, postoperative complications, postoperative pain, neck lymphoedema.

For tumour resection, operating times were calculated in minutes after the initial mucous incision to the removal of the tumour specimen. For neck dissection, subplatysmal skin flaps were completely raised before operating times were recorded, and finish time of the procedure was recorded after the neck specimen was removed and haemostasis was achieved, but before skin closure. Bleeding, haematoma, infection and wound dehiscence of the oral cavity, oropharynx and neck were considered postoperative complications connected to the surgical procedure.

Intraoperative blood loss was measured as the combined total of the volume of drainage in the suction canister and the wet weight of the sponges used (minus the dry weight of the sponges and any irrigation used during the dissection). The quantity of blood drainage of the oral cavity and the neck was measured on the first, second and third postoperative day, by the quantity of liquid present in the drainage container. Pain parameters were assessed starting on the third postoperative day (from the moment infusion of morphine-like drugs is interrupted) using two methods: NRS-11 numeric scale (Breivik et al., 2000) and by quantifying the number of days when Tramodol was administered as analgesia (100 mg 3 Xday). Also on the third postoperative day, onset of lymphoedema in regions subjected to neck dissection was assessed. The presence of oedema was tested by pitting (imprints left in the tissues by pressing) and intensity was expressed using a numeric scale: 1-light, 2-moderate, 3-severe. Values of 2 and 3 were considered positive for lymphoedema.

Statistical analysis was performed by using the x squared or Pearson test and the Mann–Whitney U punctual test. The levels of relevance used are of 10.5% and 1 %: p-values ≤ 0.05 are considered weakly significant (* = 90%), p-values ≤ 0.01 significant (** = 95%) and p-values ≤ 0.001 highly significant.

This study was reviewed and approved by the Trieste Ethics Committee.

3. Results

No significant differences were found between the two patient groups regarding age (66 UHS vs 64.56 CK $p = 0.79$) or other tumour dimensions (UHS group: T1–T2 $n = 14$, T3–T4 $n = 22$ vs CK group: T1–T2 $n = 20$, T3–T4 $n = 16$ $p = 0.16$).

An analysis of the distribution of the surgical access method was made between the study groups (UHS) and the control groups (CK), but no significant difference was found (Table 3).

The reduction of operating time with the UHS is on average 13.66 min for every T resection and 36.3 min for every neck dissection as opposed to the conventional technique (Table 4).

Intraoperative blood loss, quantity of postoperative drainage, postoperative pain and the onset of neck lymphoedema in the two patient groups are reported in Table 5.

The postoperative complications that appeared after tumour resection in the oropharynx cavity were: 2 postoperative haematomas in the control group (CK) and no complications in the study group (UHS); the difference was insignificant from a statistical point of view ($p = 0.15$). Postoperative differences in neck dissections included: 4 postoperative haematomas in the control group (CK) and no complications in the study group (UHS); the difference between the two groups was weakly significant ($p = 0.02$).

Table 1
Surgical procedures performed in the UHS group and CK group.

	UHS ($n = 36$)	CK ($n = 36$)
Hemiglossectomy	9	12
Hemipelvectomy ± enlargement of the tonsil region and/or soft palate	8	9
Cheek resection enlargement of the retromolar trigone and/or soft palate	12	9
Pharyngeal tonsillectomy ± enlargement of the tongue base and/or soft palate	7	6

Table 2
Neck dissections performed in the UHS group and CK group.

	UHS ($n = 46$)	CK ($n = 40$)
Inclusive (levels I–V)	32	18
Anterolateral selective	10	12
Supro-omohyoid selective	4	10

Table 3
Surgical access method.

	Transmaxillary conservative	Transmaxillary demolitive	Transoral	Total
UHS ($n = 34$)[a]	6	16	12	34
CK ($n = 36$)	6	12	18	36
Chi-square	0.35			
p value	0.42			

[a] In two patients of the UHS group the paralateronasal approach was used.

Table 4
Mean value ± SD between the UHS group and the CK group for operation time.

Group	Intervention	Mean value (±DS)
UHS	Tumour resection	89.67 ± 16.19 min
CK	Tumour resection	106.33 ± 20.85 min
p		0.02
UHS	Neck dissection	71.95 ± 11.14 min
CK	Neck dissection	108.25 ± 16.5 min
p		0.001

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