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Thoracoscopic Sympathectomy for Vasospastic Diseases

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ABSTRACT

Background: Vasospastic disorders (acrocyanosis, Raynaud's syndrome, causalgia) can arise from different etiologic factors, but the pathogenesis is always represented by an altered mechanism of vasal motility. Upper dorsal sympathectomy has been demonstrated to be an effective treatment for these disorders by decreasing peripheral resistances. Surgical technique has shown long-lasting results, and it can now be performed by endoscopic approach.

Methods: Our experience with six cases of sympathectomy is illustrated. The indications, thoracoscopic technique, complications and long-term results are evaluated. Four women with Raynaud's syndrome and two men with causalgia were treated in this series. After an accurate preoperative evaluation, the second, third, fourth and fifth thoracic ganglia of the sympathetic chain were identified and excised.

Results: All patients experienced relief of symptoms with very limited pain and discomfort. They did not require further medical therapy and are relapse-free at follow-up.

Conclusions: We conclude that thoracoscopic sympathectomy can be considered an effective, safe and simple treatment for selected cases of vasospastic phenomenon.

Key Words: Vasospastic diseases, Sympathectomy, Thoracoscopy, Minimal invasive surgery.

INTRODUCTION

Upper dorsal sympathectomy has been shown to be an effective treatment in some diseases, as shown in **Table 1**. Decreasing peripheral resistance, it leads to increased blood flow in patients with peripheral vascular diseases.[1] Furthermore, it causes relief of causalgic pain and cessation of sudomotor activity in upper extremities as a treatment for patients with hyperhidrosis.

Different methods have been suggested for thoracic sympathectomy: thermal, chemical (CAT scan guided) or electric transcutaneous techniques have been used all with limited success. Surgical treatment has been demonstrated to be the cornerstone for long-lasting results in sympathectomy.[2]

Many surgical methods have been used since 1929: the posterior extrapleural approach,[3] cervical or supraclavicular approach,[4] transthoracic anterior incision,[5] axillary transpleural incision[6] and the endoscopic transthoracic sympathectomy.[7-11] New technology for cameras and instruments has improved endoscopic thoracic and abdominal surgery which has become used worldwide because it is a safe, simple and cosmetically acceptable procedure.

We report six cases of our experience with thoracoscopic sympathectomy for vasospastic disease and discuss the indications, surgical technique, complications and effectiveness of treatment.

MATERIALS AND METHODS

From March 1992 to December 1993, we operated on six cases: four women and two men. One case was a 36 year old female who had been previously treated with right transaxillary sympathectomy in November 1990 for Raynaud's syndrome with good objective results.

Two women complained of typical symptoms of vasospastic diseases and another young lady (34 years old) affected by the same symptoms, had been previously unsuccessfully treated for thoracic outlet syndrome by other surgeons with a supraclavicular approach.

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Table 1.
Indications for thoracoscopic sympathectomy.

Causalgia
Raynaud's Syndrome
Hyperhidrosis
Sudeck atrophy
Acrocyanosis

One man (42 years old) two years previous underwent right forearm reimplantation as a result of a motor vehicle accident. The second male suffered a traumatic lesion of the forearm followed by lymphedema and vasospastic phenomenons. Both patients complained of causalgia, not controlled by medical and physical therapy. Angiography had been performed in both, showing normal arterial flow to the forearm and hand.

Preoperative evaluation of all patients included accurate information regarding the severity and duration of symptoms and previous therapy. Associated vascular diseases and poor results of medical therapy were documented before surgery.

Routine screening tests were performed with special attention to x-ray evaluation for pleural adhesions and thickening. Our anesthesiologists preoperatively performed a percutaneous sympathetic block with standard technique, thus demonstrating the potential beneficial effects of sympathectomy.

Finally, we must report that the first patient had requested the operation because of the good results obtained from the previous contralateral surgery.

We performed four left and two right sympathectomies by a thoracoscopic approach. Under general anesthesia, utilizing a double lumen endotracheal tube, the patient was placed in a classic lateral thoracotomy position. We introduced a 10 mm trocar in the mid-axillary line at the fourth intercostal space, performing a small incision and bluntly penetrating the pleural cavity. The lung was fully collapsed, without need of a supplementary insufflation. After introduction of the thoracoscope, the sympathetic chain was easily identified lying under the pleura and crossing perpendicularly the second, third, fourth and fifth rib. Two 5 mm trocars were inserted in the posterior and anterior axillary line at the fifth intercostal space, carefully attempting to form an angle of 90° with one another. The pleura was incised, creating a wide window, and the chain with the second, third, fourth and fifth thoracic ganglia was dissected and excised **(Figure 1, 2)**. The pleural window next to the chain was coagulated with the electrical surgical unit in order to interrupt pre- and postganglionic Kuntz's fibers **(Figure 3)**.

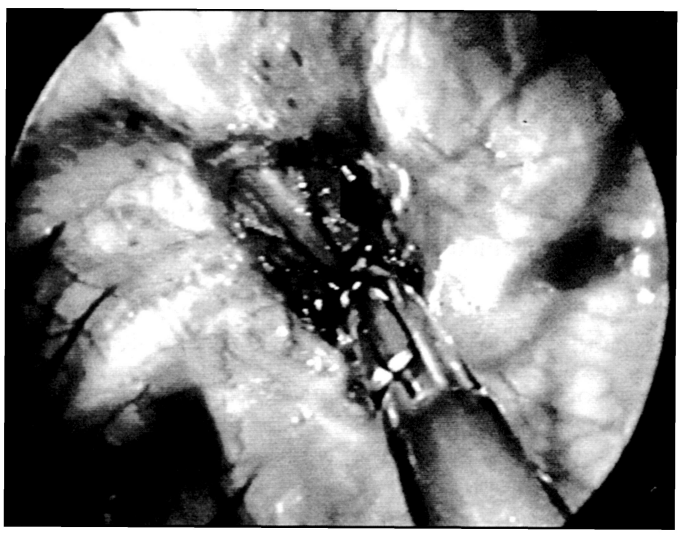

Figure 1. Dissection of the sympathetic chain (black arrow).

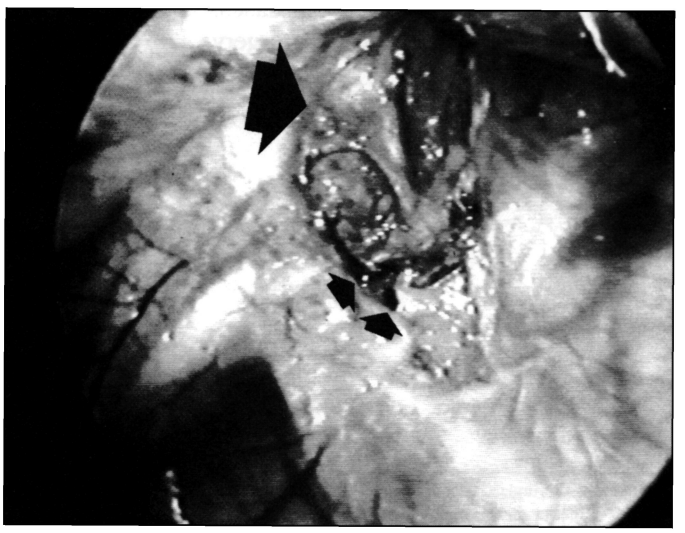

Figure 2. Distal part of stellate ganglion (big arrow) and II ganglion (little arrows) dissected.

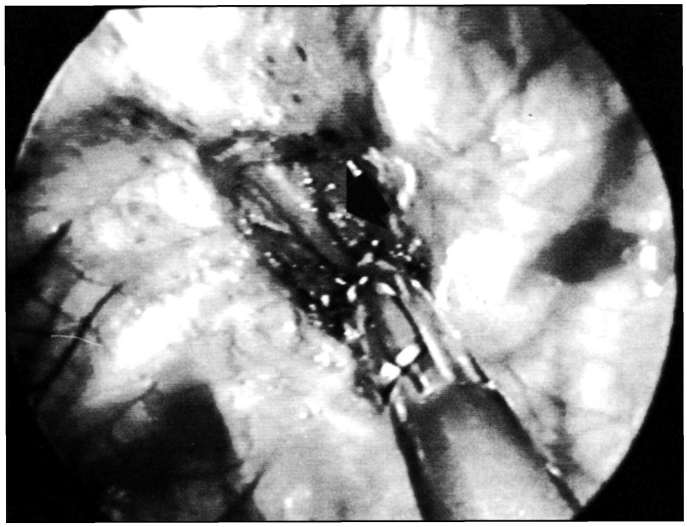

Figure 3. After excision of chain and ganglions, widening of pleural window, to coagulate communicating fibers.

The lung was reinflated and a chest drain inserted. The wounds were closed with mattress suture. After 24 hours, a chest x-ray was obtained and the drain removed. Patients were discharged after 48 hours, without complications.

RESULTS

Notwithstanding our limited experience, two findings were apparent: 1) the first patient previously treated with an axillary thoracotomy on the contralateral side two years before noted a very impressive improvement in postoperative pain, respiratory discomfort and cosmetic result after thoracoscopic sympathectomy; 2) Symptom relief was satisfactory after both the thoracoscopic and open axillary incision approaches.

The two patients with causalgia experienced satisfactory improvement of all symptoms; discoloration and coolness disappeared, and pain was immediately strongly reduced, leading to abandonment of medical therapy.

One patient was lost to follow-up. For the others, follow-up has ranged from 48 to 70 months (mean 59). Importantly, all are relapse-free, and only one shows modest signs of compensatory hyperhidrosis.

Indications for thoracoscopic sympathectomy are shown in **Table 1**. Although hyperhidrosis has the best results over a long period,[12,13] selected patients with peripheral vasospastic phenomenons experienced early relief of symptoms in 80-90% of cases, and most of them (78%) remained significantly better than before operation after many years.[1,5,14,15]

Table 2.
Preoperative evaluation.

Severity and duration of symptoms
Previous diseases
Trauma
Previous surgery
Medical therapy

In Buerger's disease, the follow-up of patients showed an unsatisfactory response to sympathectomy.[5,14-17]

Selection of patients is compulsory for good results. In all cases, very accurate interview of the patients must be performed with special regard to items indicated in **Table 2**.

In hyperhidrosis, preoperative assessment of underlying causes such as thyrotoxicosis and pheochromocytoma are necessary; likewise, the evaluation of the psychological component of sweating. Medical treatment for axillary sweating had to be demonstrated ineffective before surgery.[2]

In Raynaud's syndrome, causalgia, acrocyanosis and Sudeck's atrophy, associated vascular occlusive diseases and systemic connective tissue disorders (50% of cases) must be carefully investigated because of the poor results obtained from sympathectomy in these patients.[1-9,12-16,18-20]

Tobacco, exposure to cold, contraceptive pills, and beta adrenergic blocking agents should be avoided and long-term medical therapy attempted before performing surgery. Preoperative percutaneous sympathetic blockade should be performed to confirm the diagnosis prior to a minimally invasive procedure.

Thoracoscopic sympathectomy has several general advantages related to minimally invasive procedures. It is quick and easy to perform, postoperative pain is minimized and hospitalization is markedly reduced. Finally, convalescence is shorter and cosmesis is satisfactory. This is an important result, compared to open surgery and in considering that most patients are young females.

Some other aspects are more strictly related to a thoracoscopic approach: the sympathetic chain and ganglia are better visualized with collateral branches (Kuntz's nerve is present in 10-15% of cases[20]) and preganglionic fibers, allowing their complete transection and removal with superior results.[20] Dissection is easier, compared to all open techniques and can be limited to ganglions from II to V, thus avoiding the transection of stellate ganglion and potential Horner's syndrome. In fact, fibers for the arms ascend in the chain and only pass through T1 before joining the brachial plexus. Anastomotic branches can be identified and transected creating a wide pleural window around the ganglions.[13]

Hyperhidrosis and vasospastic phenomenon are frequently bilateral. With a thoracoscopic approach, we can now perform one-stage procedures, greatly reducing costs, risk related to anesthesia and discomfort of the patients. In bilateral sympathectomy, the patient is generally placed in a supine position,[2,12] with arms abducted 90°. A 0° telescope may be used. The prone position could be useful[10] as the lung falls forward, giving free access to the mediastinum, but a 30° thoracoscope is required, and the procedure seems to be more difficult because of the different angle between instruments and sympathetic chain. In both cases pneumothorax is induced, thus leading to possible subcutaneous emphysema. In our experience, subcutaneous emphysema can be avoided by carefully and completely collapsing the lung without overflow pressure.

Major complications are greatly reduced with thoracoendoscopic surgery: pleural effusions, pneumonia, major vessels and nerve lesions. Wound infections can be avoided, due to the minimal access.[1,13] Typically, only intercostal artery injuries can be attributed to this technique. The use of chest drain can be avoided by fully expanding collapsed lung under direct vision, and tying preplaced stay sutures when the trocar is removed. This technique should decrease the incidence of pneumothorax and septic problems related to drains. Horner's syndrome, which is present in 5-10% of all techniques,[5] is avoided by sparing the stellate ganglion, as already discussed.

Compensatory hyperhidrosis, a thermoregulatory function related to heat stress, is significant in only 5% of cases and responds partially to medical therapy.[17,19,20]

In the operating room, a raise in palmar temperature during sympathectomy is a clear sign of denervation; rate and extent of denervation can also be objectively evaluated using perspiration (an iodine-starch emulsion is applied over the skin, and turns from light-brown to blue-black in sweating area) and ninhydrine test. These tests show a complete absence of sudomotor activity in denervated areas in the great majority of cases.[1,11]

Generally, in vasomotory disorders success rate is 60%, while in hyperhidrosis 85-95% of patients improve and only a few relapse. Lower recurrence rate can be obtained by careful selection of patients, as probably happened in our experience.

CONCLUSIONS

In summary, thoracoscopic sympathectomy can be considered an effective treatment for selected cases of vasospastic phenomenon. It gives an excellent exposure of the sympathetic chain and is a safe, simple procedure with satisfactory, long-lasting results.

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