

T₄ SYMPATHECTOMY FOR PALMAR HYPERHIDROSIS: AN EFFECTIVE APPROACH THAT SIMULTANEOUSLY MINIMIZES COMPENSATORY HYPERHIDROSIS

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Compensatory hyperhidrosis (CH) is the most troublesome side effect after T₂ sympathectomy for palmar hyperhidrosis (PH). The aim of this study was to evaluate whether T₄ ganglion interruption for PH is an effective approach that can simultaneously minimize the rate of CH. Between July 2001 and July 2003, 84 PH patients undergoing bilateral thoracoscopic T₄ sympathectomy were followed up in the outpatient clinic and by telephone questionnaire. Rates of success, regret, CH, recurrence, and complications were recorded. The follow-up period ranged from 18 to 42 months. All excessive hand sweating was stopped. Only two patients had mild CH that did not affect their daily activities. No patients had recurrence or regret. The only other complication was that four patients had postoperative minimal residual pneumothorax, which needed no treatment. All patients were satisfied with the outcome. T₄ sympathectomy was an effective method to cure PH. The success rate was 100%. The rate of CH was remarkably low compared with T₂ sympathetic ganglionic interruption.

Key Words: hyperhidrosis, sympathectomy
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Palmar hyperhidrosis (PH) is a benign sympathetic disorder. It does not threaten health but affects daily activities, especially using electronic equipment and computers. In addition, social activities are seriously affected, leading to social withdrawal and even depression.

Sympathectomy is the currently recognized best method of treatment [1-3]. However, compensatory hyperhidrosis (CH) is a troublesome side effect that occurs in 30-70% of patients after T₂ or T₂₋₃ sympathectomy [4].

In 2001, Lin and Talaranta introduced the classification of sympathetic disorders according to segmental distribution of sympathetic innervation [5]. We performed sympathectomy for PH following the modified Lin-Talaranta

classification (Table). This study retrospectively reviewed patients with PH who had undergone thoracoscopic T₄ sympathectomy (ETS₄), to see whether the approach was effective and would minimize the rate of CH with low complication and regret rates.

MATERIALS AND METHODS

Between July 2001 and July 2003, patients with PH underwent ETS₄ following the Lin-Talaranta classification. They insisted on the cutting method (ETS) instead of the clipping method [6], although they were all informed of the possible problem of CH and its irreversibility if the nerve was cut. The only request of these patients was to stop palmar sweating; all other possible complications were of no concern. An important reason for patients to choose ETS was that they had absolutely no desire to undergo a second operation (reverse procedure) [6], even if the side effects were severe.

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Table. New Lin-Telaranta classification

	Sympathetic disorders	Procedure
Group 1	Facial blushing, vibration disorder	ESB ₂
Group 2	Facial sweating, facial sweating with blushing	ESB ₃
Group 3	Palmar sweating	ESB ₄
Group 4	Axillary sweating (bromidrosis)	ESB ₅

ESB = Endoscopic sympathetic block by clamping.

All patients underwent surgery on the day after admission and were discharged uneventfully after the operation. They were followed up in the outpatient clinic and by telephone questionnaire to determine the following: success, severity of CH, any regrets, other complications (e.g. Horner's syndrome, gustatory sweating), degree of satisfaction, and recurrence.

Endoscopic thoracic sympathectomy

The procedure was performed under general anesthesia, with single lumen tracheal intubation. Either two 5-mm ports or a single-port approach was used. For the former method, one port at the axillar and one at the mid-axillary line at the level of the nipple were inserted. For the latter method, a 10-mm port was inserted at the third intercostal space over the mid-axillary line. Through thoracoscopy (Karl Storz GmbH & Co, Tuttlingen, Germany), the sympathetic trunk was cut at the upper and lower end of the T₄ ganglion. The ports were removed after the lung was fully expanded. No stitches were required for the 5-mm port, while one or two stitches were necessary for the 10-mm port. A postoperative chest radiography was performed routinely.

RESULTS

Of the 84 patients, 36 were male and 48 were female, with ages ranging from 17 to 28 years. The follow-up period was 18–42 months. All excessive sweating was successfully stopped, as expected. Almost all patients had anterior chest or back pain but this subsided over 1–2 days. Four patients had minimal residual pneumothorax that resolved without treatment. No recurrence, Horner's syndrome, or gustatory sweating was noted. Only two patients had very mild CH over the back and both thighs. However, they found it acceptable. All patients were satisfied with the outcome of surgery and had no regrets about the operation.

DISCUSSION

Sweating is influenced by two factors, emotional stimulation (central control) and environmental temperature (peripheral control). Palm, axillary, plantar, and facial hyperhidrosis are emotionally induced and are not related to environmental temperature. Although it is a benign disorder and does not affect health, daily and social activities are affected. Therefore, a cure is usually desired.

Thoracoscopic sympathectomy is currently recognized as the best method of treatment for PH. Most surgeons still perform T₂ or T₂₋₃ sympathectomy, which is advocated in the textbook *General Thoracic Surgery* [7]. The rate of CH is incredibly high (about 70%). In our series, in which T₄ was the target ganglion, the rate of CH was only 2/84 (2.4%) and the severity was mild and completely acceptable to patients. In 2004, Neumayer et al [8], and in 2003, Choi et al [9], reported their series of T₄ sympathetic block for PH. The success rate was 100% and the CH rates were 8% and 3%, respectively. These discrepancies, although small, may be due to differences in the definition and assessment of symptom severity. Neumayer et al stated that there is no clear criterion to evaluate CH [8]. It is also difficult to say whether the sympathectomy is successful. These can only be assessed subjectively by patients.

In 1996, Bonjer et al [10], and in 2001, Riet et al [11], reported T₃ sympathectomy (ETS₃) for PH. The rate of CH was between those of T₂ and T₄ sympathectomy. ETS₂ causes most severe CH, ETS₃ causes less, and ETS₄ causes the least.

To explain this phenomenon, we have to review the neuroanatomy of the sympathetic nervous system. The sympathetic nervous fibers originate from the intermediolateral horns of the spinal cord between T₁ and L₂. Each pathway consists of pre- and post-ganglionic neurons. The nerve fibers distributing to the sweat glands are post-ganglionic fibers arising from the ganglia in the sympathetic trunks. These fibers then go through the grey ramus communicans and come together with the corresponding spinal nerves in the target organ. In the sympathetic trunks, ganglia may go upward and downward before leaving and distributing to the target organ. Therefore, distributions will overlap and are not necessarily to the same part of the body from the same spinal segment. The efferent fibers are accompanied by afferent fibers. The autonomic nervous system functions through positive and negative feedback mechanisms [12]. Nervous impulses from the target organs (e.g. sweat glands) are transmitted as afferent negative feedback signals to the central control center (hypothalamus), from where the efferent positive feedback signals return to

the target organ. This feedback mechanism and the neuroanatomy of the sympathetic nerve mean that T₂ interruption stops most of the negative feedback signals to the central nervous system. Therefore, the efferent positive feedback signals to the sweat gland are strong and most severe CH results. CH always occurs on the lower abdomen, back and thighs and never on the upper body or face because the nerve has already been blocked. T₃ ganglionic interruption stops fewer afferent negative feedback signals so that efferent positive feedback signals are weaker and CH is less severe. T₄ interruption causes least or almost no CH because most of the afferent negative feedback signals are preserved. CH occurs in 30–70% of patients after T₂ [4], 16.7–25% after T₃ [13,14] and 3–8% after T₄ sympathetic block [8,9].

Therefore, the changing pattern of excessive sweating is not really compensation, but only a reflex response. Some other facts in clinical practice support our philosophy: excessive sweating can be induced after sympathectomy for non-sweating sympathetic disorders such as T₂ sympathetic block for pure facial blushing; and no CH is found after lumbar sympathectomy for plantar hyperhidrosis.

According to previous studies [4,6,9], the higher the level of ganglionic blockade (e.g. T₂, T₃), the greater the regret rate. Therefore, detailed preoperative information on the possibility of side effects is important.

In conclusion, T₄ sympathectomy is an effective method for treating PH. The success rate is 100% and there is no recurrence. Most importantly, the rate of CH is reduced to a minimum.

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第四交感神經節切除術 — 治療手汗症及避免代償性出汗

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胸腔內視鏡交感神經手術是目前國際公認用來治療多汗症的最好方法。然而迄今國內、外大部份的醫師仍繼續使用第二或第三交感神經切除術來治療手汗症，結果是造成相當嚴重的轉移性或代償性的流汗，患者不勝困擾。本文作者依據林氏交感神經疾病分類法，以第四交感神經切除術來治療 84 位手心多汗症患者，追蹤 18 至 42 個月後，其成功率達 100%，並無復發。其中只有 2 位患者有輕微而且完全可接受的代償性多汗。所以，所有病人對手術的結果都非常滿意。第四交感神經手術用來治療手心多汗症不只有效，其術後之代償性多汗之發生率亦可降至最低。使患者能正常工作及享受與常人一般的社交活動。本文除報導 84 位患者之手術結果外，第四與第二及三交感神經手術之差異及機轉，亦一併討論之。

關鍵詞：交感神經手術，多汗症
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