

Institutional report - Thoracic non-oncologic Comparison of pain severity following video-assisted thoracoscopic sympathectomy: electric versus harmonic scalpels

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Abstract

The aim of this study was to compare the severity of pain over a 30-day period in a group of 1515 patients who underwent video-assisted thoracoscopic sympathectomy (VATS) to treat primary hyperhidrosis, among whom 929 were treated using electric scalpels and 586 using harmonic scalpels. From February 2000 to June 2008, 1515 patients scheduled for VATS were prospectively surveyed. They were divided into two groups according to whether electric or harmonic scalpels would be used. The patients filled out a protocol at every visit according to their subjective perception of pain, evaluating it on a scale from 0 to 10, such that 0 represented no pain and 10, maximum pain. The severity was recorded as null when the score was 0; slight, 1–4; moderate, 5–7; or severe, 8–10. The results from the evaluations were compared between the two groups. Only 152 patients did not present postoperative pain. No significant association was found between the type of scalpel used and the severity of the pain. There was no difference between harmonic and electric scalpel use in the levels of thoracic pain during the first 30 days after VATS.

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1. Introduction

The excellent results from video-assisted thoracoscopic sympathectomy (VATS) for treating patients with primary hyperhidrosis have made this type of surgery the definitive treatment of choice in this situation. Moreover, it is a safe and minimally invasive method [1].

The main immediate postoperative complications with VATS are pneumothorax and hemothorax, which are present in <10% of the cases; and thoracic pain, which although reversible, is experienced by most patients after surgery [2]. Such pain is widely present despite routine use of analgesia, and it may persist for weeks. For this reason, many patients suffer discomfort and/or are absent from work over this period.

The main explanations for this set of symptoms relate to trauma of the thoracic wall caused while introducing the trocars into the intercostal space and periosteal lesions close to the rib head and under the sympathetic chain, secondary to lesions caused by transmission of heat from the electric scalpel [3, 4].

It has been suggested that the use of harmonic scalpels might cause less postoperative pain because of the lower heat diffusion to tissues close to the sympathetic chain [5]. The data in this respect are conflicting and are based on

only two papers by Callejas et al. [5] and Kopelman et al. [6], with small samples.

The objective of this study was to compare the severity of pain over the first 30 postoperative days in a group of 1515 patients who underwent VATS to treat primary hyperhidrosis, among whom 929 were treated using electric scalpels and 586 were treated using harmonic scalpels.

2. Materials and methods

This was a prospective and uncontrolled study. From February 2000 to June 2008, data were collected from 1515 patients who underwent VATS for treatment of palmar, axillary or cranial hyperhidrosis. All of the patients came from the same outpatient clinic and were treated by the same surgical team in two different hospitals from the same institution. In one, harmonic scalpel was available and used in all cases. In the other, harmonic scalpel was not available, therefore, electric scalpel was used. The patients were interned in each hospital randomly in accordance with the availability of beds. There was no possibility of hospital choice for patients or physicians.

The patients all underwent similar treatment following the same protocol, except for the type of scalpel used. The treatment was conducted in accordance with the hospital's ethical standards as set out by its Ethics Committee for Analysis of Research Projects on Human Experimentation.

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All of the patients underwent bilateral VATS with two 5 mm incisions. The first incision was made in the fourth submammary intercostal space along an anterior axillary line to introduce the camera (30°), and the second was for the surgical instruments made in the second mid-axillary intercostal space. Ablation using an electric or harmonic scalpel was the technique chosen in all cases.

All of the patients received analgesia consisting of continuous use of non-hormonal anti-inflammatory agents along with paracetamol or dipyron for a two-week period.

The patients were divided into two groups according to whether electric or harmonic scalpels would be used. The distribution according to age, gender, body mass index (BMI) and resection level is presented in Table 1.

No significant difference was found between scalpel type used and the age, gender, BMI or resection level. No mortality or conversion to open surgery occurred in our series. Surgical failure occurred in the cases of seven patients in the harmonic group and 10 in the electric group.

All of the patients underwent three evaluations for the purpose of this study: 24 h, 1 week and 1 month after the surgery. At each visit, patients were given a clinical pain at every visit. They did this according to their subjective perception of pain evaluating it on a scale from 0 to 10, such that 0 represented no pain and 10 represented maximum pain, based on their own estimates without any intervention or advice from the interviewer. The severity was recorded as null when the score was 0; slight, when it was 1–4; moderate, when it was 5–7; or severe, when it was 8–10.

The Student *t*-test was conducted to verify the association between numerical variables (age and BMI) and type of scalpel (electric or harmonic) and for categorical variables (type of scalpel, gender, resection level, thoracic pain

grade) in contingency tables the frequency χ^2 -test was applied. The 5% level of significance was considered for all statistical tests.

3. Results

The severity of the pain according to the scalpel type used is presented in Table 2.

No significant associations were found between the scalpel type and the reported severity of pain ($P > 0.05$). Only 152 patients (10%) did not report any immediate postoperative pain, of whom 59 were in the harmonic scalpel group and 93 were in the electric scalpel group.

4. Discussion

The excellent surgical results from VATS for treating hyperhidrosis [7], result in increasing of patients who are increasingly undergoing this treatment. For this reason, we had a large sample of patients who were treated surgically.

All of the patients came from the same outpatient clinic and were treated by the same surgical team following the same care except for the type of scalpel. No differences were seen between the groups in terms of age, gender, BMI or resection level, and thus two homogenous groups of patients were formed. The surgical technique used by our team was standardized [8]. Other than the use of either an electric scalpel or a harmonic scalpel, the technique varied only in relation to the level of ganglion resection, according to the hyperhidrosis symptoms. The variation in the levels used that we observed denotes changes in approach over the period covered by this study. At the start of this period, palmar hyperhidrosis was still treated by means of sympathectomy of the T2 and T3 ganglia. With evolution of the

Table 1

Descriptive analysis of patients according to scalpel type, regarding the variables of age, gender, body mass index (BMI) and resection level, with statistical tests for the type of scalpel used

Variables	Category or measures	Scalpel type			P-value
		Electric measures or n (%)	Harmonic measures or n (%)	Total	
Age (years)	Range	8–70	11–58	8–70	0.34
	Median	23	24	23	
	Mean \pm S.D.	24.8 \pm 7.5	25.2 \pm 8.1	24.8 \pm 7.5	
	(95% CI)	(24.3–25.3)	(24.5–25.9)	[(-1.2)–0.4]**	
BMI	Range	15.5–31.1	13.6–32.3	13.6–32.3	0.07
	Median	21.3	21.6	21.5	
	Mean \pm S.D.	21.5 \pm 2.6	21.8 \pm 2.7	21.6 \pm 2.6	
	(95% CI)	(21.3–21.7)	(21.6–22.0)	[(-0.6)–0.0]**	
Gender	Female	634 (68.2)	389 (66.4)	1023 (67.5)	0.48*
	Male	289 (31.1)	192 (32.8)	481 (31.7)	
	Total	923	581	1504	
Resection level	G2	57 (6.2)	26 (4.5)	83 (5.5)	0.22*
	G2/G3	213 (23.1)	116 (20.1)	329 (21.9)	
	G3	295 (32.0)	190 (32.9)	485 (32.3)	
	G3/G4	132 (14.3)	101 (17.5)	233 (15.5)	
	G4	226 (24.5)	144 (25.0)	370 (24.7)	
	Total	923	577	1500	

P-value obtained from Student *t*-test.

*P-value obtained from χ^2 -test. ** (95% CI) for the difference.

S.D., standard deviation; CI, confidence interval.

Table 2
Severity of pain at different postoperative times according to scalpel type

Postoperative time	Thoracic pain – severity	Scalpel type			P-value
		Electric n (%)	Harmonic n (%)	Total n (%)	
Immediate	Mild	621 (74.5)	414 (78.1)	1035 (75.9)	0.06
	Moderate	134 (16.1)	61 (11.5)	195 (14.3)	
	Severe	78 (9.4)	55 (10.4)	133 (9.8)	
	Total	833 (100.0)	530 (100.0)	1363 (100.0)	
7 days	Mild	387 (61.0)	243 (61.5)	630 (61.5)	0.97
	Moderate	162 (25.6)	101 (25.6)	263 (25.6)	
	Severe	85 (13.4)	51 (12.9)	136 (12.9)	
	Total	634 (100.0)	395 (38.3)	1029 (100.0)	
30 days	Mild	113 (43.3)	68 (46.9)	181 (44.6)	0.78
	Moderate	91 (34.9)	47 (32.4)	138 (34.0)	
	Severe	57 (21.8)	30 (20.7)	87 (21.4)	
	Total	261 (100.0)	145 (100.0)	406 (100.0)	

P-value obtained from χ^2 -test.

therapy [9], we started to recommend the use of sympathectomy limited to a single ganglion: initially T2, then T3 and currently T4, with the aim of diminishing the incidence of compensatory hyperhidrosis [10]. Axillary hyperhidrosis was formerly treated by means of thermoablation of T3 and T4, and is currently done using thermoablation of T4 alone [11].

Pain is present in most cases following VATS. In one study using one port of 10 mm in diameter and another of 5 mm, the incidence of pain among their patients after hospitalization was found to be 78%. The pain was moderate in 27% of them, severe in 34% and very severe in 17%. Among that sample, pain was controlled by means of level 2 analgesics (codeine, propoxyphene alone, or propoxyphene in combination).

The use of electric scalpels and harmonic scalpels was compared in a study of 100 patients, in which trocars of 5 mm were used in 80 patients who underwent surgery using a harmonic scalpel, and trocars of 2.5 mm were used in 20 patients who underwent surgery using electric scalpels [5]. The authors did not observe any complications in the harmonic scalpel group during the immediate postoperative period, but they found that 3% presented persistent chest pain and 9% presented pneumothorax. On the other hand, despite the use of instruments of 2 mm in diameter, the incidence of pain associated with the use of electric scalpels was greater. In our sample, in which we used instruments of 5 mm in diameter, 90.0% of the patients presented this adverse event and, when it was present, it was severe in 9.8% of the cases.

The great majority of patients undergoing sympathectomy present some degree of postoperative pain. The significance that patients ascribe to this symptom depends on their individual sensitivity. The variability seen in data in the literature shows the need to standardize evaluations relating to pain. The methods for quantifying pain are usually subjective. We used a questionnaire form that proved useful and seemed to be a good means of quantifying the evolution of pain intensity [12, 13].

The use of harmonic scalpels enables dissection that is more precise because the tissue is not charred and no

smoke is produced, thereby improving the viewing of the surgical field. Furthermore, because less heat is released by harmonic scalpels than by electric scalpels, the heat produced propagates less and thus the incidence of Horner's syndrome is reduced practically to zero, particularly when T2 thermoablation is performed [1, 6, 14, 15].

In a small group composed of 100 patients, the incidence of pain associated with the use of electric scalpels was greater than in the group of patients treated with harmonic scalpels [5]. On the other hand, in a group of 60 patients with palmar hyperhidrosis who were treated by means of thoracoscopic sympathectomy using a harmonic scalpel on one side and diathermy on the other, no difference in postoperative pain was observed [6].

In our sample, we also did not find a significant correlation between the scalpel type and the severity of pain. Studies on methods for diminishing the incidence and severity of pain should be included in future studies aimed at technical improvement of VATS.

In conclusion, our findings can be summarized as follows: there was no difference in the levels of postoperative thoracic pain following VATS between the use of harmonic vs. electric scalpels.

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