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UPPER THORACIC SYMPATHECTOMY "THORACOSCOPIC VERSUS SUPRACLAVICULAR APPROACH"

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With the outburst of the use of video-endoscopic assisted techniques in the early nineties, thoracoscopy was one of the most privileged domains. This is due to the already formed cavity maintained by the bony framework. This encouraged the performance of many of the "open sky" surgeries in the thoracic cavity to be included in a minimal invasive approach. In this study, we compared the results of upper thoracic sympathectomy that had been done either by the supraclavicular approach or by video-assisted thoracoscopic surgery. It was found that the thoracoscopic approach was easier to perform and less painful than the supraclavicular approach. Exposure was better, operative time and hospital stay were also reduced. The long-term success rate (one-year follow-up) was more than 90% in both groups. As thoracoscopic sympathectomy resulted in achieving similar long-term results as the supraclavicular approach, thus the endoscopic approach is the operation of choice when upper thoracic sympathectomy is contemplated.

INTRODUCTION

With recent popularization of video-laparoscopic cholecystectomy comes a renewed interest in thoracoscopy and its clinical applications in intrathoracic disease [(1)].

Video-assisted thoracoscopic surgery (VATS) became an important tool in the surgical treatment of various thoracic diseases. Currently many interventions that routinely required thoracotomy can be preformed by VATS safely and with excellent results. This includes pleurectomy, decortication, wedge-resection, bullectomy and volume reduction surgery for emphysema, biopsy and/or resection of mediastinal tumors, thymectomy for myasthenia gravis, sympathectomy and even lobectomy [(2)].

There are three basic approaches to upper thoracic sympathectomy, which by order of invasiveness are:

1. Non-surgical
2. Endoscopic.
3 Open surgical.

The non-surgical methods include percutaneous phenol sympathectomy and percutaneous radiofrequency sympathectomy. Both of these techniques had been followed by a prolonged and painful neuritis and should be reserved only for patients whose general condition is too poor to be suitable for general anesthesia [(3)]

Surgical sympathectomy has traditionally been achieved by "open" surgical techniques. The transaxillary, cervical or dorsal approaches have not been without morbidity. Cosmetically these procedures were found to be less than ideal. The main indication for sympathectomy is palmar and axillary hyperhidrosis refractory to medical treatment, although it has been used with some success in troublesome causalgia. Use of sympathectomy in Raynaud's disease remains disappointing [(3)]. It has also been used in severe upper limb arteriopathies (atherosclerotic or arteritic) where there is no possibility for arterial reconstruction to improve amputation stump healing and decrease pain sensation. The technique was less frequently and successfully used for angina pectoris with failed medical and impossible surgical myocardial revascularization [(4)]. Also it was used in long QT syndrome complication with recurrent arrythmias inspite of the use of beta-blockers (5) .

PATIENTS AND METHODS

Forty-three patients who had been operated upon in the Surgical Department of Kasr El-Aini Teaching Hospitals for hyperhidrosis (palmar and axillary), vasomotor disorder of the upper limb or non-reconstructable arteriopathies, in the period from 1993 till 1999 have been subjected to cervical sympathectomy either by the supraclavicular approach or by video-assisted thoracoscopic surgery.

The results of the 2 groups were compared concerning:

1.Exposure.
2. Duration of operation.
3. Duration of hospital stay.
4.Complications as: Horner's syndrome, pneumo or hemothorax, post-operative pain, and compensatory hyperhidrosis.
5. Cosmetic results.
6. Time of return to work.
7.Long-term results (all patients had been followed-up for a period of one-year at least).

Technique of thoracoscopic cervical sympathectomy:

Thoracoscopic sympathectomy was done under general anesthesia with the patient in a lateral decubitus position. To allow the lung to fall down, the operation table was placed in anti-Trendelenburg position. A double lumen endobronchial tube was inserted to allow deflation of one lung. Access to the pleural cavity was established through a 2-cm stab incision in the midaxillary line in the fourth or fifth intercostal space. After the muscles and parietal pleural had been opened with a curved clamp, a rigid 10-mm trocar was inserted. Carbon dioxide was insufflated to a maximum pressure of 8-mm Hg to facilitate compression of the lung. After sufficient compression of the lung, carbon dioxide insufflation was discontinued. A 5-mm trocar was inserted through the posterior axillary line in the fifth intercostal space. A second 5-mm trocar was placed in some patients when retraction of the lung or sympathetic chain was required. Apical pleural adhesions, if present, were cut with endoscopic scissors. After visualization of the sympathetic chain, the second rib was identified. The first rib was usually covered by fatty tissue (Palpation with an endoscopic dissection clamp and localization of the brachiocephalic vessels proved helpful to localize the first rib). To dissect the sympathetic chain, the parietal pleura was opened with a diathermy hook. The sympathetic chain was always divided with diathermy. The 2nd and 3rd thoracic ganglia were resected. The lung is then inflated, by the anesthetist, while withdrawing the camera. Plain x-ray chest was then performed to exclude the presence of penumothorax, otherwise, an under water seal was inserted (Figs. 1, 2, 3 and 4).

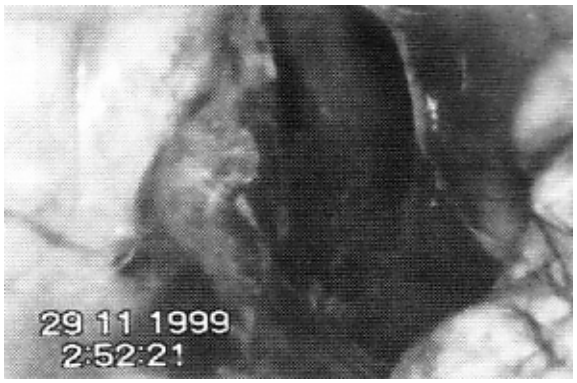

Fig. (1): Opening of the posterior pleura.

Fig. (2): Exposure of the sympathetic chain..

Fig. (3): Cauterization of the sympathetic chain.

Fig. (4): Cutting of the sympathetic chain.

RESULTS

The study included 43 patients (23 were done thoracoscopically and 20 were performed through the supraclavicular approach).

The following tables from 1 to 6 will depict age distribution, sex distribution, indication of sympathectomy, the side operated upon, the comparison between one and two-lung anesthesia in thoracoscopic sympathectomy, and complications, respectively.

Table (1): ***Age***

	Age	*Mean*
Thoracoscopic Sympathectomy	21-43 years	33.8 years
Supraclavicular approach	8-50 years	25.0 years

Table (2): ***Sex***

	Male		*Female*		*Total*
	No.	%	No.	%	
Thoracoscopic Sympathectomy	8	34.8 %	15	65.2 %	23
Supraclavicular approach	4	20 %	16	80 %	20

Table (3): ***Indications for sympathectomy***

	Hyperhidrosis		*Vasmotor disorder and end-stage arteriopathy of the upper extremity*		*Total*
	No.	%	No.	%	
Thoracoscopic Sympathectomy	17	73.9 %	6	26.1 %	23
Supraclavicular approach	15	75 %	5	25 %	20

Table (4): ***Side operated upon***

	Right upper limb		*Left upper limb*		*Total*
	No.	%	No.	%	
Thoracoscopic Sympathectomy	8	34.8 %	15	65.2 %	23
Supraclavicular approach	10	50 %	10	50 %	20

Table (5): ***Thoracoscopic Sympathectomy (one versus two-lung anesthesia)***

	Two lung anesthesia		*One lung anesthesia*		*Total*
	No.	%	No.	%	
Thoracoscopic Sympathectomy	6	26.08 %	17	73.91 %	23

Table (6): ***Complications***

	Thoracoscopic Sympathectomy		*Supraclavicular approach*	
	No.	%	No.	%
Horner' s syndrome	-	0.0	3	15 %
Pneumothorax	-	0.0	2	10 %
Compensatory hyperhidrosis	1	4.3 %	5	25 %
Postoperative pain:				
- Mild*	5	21.7 %	3	15 %
- Mode	15	65.2 %	12	60 %
rate*	-	0.0 %	5	25 %
- Sever				
e*				
Duration of operation	20-30 min.		60-120 min.	
	Mean = 25.5 min.		Mean = 77.65 min.	
Exposure	Satisfactory and easy		Difficult	
Hospital stay	1-3 days		2-7 days	
	Mean = 1.7 days		Mean = 3.9 days	
Time of return to work	3-7 days		7-14 days	
	Mean = 5 days		Mean = 11.8 days	
Cosmosis	Better cosmosis		-	

*Mild: requires no postoperative analgesia.
*Moderate: requires postoperative non-steroidal anti-inflammatory drugs.
* Severe: requires postoperative narcotics.

N.B.: Long-term follow-up (for 1 year):
The results were nearly the same in both groups as the long-term success rate was more than 90% in both groups.

DISCUSSION

In this study, 43 patients had been operated upon for upper thoracic sympathectomy, 23 were done thoracoscopically and 20 were performed through the supraclavicular approach.

The main indication was hyperhidrosis (73.9% in the thoracoscopic approach and 75% in the supraclavicular approach) while in the remaining, 26.1% and 25% in both groups respectively, the indication was vasomotor disorder and end stage arteriopathies of the upper extremity in cases not suitable for arterial reconstruction and where medical treatment failed to control the disease.

The major effect of cervical sympathectomy is compensatory sweating[4~5] . It is supposed to be the result of a compensatory mechanism and is related to the extend of sympathectomy[6]. Hederman in 1993 noticed a reduction in the incidence of compensatory sweating when sympathectomy was limited to the 2nd and 3rd ganglia[7].

In this study, the incidence of compensatory sweating was only 4.3% in the thoracoscopic approach compared to the 25% incidence in the supraclavicular approach. We did not have a single case of intolerable, or incapacitating compensatory sweating. This can be explained by the fact that the thoracoscopic view allows much better exposure with magnification than the supraclavicular open approach. This in-turn allows more precise exposure and excision of the 2nd and 3rd ganglia under direct vision.

These incidence are less than the 64% of compensatory sweating in Hederman series in l993[7].

Herbst et al. (1994) have shown that sweat glands interfere with thermoregulation and that sympathectomy provokes a denervation of a sweat glands rich territory. This necessitates that other sweat gland rich areas overact and compebsate in cases ot “thermic stress". It may affect the trunk in 28%, the feet 32%, the face 27%, the axillae 13% and diffuse affection in 42% of cases. In only 7% of cases it proves incapacitating and interfering with lifestyle [8].

Wittmoser (1992) [9] and Gossot et al. (1997) [10] proposed a more selective sympathectomy concentrating only on the rami communicants of T_2 and T_4. Bonjer et al. in 1996[4] also advocated a trunkal sympathectomy limited only to T_3 (Fig. 5). All these were advocated to reduce the incidence of compensatory hyperhidrosis. However, Gossot et al. in 1997 stated that inspite of the fact of less compensatory hyperhidrosis they recorded a higher incidence of recurrence[10].

This fact can also explain why the incidence of Horner's syndrome was higher (15%) in the supraclavicular approach than (0.0%) in the thoracoscopic approach. This finding was previously reported by Chandler in 1993, who found that the standard operative approach for dorsal sympathectomy was associated with higher risks of Horner's syndrome[l].

None of our cases experienced cardiac arrhythmias while using monopolar energy in dissecting or severing the sympathetic trunk. 2 cases of cardiac arrest were reported in literature with full recovery after resuscitation. The mechanism could be a myocardial hypersensitivity to electric stimulation or sympathetic over stimulation causing ventricular fibrillation[11].

The comparison between the two approaches concerning the postoperative pain, duration of operation, exposure and the hospital stay was in favor of the thoracoscopic approach.

Concerning the postoperative pain it was mild in 21.7% in thoracoscopic approach and 15% in the supraclavicular one, it was moderate in 65.2% and 60% respectively and it was not recorded to be severe in the thoracoscopic approach while it was severe in 25% of the supraclavicular approach cases.

The mean duration of operation was 25.5 min. in the thoracoscopic approach, compared with 77.65 min. in the supraclavicular approach.

The mean hospital stay was 1.7 days in the thoracoscopic approach, while it was 3.9 days in the supraclavicular approach.

As regards the operative time in the thoracoscopic group we have to point to two important aspects. The first is the learning curve. The second aspect is that this operative time was taken down by the use of one lung anesthesia. This is more physiologic to the patient and allows an adequate lung collapse and well-exposed operative field. In all the 6 cases were one lung anesthesia was not available the use of a capnograph is mandatory.

We noticed that we could only compress the lung with retractor (using an extra-port) and work for 5 minutes and then allow it to be ventilated again and so on. This maneuver is the direct cause for operative time prolongation. Another factor which we found quiet helpful in taking down the operative time was the initial use of CO_2 nsufflation because it helped to collapse the lung and allows a better operative field.

From the above mentioned results the thoracoscopic approach was found to be easier to perform and less painful than the supraclavicular approach. Exposure was better, operative time and hospital stay were also reduced. This is the same conclusion that has been reached by Drott in 1995[12].

As the duration of operation is comparably less in the thoracoscopic approach, the post-operative complications are fewer and the hospital stay is less, the time of return to work was comparably less (mean 5 days in the

thoracoscopic approach than (mean 11.8% days) in the supraclavicular approach. This is the same conclusion as obtained by Liu in 1992, who stated that, extended thoracoscopic T_2 sympathectomy is not only a timesaving method but also a very simple and effective method in the treatment of hyperhidrosis and the patient returns to work early, so it is worthy of being propagated worldwide [13] .

Cohen et al. in 1995, in their study that had been done on 23 patients with thoracoscopic dorsal sympathectomy reported that the thoracoscopic approach is better in times of less pain, early discharge, quicker return to normal activity and smaller, less conspicuous scar [14] .

As the long-term success rate (1-year follow-up) was more than 90% in both groups, the choices of the surgical approach should therefore be based on factors other than the rate of success of the operation. This is in accordance to the results of Drott et al. who reported in 1995 the long term results of thoracoscopic sympathectomy in 850 patients where they found only a 2% recurrence rate and 98% satisfactory results after at least 31 months [12] . They also advocated a thorough exploration searching for accessory rami (fibers of kuntz) which may short-circuit the main sympathetic trunk (Fig. 5).

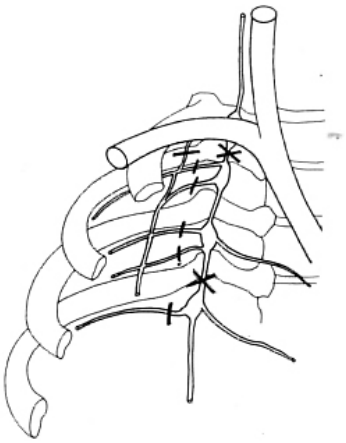

Fig. (5): Anatomic considerations implying some operative strategies.
X :truncal section of the sympathetic chain.
ı : sites of rami section for selective sympathectomy.
- : fibers of Kuntz (short-circuiting and cause of recurrence) necessitate exploration a more lateral area of the first intercostal space.

CONCLUSION

The problem with upper thoracic sympathectomy in the past has always been the large and often technically demanding surgical access required with its associated morbidity. The ability to achieve similar long-term results using thoracoscopy has resulted in the endoscopic approach becoming the operation of choice when upper thoracic sympathectomy is contemplated. In cases of axillary hyperhidrosis, when ablation of the fifth ganglion is required, the endoscopic approach facilitates access with relative ease when compared with the open approaches. Only in occasional cases when dense apical pleural adhesions are en__countered might open surgery be required, although this would appear to be rare from current reports.

1.The advantages of thoracoscopic dorsal sympathectomy are:

- Excellent exposure, easy access and precise localization.
- Better cosmosis.
- Fewer post-operative complications.
- Shorter duration of operation.
- Quicker return to work.

2.The main disadvantages of this approach for the surgeon are:

- Loss of binocular vision.
- Entering the pleural cavity.
- Inability of intra-operative palpation.

So, in the presence of good anesthetic facilitates, trained endoscopic surgeons, and a good set of thoracoscopy, the authors recommend choosing the thoracoscopic approach.

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