Surg Endosc (2002) 16: 1055–1058
DOI: 10.1007/s00464-001-8231-6

SURGICAL ENDOSCOPY
and Other Interventional Techniques

Needlescopic thoracic sympathetic block by clipping for craniofacial hyperhidrosis

An analysis of 28 cases

T. S. Lin, M. C. Chou

Division of General Thoracic Surgery, Changhua Christian Hospital, Chung Shan Medical University, Taichung, 135 Nanh-siao Street, Changhua City, Taiwan, Republic of China

Received: 11 July 2001/Accepted in final form: 18 December 2001/Online publication: 18 March 2002

Abstract

Background: Endoscopic thoracic sympathectomy or sympathicotomy of the lower part of the stellate ganglion is an efficient method for the treatment of craniofacial hyperhidrosis, but postoperative compensatory sweating may be troublesome in some patients. Needlescopic thoracic sympathetic block by clipping may achieve a similar effect as well as providing a possible reverse operation for patients who suffer from intolerable postoperative compensatory sweating.

Methods: Between January 1998 and June 2000, we collected a total of 28 patients with craniofacial hyperhidrosis. There were 15 men and 13 women with a mean age of 39.2 years (ranges, 19–50). All patients were placed under single-lumen intubated anesthesia in a semisitting position. Two ports were needed. We used a 2-mm 0° thoracoscope and endo clips to perform a sympathetic block by clipping the lower third of the stellate ganglion at the second intercostal space.

Results: The operation was usually accomplished within 20 min (ranges, 15–30). All patients were discharged within 4 h after the operation. There were no surgical complications or surgical mortality cases. All patients achieved improvement of craniofacial hyperhidrosis without recurrent symptoms after a mean of 25.3 months (range, 12–41) of follow-up. Twenty-five patients (85.7%) developed compensatory sweating of the trunk and lower limbs. One of these patients could not tolerate this postoperative sweating; he therefore underwent a reverse operation and obtained improvement of the compensatory sweating 18 days after removal of the endo clips.

Conclusion: Needlescopic thoracic sympathetic block by clipping is a safe and effective method for the treatment of craniofacial hyperhidrosis; compensatory sweating may be improved after a reverse operation and removal of the endo clips.

Key words: Hyperhidrosis — Craniofacial hyperhidrosis — Needlescopic thoracic sympathetic block by clipping — Compensatory sweating — Endoscopic thoracic sympathicotomy — Endoscopic thoracic sympathectomy

Craniofacial hyperhidrosis (CFH) is a rare clinical condition in which patients suffer from excessive local sweating on the head and face. This condition is often associated with mental stress. In addition, female patients may be troubled by an inability to apply cosmetics [4, 9]. The etiology remains unclear. In treating patients with CFH, we used to achieve successful sympathectomy of the lower third of the stellate ganglion, but this procedure has a major drawback in that it appears to be irreversible [9]. It is difficult to recover sympathetic nerve conduction after endoscopic thoracic sympathicotomy or sympathectomy (ETS). Moreover, patients are often distressed by intolerable compensatory sweating over the trunk or back after ETS [6, 8]. Some patients express regret and even want to restore the original sweating sites. Therefore, we are attempting to device a new surgical technique that not only yields a similar improvement of craniofacial hyperhidrosis but also maintains the cometic benifit. To date, there have been few reports of needlescopic thoracic sympathetic block by clipping (NTSBBC) for CFH. With this procedure, patients may opt for a reverse operation when they sustain such postoperative complications as craniofacial anhydrosis, intolerable compensatory sweating over the trunk and lower limb, Homer's syndrome, and so on.

Correspondence to: T. S. Lin

Patients and Methods

From January 1998 to June 2000, we collected a total of 28 patients with CFH undergoing NTSBBC. They included 15 men and 13 women with a mean age of 39.2 years (range, 19–50).

For treatment, all patients were placed in a semisitting position with abduction of both arms under single-lumen intubated anesthesia. We then clipped the lower third of the stellate ganglion at the second intercostal space (Fig. 1). Throughout the procedure, the patients were ventilated with 100% inspired oxygen and anesthetized with propofol (Diprivan).

Two ports were used. First, a 2-mm incision was created along the anterior axillary line at the fifth intercostal space for the introduction of a 2-mm 0° thoracoscope (Auto Suture, Tyco, USSC, Norwalk, CT, USA) through an obtuse head trocar. Another 8-mm incision was made at the third intercostal space in the midaxillary line for insertion of a diathermy hook dissector and an endo clip applier. When the patients are placed in a semisitting position, the lungs are displaced downward by gravity. Usually, the operative field from the first to the fifth rib can be visualized easily via temporary disconnection of the patient's endotracheal tube from the ventilator by the anesthesiologist. During NTSBBC, a pulse oximeter monitor is necessary to prevent hypoxemia. When peripheral arterial oxygen saturation SaO_2 oxygenation decreases to 92%, the lung should be reinflated by the anesthesiologist to avoid hypoxemia.

Next, the lower third of the stellate ganglion was blocked by clipping without transecting the sympathetic trunk. We prefer to use an M Disposable Clip Applier with 20 medium titanium clips (Auto Suture) so that a constant compression force can be maintained even if the nerve trunk atrophies during the compression. A single port below each axilla is enough to allow a reverse operation with removal of the clips to be performed in cases where the patients cannot tolerate postoperative compensatory sweating or other complications. After adequate sympathetic blocking, the lung was reinflated under visual control. It is important to have the anesthesiologist exert continuous positive pressure for a few seconds to prevent pneumothorax and possible incomplete expansion of the lung before the skin is closed. No thoracic drains were needed.

A routine chest radiograph was checked postoperatively to rule out hemopneumothorax or segmental atelectasis of the lung. All operations were performed on an outpatients basis. For follow-up, questionnaires were sent to all patients.

Results

The NTSBBC was generally carried out within 20 min (range, 15–30). Successful bilateral sympathetic blocks were achieved in all patients. All patients were discharged within 4 h after the operation. The mean postoperative follow-up period was 25.3 months (range, 12–41). The postoperative results were satisfactory, and all patients obtained improvement of sweating on the head and face without recurrence. The degree of improvement in craniofacial hyperhidrosis were differentiated into the following four categories: (a) no sweating in 22 patients (78.6%), (b) markedly decreased sweating in six patients (21.4%), (c) mildly decreased sweating: in no patients, (d) no change in no patients. Twenty-five patients (85.7%) developed compensatory sweating of the trunk and lower limb, six patients (21.4%) on the axillae, 22 patients (78.6%) on the back, 18 patients (64.7%) lower chest and abdomen, 21 patients (75%) on the lower limbs, and one patient (3.6%) on the sole. One patient (3.6%) was more embarrassed by the compensatory sweating than the original form of craniofacial hyperhidrosis, so he underwent a reverse operation 12 days after the first procedure. He obtained improvement of his troublesome compensatory sweating and the original sweating on his face returned ~ 18 days after removal of the endo clips. Overall, 27 patients (96.4%) achieved satisfactory results following NTSBBC. Neither transient nor permanent Homer's syndrome occured in any patient.

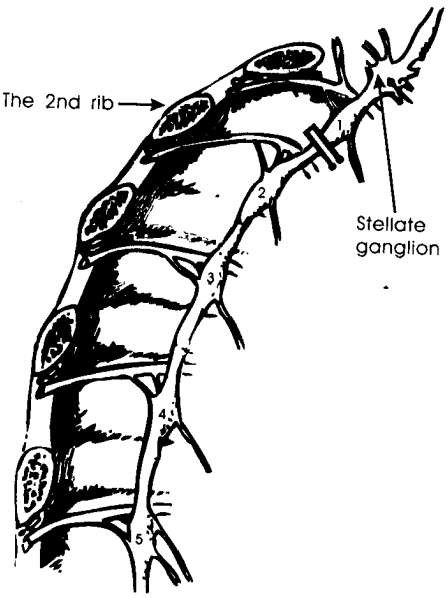

Fig. 1. Clipping the lower third of the stellate ganglion at the second intercostal space.

Discussion

CFH is one of the common cardial symptoms of social phobia and has a strong negative impact on quality of life. ETS is a well-established treatment of choice for CFH [2, 4, 9]. Drott et al. have advocated that ablation of the second and third thoracic sympathetic ganglia for palmar hyperhidrosis, ablation of the fourth thoracic sympathetic ganglion for axillary hyperhidrosis, and ablation of the lower part of the stellate ganglion for cases with facial involvement [2]. In addition, Yilmaz et al. performed transection of the lower third of the stellate ganglion to treat facial blushing [14]. We have treated patients with CFH successfully by performing a sympathectomy of the lower third of the stellate ganglion at the second rib bed [9]. All of the aforementioned reports imply that ablation of the lower part of the stellate ganglion will improve craniofacial hyperhidrosis [2, 9, 11, 14]. However, compensatory sweating is still a common complication that develops in ~47–98% of patients after ETS [1–5, 7–15]. In our current serires, 85.7% of patients developed compensatory hyperhidrosis after NTSBBC. The exact mechanism of this complication is still not clear. It may be a thermoregulatory response. Despite its high incidence, there is no effective way to avoid it [6, 8].

In an animal experiment performed in 1944, Denny-Brown and Brenner showed that a compression force of >44 g to a nerve fiber for >2 weeks would cause failure of the conduction of nerve impulses, with varying degrees of loss of the myelin sheaths [6]. We applied this concept to a thoracoscopical procedure that clips the lower third of the stellate ganglion at the second space using endo clips, which could exert a compression force of ~150 g. From 1994 to 1998, we used an 8-mm thoracoscope (Karl Storz, Tutlingen Germany) to perform ETS with a one-port method for patients with palmar, axillary, and craniofacial hyperhidrosis. Beginning in June 1997, we switched from the one-port ETS method to two-port NTSBBC to address the troublesome compensatory sweating that so often develops after the resolution of primary hyperhidrosis [8]. Lin et al. performed a thoracoscopic clipping of the T2 sympathetic ganglion to treat 326 patients with palmar hyperhidrosis. Five of these patients requested a reverse operation because they could not tolerate the compensatory sweating, and four of them obtained recovery in 6 days to 2 months after removal of the endo clips [6]. Although the incidence of postoperative compensatory sweating following NTSBBC is similar to that of ETS NTSBBC allows the patient the opportunity to improve his or her compensatory sweating via removal of the endo clips.

Basically, we can accomplish ETS for patients with primary hyperhidrosis using only one port, but two ports are needed for NTSBBC. One of incisions was made at the anterior axillary line at the fifth intercostal space, which is near the breast in female patients. Many people worry about the cosmetic outcome of NTSBBC. Therefore, we use a 2-mm scope inserted through a 2-mm incision, which improves the cosmetic results. Children and girls of small stature may have more narrow intercostal spaces; hence, NTSBBC is also a good option for these patients.

In a study involving 17 adult cadavers, Chiou and Liao classified the relationship between the T2 ganglion and the third rib into three types. In most cases, they found that the upper margin of the T2 ganglion was at the second intercostal space near the upper border of the third rib [1]. In addition, the lower end of stellate ganglion is located at the second intercostal space near the lower margin of the second rib. Thus, nerve conduction can be interrupted from the lower third of the stellate ganglion to the head and face by NTSBBC or ETS at the level of the second intercostal space or second rib bed.

The second rib lies beneath the first intercostal muscle, which is the best landmark for identifying the second rib, the second intercostal space, and the lower third of the stellate ganglion. Under video assistance, the parietal pleura along the upper thoracic sympathetic trunk at the second intercostal space is opened with the hooked diathermy probe [6]. With NTSBBC via the two-port method, it becomes technically feasible to mobilize and elevate the sympathetic trunk from the neighboring tissue by using a hooked diathermy probe through the working channel of an 8-mm thoracoscope. But it is impossible to mobilize the sympathetic trunk from the neighboring soft tissue for placement of the endo clips on the sympathetic trunk in front of the second rib when a 2-mm thoracoscope is used for NTSBBC via the two-port method. We could accomplish the mobilization and elevation of the sympathetic trunk from the second rib if we used a 2-mm thoracoscope in triple-port incisions, but this method would not yield a better cosmetic effect than the two-port method. In this series, we used a 2-mm endoscope to perform a sympathetic block by clipping the lower third of stellate ganglion without transection of the sympathetic trunk at the second intercostal space via a two-port method. Usually, we do not need to mobilize the stellate ganglion or any segment of the sympathetic trunk at the level of second intercostal space and find it sufficient to directly clip the sympathetic trunk.

NTSBBC offers provide the possibility of restoring the patients previous condition (CFH) and eliminating the more onerous condition that arises from compensatory reverse sweating, because the operation can be reversed via removal of the endo clips. The incidence of Homer's syndrome after ETS has been reported to range from 0 to 3.3% [6, 8, 9]. Possible causes of Horner's syndrome include an anatomic variation of the stellate ganglion and an electric current relayed to the stellate ganglion. The caudal third of the stellate ganglion is usually visible in the dome of the pleural cavity and can be approached selectively, whereas the upper two-thirds of the stellate ganglion are not accessible by the endoscopic method. The removal of the lower part of the stellate ganglion does not result in Horner's syndrome [2, 4, 9, 11, 14]. In our series, neither transient nor permanent Horner's syndrome could occur because we clipped only the lower third of the stellate ganglion at the second intercostal space. Even when Horner's syndrome occurs after NTSBBC due to inadvertent damage to the upper two-thirds of the stellate ganglion, it can be ameliorated by a reverse operation. In our experience, there is no sloughing of the endo clips after the clipping method. Another benefit of sympathetic block by clipping is that it is safer than ETS in patients where the sympathetic trunk is close to a vessel [8, 10]. In addition, it obviates the induction of cardiac arrhythmia by electric stimulation from the diathermy probe because no electrocautery is ever applied to the sympathetic trunk itself [5, 6, 8].

We regret that we are unable to provide definite data on the force required to block nerve conduction without causing permanent nerve damage. However, Lin et al. have proposed a possible mechanism for nerve regeneration after the reverse operation and described the nerve conduction that could be expected if the reverse operation were performed within 2 weeks after the first thoracic sympathetic clipping [6]. Further data on the clipping force, the durability of the conduction block, the duration of reversibility, as well as the incidence of recovery when reverse operations are performed >14 days after NTSBBC are still needed and could be realized by further human and animal studies in the near future.

In conclusion, needlescopic thoracic sympathetic block by clipping is a safe and effective method for the

treatment of patients with distressing craniofacial hyperhidrosis. Both single-lumen intubated anesthesia and a semisitting position are recommended during operation. Troublesome postoperative compensatory sweating may be improved after reverse operation.

References

1. Chiou TSM, Liao KK (1996) Orientation landmarks of endoscopic transaxillary T-2 sympathectomy for palmar hyperhidrosis. J Neurosurg 85: 310–315
2. Drott C, Göthberg G, Claes G (1995) Endoscopic transthoracic sympathectomy: an efficient and safe method for the treatment of hyperhidrosis. J Am Acad Dermatol 33: 78–81
3. Goh PM, Cheah WK, De Costa M, Sim EK (2000) Needlescopic thoracic sympathectomy: treatment for palmar hyperhidrosis. Ann Thorac Surg 70: 240–242
4. Kao MC, Chen YL, Lin JY, Hsieh CS, Tsai JC (1996) Endoscopic sympathectomy treatment for craniofacial hyperhidrosis. Arch Surg 131: 1091–1096
5. Lin CC, Mo LR, Hwang MH (1994) Intraoperative cardiac arrest: a rare complication of T2, 3-sympathectomy for treatment of hyperhidrosis plamaris. Eur J Surg (Suppl) 572: 43–45
6. Lin CC, Mo LR, Lee LS, Ng SM, Hwang MH (1998) Thoracoscopic T2–sympathetic block by clipping — a better and reversible operation for treatment of hyperhidrosis palmaris: experience with 326 cases. Eur J Surg 164: 13–16
7. Lin TS (1999) Transthoracic endoscopic sympathectomy for palmar hyperhidrosis in children and adolescents. J Laparoendosc Adv Surg Techn 9: 327–330
8. Lin TS (2001) Video-assisted thoracoscopic T2 sympathetic block by clipping for palmar hyperhidrosis (analysis of 52 cases). J Laparoendosc Adv Surg Techn 11: 59–62
9. Lin TS, Fang HY (2000) Transthoracic endoscopic sympathectomy for craniofacial hyperhidrosis: analysis of 46 cases. J Laparoendosc Surg 10: 243–247
10. Lin TS, Fang CY, Wu CY (2000) Repeat transthoracic endoscopic sympathectomy for palmar and axillary hyperhidrosis. Surg Endosc 14: 134–136
11. Rex LO, Drott C, Claes G, Göthberg G, Dalman P (1998) The Borås experience of endoscopic thoracic sympathicotomy for palmar, axillary, facial hyperhidrosis and facial blushing. Eur J Surg 580: 23–26
12. Shachor D, Jedeikin R, Olsfanger D, Bendahan J, Sivak G, Freund U (1994) Endoscopic transthoracic sympathectomy in the treatment of primary hyperhidrosis — a review of 290 sympathectomies. Arch Surg 129: 241–244
13. Yamamoto H, Kanehira A, Kawamura M, Okada M, Ohkita Y (2000) Needlescopic surgery for palmar hyperhidrosis. J Thorac Cardiovasc Surg 120: 276–279
14. Yilmaz EN, Dur AH, Cuesta MA, Rauwerda JA (1996) Endoscopic versus transaxillary thoracic sympathectomy for primary axillary and palmar hyperhidrosis and/or facial blushing: 5-year experience. Eur J Cardiothorac Surg 10: 168–172
15. Yim AP, Liu HP, Lee TW, Wan S, Arifi AA (2000) Needlescopic video-assisted thoracic surgery for palmar hyperhidrosis. Eur J Cardiothorac Surg 17: 697–701