

The application of thoracoscopic sympathectomy for the optimal management of hyperhidrosis and severe upper extremity ischemia

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Abstract

Background: The thoracic sympathectomy is traditionally performed through open surgical thoracotomy. It is an extensive procedure associated with an unacceptable inconvenience. The present study describes a less morbid and minimally invasive thoracoscopy as the procedure of choice for thoracic sympathectomy.

Methods: The present study, carried out during 2001 to 2005, was performed on 33 patients aged from 17 to 18, with a mean of 42.7 years and comprising 25 males and 8 females. They suffered from essential hyperhidrosis and severe upper extremity ischemia, which were unsuitable for revascularization. Of 33 patients, 15 had Buerger's disease, 3 emboli, 5 essential hyperhidrosis, 3 Raynaud's syndrome, 3 intra-arterial injections, 2 advanced artherosclerosis, 1 acute thrombosis, and 1 patient post-traumatic ischemia. The patients were indicated to undergo a probable emergency thoracotomy. They were anaesthetized using one lung endobronchial intubations and underwent a two-port videothoracoscopy. Sympathetic chain resection was limited to T₂-T₃ and lower third of the stellate ganglion. The patients were kept under careful observation and comparisons were made between their preoperative and postoperative symptoms. Moreover, the early and late complications were carefully documented and analyzed.

Results: The presenting symptoms included 11, 4, 4 and 3 cases of ulcer and gangrene, rest pain, cyanosis and cold extremities, as well as excessive hand sweat respectively. The foregoing thoracic sympathectomy led to corresponding complete and partial recovery of 31 and 2 patients.

Conclusion: Thoracoscopic sympathectomy is a simple, safe, reliable and cost effective therapy with surprisingly good results and low complications in patients with primary hyperhidrosis as well as limb threatening upper extremity ischemia, an entity unsuitable for revascularization. Additionally, the results of sympathectomy for ischemia of upper are much better than lower extremities, so the procedure could be advised liberally for such patients.

Keywords: Sympathectomy; Thoracoscopy; Ischemia; Hyperhidrosis

Introduction

Bernard and Brown-Squard described sympathetic control of circulation in 1852. Gaskell and Langley mapped

the anatomy of autonomic nervous system in 1884.¹ In the upper extremity, the sympathetic nervous system controls vasomotor activity, piloerection and sweating.² Hyperhidrosis, which may cause psychological and occupational problems, is a pathologic excessive sweating with the prevalence of 0.6-1.0% in young population.^{3,4} Unfortunately, all conservative managements, including drug therapies and injection of botulinum toxin have been associated with unsatisfactory results,^{5,6} while

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surgical operations or minimally invasive thoracic sympathectomy may result in successful control of symptoms.^{3,5,7} Other indications for thoracic sympathectomy include Raynaud's disease, causalgia, and severe limb ischemia unsuitable for revascularization.⁸ Alexander (1884) was credited as the first surgeon who operated on the sympathetic nervous system and Leriche (1913) described parietal sympathectomy to increase blood flow to the extremity.¹ Thoracoscopic sympathectomy which is described for the first time in 1942 by Hauges,³ has been accepted as a procedure of choice for its better visualization of anatomic structures, favorable cosmetic results and less scar formation instead of conventional open surgical method.^{8,9} Despite numerous reports of using thoracoscopic sympathectomy for hyperhidrosis, fewer studies have been conducted to evaluate this approach for upper extremity ischemia.⁸ Several studies indicated good results of using thoracoscopic sympathectomy for patients with Buerger's disease,⁸ Raynaud's syndrome^{8,10} and inadvertent intra-arterial injections.⁸

Herein, we discuss our 5-year experience of performing this technique on patients suffering from primary hyperhidrosis as well as cases with severe upper extremity ischemia for which revascularization was not feasible.

Materials and Methods

Thoracoscopic thoracic sympathectomy was initiated in Vascular Surgical Unit of Imam Reza Hospital, Mashhad on 2001. During a 5-year period (2001 to 2005), 33 patients, 25 males and 8 females, underwent the operation and were carefully followed up by the authors. There was only one case whose operative procedure was changed to open thoracotomy, and was excluded from follow up, because of tight adhesion of visceral and parietal pleura. The indication for surgery was limb-threatening ischemia for which revascularization was not feasible, or for cases with unbearable primary hyperhidrosis. Before starting the procedure, all patients were indicated to undergo possible open thoracotomy. Bilateral sympathectomy was not performed on any of the patients. The operation was carried out under a one-lung anesthesia using a two port thoracoscopic sympathectomy. The first port was entered in the 3rd or 4th intercostal space near the anterior auxiliary line, which was used as an entrance for the camera, and the second port entered in the 2nd intercostal space around the mid clavicular line, which allowed entrance of laparoscopic hand

pieces. Before entering the first port, parietal pleura were fenestrated by means of a hemostat to induce pneumothorax and allowing the lung to collapse. After visualization of anatomic structures and identification of sympathetic chain, the parietal pleura were opened just proximal to T₂-T₃ ganglia by a hook electrocautery. Passing the hook under it then elevated the chain and finally T₂, T₃ and lower 3rd of stellate ganglia were resected by sharp cuts instead of electrocautery to avoid inadvertent thermal damage. The specimen was sent for microscopic examination to confirm the procedure. At the end of operation, the lung was inflated under direct vision and a sealed dressing was used to cover the incision or alternatively, the procedure was terminated by insertion of a chest tube in place of 1st port. A chest X-ray was obtained after 2 hours. The chest tube was removed on the 1st postoperative day if no complications occurred. In the absence of chest tube, the dressing was removed on the 3rd postoperative day. The patient was discharged from hospital on the 3rd day if the treatment course was uncomplicated.

Results

The study comprised 33 patients,⁸ females and 25 males, aged from 17 to 81 with mean age of 42.7 years. Five patients aged from 17 to 32 years (mean: 21.8) underwent the operation for intolerable hyperhidrosis. All the remaining cases were involved with severe ischemia unsuitable for revascularization. The ischemia was mostly resulted from Buerger's disease, arterial emboli, intra-arterial injections, Raynaud's disease, advanced atherosclerosis, acute thrombosis in 15, 3, 3, 3, 2 and 1 patients respectively while ischemia following trauma was found in only 1 patient (Table 1). Five patients suffered from hyperhidrosis, whereas 14, 7, 6 and 1 patient had gangrene in finger area or more distal regions, ischemic ulcer, cyanosis, ischemic rest pain respectively (Table 2). All surgical operations for resection of sympathetic chain were technically successful. In 12 cases the procedure was performed on the left and in 21 cases on the right sides. In 19 patients the operation was terminated without placing chest tube, but for 12 cases, chest tube was inserted prophylactically and in only 2 patients chest tube was used for therapeutic reasons such as hemothorax or pneumothorax. None of the patients had chest tube inserted during the final year of our study.

Considering elimination of symptoms or complete healing of ulcers as absolute recovery, 31 patients fully recovered, while partial recovery was achieved in only two cases with Buerger's disease, of which one patient expired due to irrelevant causes after 3 months, and another recovered from pain and cyanosis, but his ulcers remained unhealed. All cases responded to therapy and major amputation was not performed on any patients. Minor amputation limited to finger or more distal areas was only performed for 6 patients previously involved with gangrene. In remaining patients ulcers and other symptoms were completely resolved, or autoamputated in case of fingertip gangrene. There were no reports of Horner's syndrome or infectious complications. Hospital stay was prolonged in 2 cases with hemothorax or pneumothorax, who were treated by chest tube insertion (Table 3).

Table 1: Etiology

Indications for Surgery	No.
Buerger's Disease	15
Essential Hyperhidrosis	5
Arterial Emboli	3
Intra-arterial injection	3
Raynaud's Disease	3
Advanced Atherosclerosis	2
Acute Thrombosis	1
Trauma	1
Total	33

Table 2: Presenting Symptoms

Presenting Symptoms	No.
Gangrene limited to fingers	14
Ischemic Ulcer	7
Hyperhidrosis	5
Cyanosis	6
Ischemic rest pain	1
Total	33

Table 3: Outcome and complications

Outcome	No.
Complete recovery	31
Partial recovery	2
Major amputation	0
Minor amputation	6
Horner's syndrome	0
Hemothorax/pneumothorax	2

Discussion

Thoracic sympathectomy is one of the options for treating patients with axillary or palmar hyperhidrosis. It is also considered as an appropriate procedure for management of cases suffering from peripheral vascular disease such as Raynaud syndrome.¹¹⁻¹³ Moreover, Thoracic sympathectomy may result in better pain management, ulcer healing, and prevention of ischemic upper extremities amputation.⁸ It is specifically indicated for patients involved with ischemia due to peripheral vascular lesions for which revascularization is not feasible.¹⁴ Currently, thoracoscopic sympathectomy is performed in place of conventional open surgical method,^{5,7,9,11} since due to postoperative pain, 20% of the patients who had experienced thoracic sympathectomy through thoracotomy are not willing to undergo the operation of the opposite side.¹⁵ Frequent studies indicated favorable results from thoracoscopic sympathectomy for management of upper extremity hyperhidrosis.^{3,4,5,7,9,11} Patient's satisfaction with no relapse in our 3-year follow up is consistent with the results of previous reports, although fewer studies evaluated this approach for the upper extremity ischemia. Some investigators considered it as an effective management^{8,14} whereas others doubted its efficacy,¹⁶ and still some believed that it should be re-evaluated.¹⁷ According to our results, and in regard to ischemia, though outcomes of thoracoscopic sympathectomy are not as satisfactory as hyperhidrosis, its favorable results demand re-evaluation of its efficacy in this subset of patients. Nevertheless, some studies concluded that sympathectomy, because of its temporary effects, does not effectively contribute to prognosis of Raynaud syndrome.¹⁶

In respect of good recovery from symptoms including cyanosis and well-established pains in fingers which continued for days to weeks, all patients who underwent the operation were satisfied with the outcome.¹⁷ It is worthy of mention that evaluation of the patients revealed no other organ involvements or underlying disease.¹⁸

Resection of lower 3rd stellate ganglion (C₈, T₁) was performed due to its innervations of upper extremities in 10% of cases.⁷ Contrary to several reports of transient or permanent Horner's syndrome,^{3,19,20} it was not observed in our patients. It was shown that resection of this part of ganglion could be performed without any complications.

Since there are some controversies over methods of sympathetic chain resection such as electrocautery, cryoablation, radiofrequency, and sharp cut,⁷ some studies attributed possibility of Horner's syndrome to thermal injury of stellate ganglion,¹¹ so cutting by scissors was preferred in our study. We also did not apply chest tube insertion routinely, despite its frequent use even in uniportal thoracoscopic sympathectomy,²¹ and only closed the wound by dressing after inflating the lung under direct vision.

Thoracoscopic sympathectomy is a simple, safe, reliable and cost effective therapy with surprisingly good results. The advantages are low complications in patients with primary hyperhidrosis as well as limb

threatening upper extremity ischemia unsuitable for revascularization. Additionally results of sympathectomy for upper extremity ischemia is much better than lower one, so the procedure could be advised liberally for such patients.

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