

T₃/T₄ Thoracic Sympathectomy and Compensatory Sweating in Treatment of Palmar Hyperhidrosis

ABSTRACT

Compensatory sweating (CS) is one of the most common postoperative complications after thoracic sympathectomy, sympathectomy or endoscopic sympathetic block (ESB) for palmar hyperhidrosis. This study was conducted to examine the relevance between CS and the sympathetic segment being transected in the surgical treatment of palmar hyperhidrosis, and thus to detect the potential mechanism of the occurrence of CS. The rates of occurrence and severity of CS are lowered with the lower sympathetic chain being transected

Keywords: thoracic sympathectomy, palmar hyperhidrosis, compensatory sweating

1. Introduction

Compensatory sweating (CS) is one of the most common postoperative complications after thoracic sympathectomy, sympathectomy or endoscopic sympathetic block (ESB) for palmar hyperhidrosis. Severe CS in some cases has an adverse effect on patients' quality of life, but the exact mechanism of this complication is not clear. This randomized prospective study was designed to investigate the correlation between the sympathetic transection level and postoperative CS in patients with palmar hyperhidrosis. One hundred and sixty-three patients with palmar hyperhidrosis treated from October 2004 to June 2006 were randomly divided into two groups: intercostal video-mediastinoscopic thoracic sympathectomy at T₃ level in 78 patients and at T₄ level in 85 patients..

2. Methods

Of the 163 patients, 96 were male and 67 were female, the age of the patients was from 14 to 52 years with a median of 28.3 years. All patients had excessive sweating in hands as the chief complaint. The severity of sweating was graded into mild, moderate and severe levels. Systemic or secondary hyperhidrosis was excluded before randomization. ECG and chest X-ray examination were performed routinely. The basic data of T₃ (78 patients) and T₄ (85) groups are shown in Table 1.

2.1. Anesthesia

The procedure was performed under single-lumen intubated general anesthesia, by which a low volume ventilation or block of ventilation for 2–3 minutes was taken to collapse the lung lobe, then the thoracic sympathetic trunk could be clearly identified in parallel to the vertebral column. Saturation of blood oxygen (SO₂) was carefully monitored during the operation. After re-ventilation when SO₂ was less than 0.80, the operation was paused until SO₂ reached the normal level.

2.2. Intercostal Video-mediastinoscopic Sympathectomy

A 2.0–2.5 cm incision was made between the second and third rib at armpit, then a video-mediastinoscope was inserted into the thoracic cavity to identify the T₃ sympathetic ganglion by inspection and palpation. Normally, the rib that can be seen at the top of the cavity is the second, and the first rib is often covered by surrounding fat tissue. Then an electrocautery hook was inserted to isolate and cut the sympathetic chain at the level of T₃ or T₄ according to preoperative randomization. An ablation area around the cutting site of the sympathetic chain was extended with a range of 2 cm along the rib to destroy the nerve fibers of Kuntz completely. Video-mediastinoscope was removed at the end of the procedure, and the

suction tube was aspirated while the lung was reinflated and continuous positive pressure was exerted for a few seconds. Then the suction tube was removed quickly and the incisions were closed with absorbable suture. No closed chest drainage was performed. Chest X-ray and ECG were performed on day 1 after the operation^{1,2}.

2.3. Statistical Analysis

The chi-square test and radit analysis were used in analyzing the result through statistical software SPSS 11.0 for Windows. A *P* value less than 0.05 was considered statistically significant.

3. Results

3.1. Operative Results

There was no conversion to open techniques. Neither perioperative mortality nor serious complications such as cardiac arrhythmia or arrest were observed during the operation. The median duration of the operation was 30 minutes (range, 20 to 40 minutes). Palmar hyperhidrosis was cured in all patients shortly after sympathicotomy with warm and dry hands, and the temperature at the palm increased by 1.5–3°C compared with that before sympathectomy. No bradycardia or Horner's syndrome was encountered. Hospital stay for all patients ranged from 1 to 2 days. All patients resumed their normal life and work within 2 weeks after discharge from the hospital.

3.2. Follow-up

Phone-call or letter follow-up were available for 163 patients after sympathicotomy, 8 of them lost contact. The period of follow-up lasted for 3–24 months. The mean duration was 13.8 ± 6.2 months. No recurrence of palmar hyperhidrosis was observed. Information of postoperative sweating over the body was collected for analysis. The severity of CS was classified into three levels according to the definition described in the literature³: mild: a little more sweating than before, no influence on normal daily activities; moderate: more sweating than before, a mild influence on normal daily activities, which embarrasses the patient; severe: obvious sweating with severe influence on normal daily activities, which makes the patient regret for receiving sympathicotomy.

3.3. CS

CS with different severity occurred immediately or at day 1 after sympathicotomy (Table 2). The most common sites of CS included the back and chest. The uncommon sites included the waist buttock, and thigh. CS occurred not more common in patients with T₄ sympa-

thicotomy than in those with T₃ sympathicotomy ($P < 0.05$). No severe CS was seen in all patients. Mild CS was not significantly different between T₄ and T₃ sympathicotomy group ($P > 0.05$), but less moderate CS occurred in patients with T₄ sympathicotomy than in T₃ patients ($P < 0.05$).

4. Discussion

CS is a phenomenon of a greater amount of sweating elsewhere in the body after treatment for hyperhidrosis^{4,5}. It has an effect on patients' satisfaction to the surgery.

4.1. Mechanism of CS

Up to the present, the mechanism of CS after sympathicotomy remains poorly understood, and there is no acceptable explanation for it. The concept of "compensation" described in the 1970s indicates that a greater amount of sweating elsewhere in the body compensates for the lack of sweating in the treated body area in order to maintain sweating balance of the whole body^{6,7}. However, recent data are conflicting with this theory. One is that there is no CS after the treatment with botulinum toxin for palmar hyperhidrosis⁸.

Although the exact mechanism is still unknown, the occurrence of CS is believed to be a result of disturbance of the sympathetic system after surgery. After comparing different surgical approaches for hyperhidrosis, Lin et al⁹ concluded that destruction of the nerve reflex arch between the sympathetic trunk and hypothalamus is responsible for excessive sweating elsewhere in the body after sympathicotomy. It's a disorder of imbalanced regulation of sweating of the body. They suggested that preservation of the negative afferent tone to the hypothalamus be the key technique for the prevention of postoperative CS. This hypothesis is so far the most satisfactory explanation for CS after sympathicotomy and is already verified by other clinical studies.

4.2. Influence of CS on Human Body

Patients' lifestyle with CS will not be affected³. Only after repeat enquiries many patients may complain of more sweating elsewhere in their body after surgery, without effect on their normal life. This condition is called mild CS (minor), normally consisting of the majority of cases with CS. In the present study, the mild CS accounted for 47.4% in T₃ group and 37.6% in T₄ group respectively. In some patients excessive sweating occurs at some new sites of the body after surgery and the new hyperhidrosis has an adverse effect on patients' lifestyle. This condition is so called compensatory hyperhidrosis, with which the patient has a decreased but acceptable satisfaction to the procedure. This kind of CS is classi-

Table 2. CS after T₃/T₄ sympathectomy

| Group | n | CS | | | | | |
|----------------|----|--------|------|-------|------|----------|------|
| | | No | | Mild | | Moderate | |
| | | n | % | n | % | n | % |
| T ₃ | 78 | 23 | 29.5 | 37 | 47.4 | 18 | 23.1 |
| T ₄ | 85 | 47 | 55.3 | 32 | 37.6 | 6 | 7.1 |
| χ^2 value | | 11.056 | | 1.597 | | 8.312 | |
| P value | | 0.001 | | 0.206 | | 0.004 | |

fied as moderately severe. In the present study the moderate CS accounted for 23.1% in T₃ group and 7.1 % in T₄ group respectively. In a few cases, unfortunately, severe excessive sweating occurs elsewhere in the body, making the patient feel anguished and embarrassed, even regret for having the sympathectomy done. This condition is called severe CS. No a single case of severe CS was found in the present study.

4.3. Correlation Between CS and the Level of Thoracic Sympathectomy

The correlation between CS and surgical approaches, particularly the level of thoracic sympathetic chain transection is a hot topic for investigation in this field in recent years. According to the anatomy and physiology of the upper thoracic sympathetic chain, limiting destruction area or lowering the transection level of the sympathetic chain will result in a localized desympathectomy, which would be a theoretical basis for the prevention of CS^{10,11}. This hypothesis is supported by clinical findings^{12,13}. For example, a comparative analysis by Yoon et al^{14,15} showed that CS after T₃ sympathectomy (16.73%) was significantly less than that after T₂-T₃ sympathectomy (45.8%), but with almost the equal therapeutic rate of 100% for palmar hyperhidrosis under the two procedures. Comparison of T₂-T₄ sympathectomy with T₄ sympathetic clipping for the treatment of palmar hyperhidrosis¹⁶ showed that T₄ sympathetic clipping resulted in a significantly less CS but an equal therapeutic effect on hyperhidrosis. At present more and more surgeons agree that the preservation of T₂ ganglion and sympathetic segment above can lead to a major reduction of CS, particularly embarrassing and disabling CS, which is also supported by the results of the present study^{17,18}.

Whether lowering sympathetic transection level from T₃ down to T₃ can reduce further CS or not is worth investigating since there is no randomized clinical trial

about it. The results of the present randomized clinical trial showed that the incidence of moderate CS was significantly lower in T₄ sympathectomy group than in T₃ group ($P < 0.05$), although there was a similar incidence of mild CS in the two groups ($P > 0.05$). This finding indicates that lowering the thoracic sympathetic transection level further can significantly reduce both incidence and severity of CS. Single T₄ sympathetic transection or clipping as a popular surgical procedure for palmar hyperhidrosis has been accepted by more and more surgeons^{19,20}.

In conclusion, these clinical findings are helpful to better understand dominant characteristics of the upper thoracic sympathetic chain and the exact mechanism of CS after sympathectomy although this side effect can not be avoided completely at the moment.

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