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COMPARATIVE STUDY OF THORACOSCOPIC VERSUS OPEN SURGICAL APPROACH FOR UPPER DORSAL SYMPATHECTOMY

By
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Upper dorsal sympathectomy has been performed for a wide variety of indications, the most common of which is palmer hyperhydrosis. With the development of video-assisted thoracic surgery, its application has extended to include thoracoscopic sympathectomy. In the present study we describe our experience with this recent technique and evaluate its results in comparison with the standard open surgical supraclavicular approach.

Forty-five cases of thoracoscopic sympathectomy were studied in comparison with 20 cases of open supraclavicular sympathectomy performed for various indications. The two groups were well matched regarding age, sex, side of surgery, and indication for the procedure (p>0.05).

Relief of symptoms was achieved in 42 patients (93.3%) in the thoracoscopic group versus 18 patients (90%) in the open surgical group (p>0.05). Recurrent hyperhydrosis occurred in one patient in the thoracoscopic group six months after the procedure. No perioperative deaths or major complications were encountered in either group. Horner's syndrome occurred in three patients in the thoracoscopic group and in two patients in the open surgical group (p>0.05). Minor complications included surgical emphysema (one patient), and intercostal neuralgia (one patient) in the thoracoscopic group. In the open surgical group, minor wound complications (hematoma, chylous discharge) occurred in two cases. The mean operative time was significantly shorter for the thoracoscopic technique compared to the open surgical procedure (32.9±11.6 mm. versus 73.3±33.3 min., p<0.0001). The mean hospital stay was also significantly shorter for the thoracoscopic group compared to the open surgical group (1.12±0.4 days versus 2.81±2.5 days, p<0.0001).

In conclusion, the present study supports the superiority of the thoracoscopic approach for upper dorsal sympathectomy. Its technical ease, increased patient acceptance, minimal morbidity, and excellent results make it the approach of choice for this procedure.

Keywords: Sympathectomy - Thoracoscopy - Hyperhydrosis

INTRODUCTION

Upper dorsal sympathectomy has been employed for treatment of a large variety of conditions. Best results are achieved with cases of hyperhydrosis, causalgia, and vasospastic disorders [1-6]. Multiple approaches have been described for this operation indicating dissatisfaction and problems with each of them. The two most commonly used approaches are the supraclavicular and the transaxillary transpleural approaches. With the development of video thoracoscopy and video-assisted thoracic surgery (VATS), its application has been extended to include dorsal sympathectomy [7,8].

We herein report our experience at Ein-Shams University Hospitals with the use of this recent technique and compare its results with those of the standard open surgical supraclavicular approach.

PATIENTS AND METHODS

The present study was carried out at Ein-Shams University hospitals during the period between April 1994 and March 1999. Forty-six patients undergoing 65 dorsal sympathectomy procedures for various indications were included in the present study. Nineteen patients had bilateral procedures, and all were performed at two separate sessions. There were 42 males and 23 females and the mean age was 31.5±8.1 (range 13-70 years). Sympathectomy was performed by the thoracoscopic technique in 45 cases (Group I). The remaining 20 cases underwent open surgical sympathectomy via the supraclavicular approach (Group II).

Indications for surgery were incapacitating primary hyperhydrosis in 52 cases (80%), vasospastic disorders in 10 cases (15.4%), reflex sympathetic dystrophy in 2 cases (3.1%), and one patient underwent sympathectomy for severe rest pain following intra-arterial injection of narcotics (1.5%).

Patients undergoing sympathectomy for indications other than hyperhydrosis underwent percutaneous stellate ganglion block preoperatively to demonstrate symptomatic benefit. Standard anterior approach was used as described by Riegler and d'Amours [9].

Technique of thoracoscopic sympathectomy:

After induction of general endotracheal anesthesia, the patient was kept in the supine position with the arm abducted. The standard laparoscopic set of instruments was used. A 1-cm incision was made in the 4th intercostal space mid-axillary line and the Verees needle inserted into the pleural cavity with subsequent insufflation of C02 to maintain an intrapleural pressure of 8-10 mmHg. The volume of C02 required to maintain such pressure ranged between 1000 to 1500 cc depending on the size of the patient. The positive pressure on the lung allows great visualization of the sympathetic chain which lies far posterior. The 10mm trocar was then inserted and the laparoscopic camera introduced. Care was taken not to damage the intercostal bundle when inserting the trocar. One or two other incisions were then made as needed for the 5mm trocars in the 4th intercostal space mid-clavicular line and anterior axillary line respectively. The trocars were inserted under direct camera vision. Through these ports, the grasper dissector, coagulator, and the suction/irrigator were inserted as needed. The sympathetic chain could be easily identified running over the neck of the ribs posteriorly. The lower half of the stellate ganglion was also well visualized using this approach. The pleura overlying the sympathetic chain was then incised using the electrocautery, thus exposing the chain.

Two techniques were used for ablation of the chain:

(a) Excision of the chain between endoclips from the lower third of the stellate ganglion through the 3rd thoracic ganglion (n=8). The 4th ganglion was only excised for cases of axillary hyperhydrosis.

(b) Fulguration of the chain by electrocoagulation of its ganglia and rami (n=37). The stellate ganglion was avoided with this technique to avoid transmission of the thermal injury to its cervical portion. Following ablation of the chain, the lung was re-inflated under camera vision while the anesthesiologist applies continuous positive pressure until full expansion was achieved. A 32 F chest tube was inserted in the first four cases in the series and left in place for 24-48 hours postoperatively. In the remaining patients chest tubes were not employed. Postoperative chest X-ray was obtained routinely to rule out the presence of pneumothorax.

Group II patients (n=20) underwent standard open surgical sympathectomy via the supraclavicular approach. The supraclavicular approach was chosen for comparison because it is the most popular technique used in our practice.

Statistical analysis:

Results of the two groups (surgical and thoracoscopic) were analyzed and compared regarding efficacy in providing symptom relief, operative and postoperative complications, operative time and hospital stay. Analysis was done by use of Instat software. Data was reported as mean ± the standard deviation of the mean. Data for the two groups was compared using Chi-square test for comparing proportions and 2-tailed Student t test for comparing means. Results were considered significant at a P value less than 0.05.

RESULTS

The two groups were well matched regarding age and sex distribution, side of surgery and the indication for the procedure (Table 1).

Table (1) : ***Comparison of age, sex, side, and indication for sympathectomy for the two study groups.***

	Group I (Thoracoscopic) n= 45	*Group II (Surgical) n=20*	*P value*
Mean age (years)	30.9±6.4	32.5±14.9	0.53 (NS)
Sex (male: female)	32:13	10:10	0.15 (NS)
Side of surgery (right: left)	28:17	13:7	1.0 (NS)
Indication: Hyperhydrosis	37(82.2%)	15(75.0%)	0.70 (NS)
Vasospastic disease	6(13.3%)	4(20%)	0.75 (NS)
Reflex sympathetic dystrophy	1(2.2%)	1(5%)	0.85 (NS)
Ischaemia	1(2.2%)	0(0%)	0.67 (NS)

The overall success rate was similar for both groups. Complete relief of symptoms was achieved in 42 patients (93.3%) in the thoracoscopic group versus 18 patients (90%) in the open surgical group (p>0.05). Recurrence of hyperhydrosis occurred in only one patient in the thoracoscopic group six months after the procedure. On thoracoscopic re-exploration of the surgical site T3 ganglion was noted to have been missed during the original procedure. Ablation was done by fulguration with relief of symptoms.

No perioperative deaths or major complications requiring surgical intervention in the early postoperative period were encountered in either group. Minor complications included surgical emphysema in one patient in the thoracoscopic group that required chest tube insertion in the postoperative period. Another patient in the thoracoscopic group experienced persistent intercostal neuralgia for six weeks postoperatively. In the open surgical group, one patient had a small wound hematoma that was managed conservatively. Another patient had chylous discharge from the wound that was also managed conservatively. There were no wound complications in the thoracoscopic group. Horner's syndrome occurred in three patients in the thoracoscopic group and in two patients in the open surgical group (p>0.05), figure 1. Overall the incidence of minor complications was not significantly different between the two study groups (p>0.05). Complication rate was also similar for thoracoscopic cases where ablation of the chain was done by fulguration or excision (p>0.05).

The mean operative time was significantly shorter for the thoracoscopic technique compared to the open surgical procedure (32.9±11.6 minutes versus 73.3±33.3 minutes, p<0.000l). For the thoracoscopic group the operative time was significantly shorter for the fulguration technique compared to the excision technique (18.1±12.6 minutes versus 42.9±7.4 minutes, p<0.0001), (Fig. 2).

The mean hospital stay was also significantly shorter for the thoracoscopic group compared to the open surgical group (1.12±0.4 days versus 2.81±2.5 days, p<0.0001), (Fig. 3).

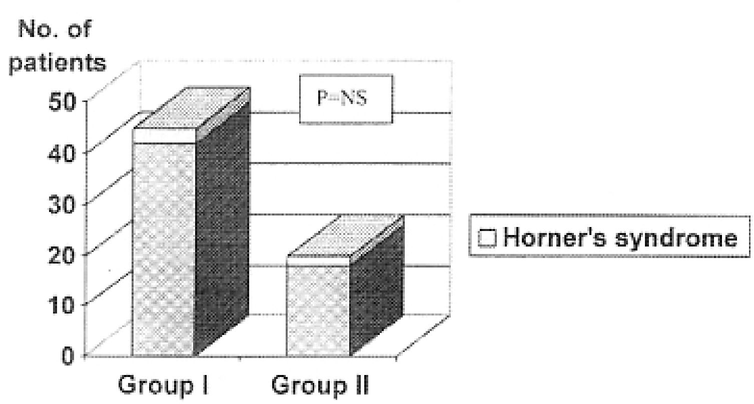

Fig (1): Incidence of Horner's syndrome in Group I (thoracoscopic) vs. Group II (open surgery).

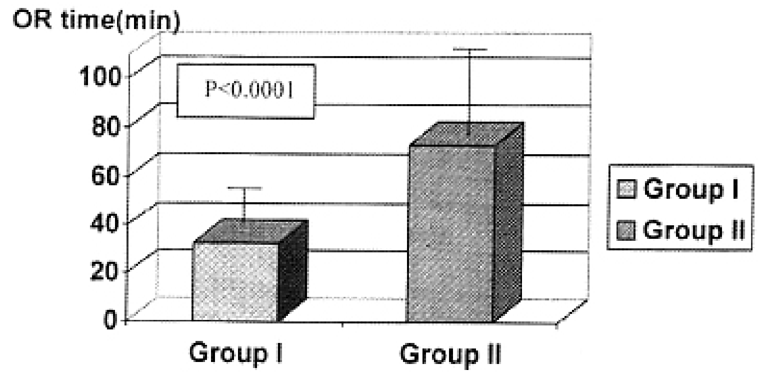

Fig (2) . Mean operative time for Group I (thoracoscopic) vs. Group II (open surgery)

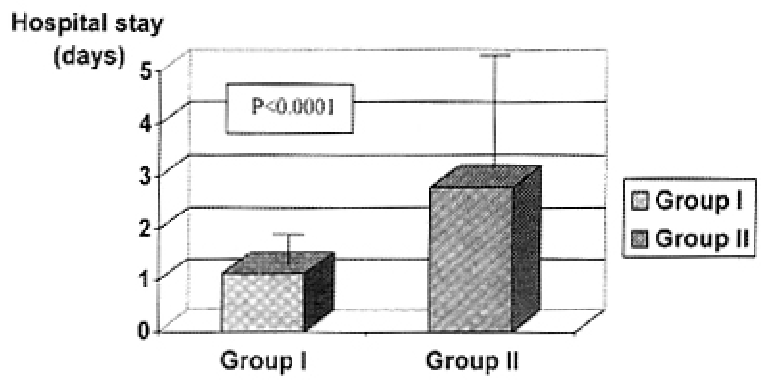

Fig (3) .Hospital stay for Group I (thoracoscopic) vs. Group III (open surgery)

DISCUSSION

Upper dorsal sympathectomy has been performed for management of a wide variety of indications, the most common of which is primary hyperhydrosis. Other indications include causalgia, reflex sympathetic dystrophy, vasospastic syndromes, and vascular insufficiency of the upper extremities [1-6].

Traditional approaches for upper dorsal sympathectomy have generally been associated with some technical difficulties or problems. The supraclavicular (anterior) approach involves deep exploration and dissection through vital neck structures [10]. The axillary approach may be complicated by operative injury to the brachial plexus [11,12]. The upper dorsal (posterior) approach requires resection of one or two ribs on each side, leaving the patient with unsightly and often painful scars [13,14].

Thoracoscopic sympathectomy was first reported in 1944 by Goetz [15]. The first large series of patients however was published in 1951 by Kux [16]. Nevertheless, the endoscopic technique did not gain wide acceptance despite its proven efficacy until the 1990s in association with the upsurge of video-assisted endoscopic surgical procedures [17-20].

Variation in the technique of thoracoscopic sympathectomy have been described among different authors. Kux performed the procedure in the prone position making a single incision just anterior to the tip of the scapula [21]. Others have used a lateral thoracotomy position[3,5,22]. In the present study we have used the supine position for all of our cases and have encountered no particular difficulty with visualization of the chain in this position. The supine position has also been preferred by other authors [23,24].

While in the initial experience with thoracoscopic sympathectomy described by Kux [21]; pneumothorax was induced by instilling 1000 cc of room air, most authors have subsequently used CO_2 in volumes ranging from 1000-2000 cc depending on the size of the chest [4,20,23,24]. We have used $C0_2$ in our study patients because of its documented safety, and the laparoscopic equipment is set to deliver Co_2.

Single-lung anesthesia by use of a double lumen endotracheal tube is recommended by some authors [5,22-25]. We have used standard single lumen endotracheal tube in our cases. With induction of adequate pneumothorax, collapse of the lung with satisfactory visualization of the chain was achieved without difficulty. Similar experience has been reported by other authors [6]

The number of incisions used to perform the procedure has also been variable among different authors. Kux [21] and Weale [26] utilized a single incision in the mid-axillary line in the 4th or 5th intercostal space, through which they coagulated the chain with an insulated power electrode introduced along the working channel of the endoscope. Claes et al [4] also used a single incision 2cm below the clavicle in the mid-clavicular line. Others have recommended two or three incisions to adequately perform the procedure [5,20,22,23]. We have used two incisions: a 10mm port for the camera and a 5mm operating port for cases where the chain was ablated by coagulation. For cases where excision of the chain was carried out, a third 5mm operating port was necessary.

Some authors strongly advocate dissection and excision of the chain as the method of choice for its ablation [22]. They believe that this allows precise excision of the lower end of the stellate ganglion, thus minimizing the risk of postoperative Horner's syndrome as well as the risk of thermal injury to the closely lying brachial plexus or intercostal vessels. In the present study we have found no difference in complications between cases where the chain was ablated by excision or coagulation. Furthermore, ablation by coagulation significantly shortened the operating time and simplified the procedure. Other authors have reported similar experience with electrocoagulation of the chain [4,6].

Considerable controversy also exists regarding the extent of chain ablation necessary for adequate denervation of the hand and axilla. Kux advocated extensive denervation from TI through T6 [21]. On the other hand, Lin [18] has found ablation of the T2 ganglion sufficient. In our study ablation of T2 and T3 was done for hand denervation, and T4 was included for cases with axillary hyperhydrosis. This has also been the recommendation of most other authors [3,6,20,22,24,27].

The use of chest tube drainage at the end of the procedure has also been a point of controversy. The conservative approach is routine placement of a chest tube for 24-48 hours after the procedure [5,22]. This obviously extends the hospital stay for these patients. Others have demonstrated that it is not necessary [3,21,23,26]. We have not routinely used chest tubes in this series except in our first four cases. In the remaining cases the lung was re-inflated under camera vision while the anesthesiologist applies continuous positive pressure until full expansion was achieved and chest tubes were not employed.

Performing bilateral sympathectomy at the same setting has been advocated by some authors for fit patients[21,23,24]. This obviously avoids repeated hospitalization and repeated exposure to anesthesia. We have not adopted this approach in our study, and until sufficient experience has been gained by the operating team, staging of the procedures is probably the safer policy [3].

We had to re-operate on one patient in the present series for recurrent hyperhydrosis. In this patient no particular difficulty was encountered with pleural adhesions during the second procedure which was also performed via the thoracoscope. Claes et al [4] had a re-operation rate of 2% over a five-year period and has also reported that adhesions after the first procedure were sparse. Others have reported similar experience [28,29].

Comparing the results of thoracoscopic sympathectomy with the standard open surgical technique in the present study has revealed several advantages for the endoscopic approach. The anatomy is well exposed, and the magnification provided by the improved video technology makes good visualization easy. The procedure seems to be better tolerated, and the operating time as well as the hospital stay is significantly shorter. Excellent results have also been reported by a number of authors [3,4,6,20-24,26]. All reported minimal if any morbidity. Horner's syndrome is generally reported at a rate of less than 5%. Reduced operating time and rapid return to work has been shown by Claes et al [4] in their experience with 500 cases of thoracoscopic sympathectomy with a mean operating time of 25 minutes, mean hospital stay of one day with return to work within less than a week.

Caution however should be taken with this procedure in patients with previous chest conditions that might predispose to pleural adhesions as this would be a contraindication to the thoracoscopic approach. Such adhesions would predispose to lung injury and may prevent the creation of an adequate pneumothorax needed for exposure. Careful history and routine preoperative chest radiography are mandatory to detect these cases, as they would be better served by the open surgical approach.

In conclusion, the present study supports the superiority of the thoracoscopic approach for upper dorsal sympathectomy. Its technical ease, increased patient acceptance, minimal morbidity, and excellent results make it the approach of choice for this procedure.

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