

Original article

Comparison of compensatory sweating and quality of life following thoracic sympathetic block for palmar hyperhidrosis: electrocautery hook versus titanium clip

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Keywords: *compensatory sweating; quality of life; thoracic sympathetic block; palmar hyperhidrosis*

Background Video-assisted thoracic sympathetic block is an effective, safe, and minimally invasive method for treatment of primary hyperhidrosis. The purpose of this study was to decide which one of using electrocautery hook and titanium clip is the appropriate procedure for primary palmar hyperhidrosis by assessing the compensatory sweating (CS) and quality of life (QOL) of patients after sympathetic block.

Methods Between October 2007 to August 2010, 120 patients with primary palmar hyperhidrosis were randomly divided into two groups, electrocautery hook group (60 patients) and titanium clip group (60 patients). All patients were treated by sympathetic block at T4 level. The CS was graded based on severity and location; the QOL was classified to 5 different levels based upon the summed total scores (range from 20 to 100) before and after surgery. The variables were compared.

Results The postoperative follow-up period was 2 months. All patients were cured. Three patients in electrocautery hook group and 1 patient in titanium clip group had a unilateral pneumothorax on chest X-ray, but none of them was necessary to have chest drainage. Neither perioperative mortality nor serious complications such as cardiac arrhythmia or arrest were observed during the operation. No bradycardia or Horner's syndrome occurred. CS was not more common in patients in titanium clip group than in those in electrocautery hook group ($P=0.001$). Moderate and severe CS was few in all patients, and there was no significant difference between two groups ($P=0.193$). Most of the patients feel a notable improvement of the the QOL; nevertheless, there was no significant difference between the groups ($P=0.588$).

Conclusions Both electrocautery hook and titanium clip used for sympathetic block at the T4 level are effective, safe, and minimally invasive for palmar hyperhidrosis. Because of the lower severity of CS and the similar improvements in the QOL after operation, we prefer to use of titanium clip for treating palmar hyperhidrosis.

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Palmar hyperhidrosis is a disease characterized by excessive sweating of the hands, with higher prevalence from 18 to 54 years. The prevalence rate of primary palmar hyperhidrosis was 4.36%. It is especially prevalent in adolescents of southeast China.¹ The related results indicated that sympathetic block was a safe and minimally invasive method for treatment of primary hyperhidrosis.^{2,3} With the development of outlook, the focus of initial studies has changed from the elimination of sudoresis to the elevation of quality of life (QOL) after operation.⁴ The aim of this study was to determine the electrocautery hook or titanium clip as an appropriate procedure for primary palmar hyperhidrosis by comparing the compensatory sweating (CS) and QOL.

METHODS

Patients

This was a prospective randomized study. From October 2007 to January 2010, 120 patients who suffered from palmar hyperhidrosis were treated by sympathetic block at T4 level in the Second Affiliated Hospital of Soochow University. Random 60 cases were performed using electrocautery hook and the others were using titanium

clip. The treatment was conducted in accordance with the standards of the hospital's Ethical Committee. The clinical characteristics of patients are listed in Table 1. There was no significant difference between two groups in terms of age, gender, family history and follow-up time.

The chief complaint of these patients was excessive sweating in hands. Systemic or secondary hyperhidrosis was excluded. A preoperative chest X-ray was performed to exclude lung disease with pleural adhesions.

All patients underwent follow-up survey at preoperative time and postoperative two months. The CS was evaluated by a semi-objective criteria,⁵ taking into consideration of information obtained from the patient

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regarding the level of discomfort, influence on social, professional activities, and the need to change clothing, together with objective observations from examiner. The classification of CS is shown in Table 2.

Table 1. Clinical characteristics of patients in both groups

Characteristics	Electrocautery hook	Titanium clip	<i>P</i> values
No. of patients	60	60	–
Gender (male/female)	25/35	19/41	0.256
Age (years)	27.5±6.3	22.5±6.3	0.326
Family history (<i>n</i>)	18	21	0.559

Table 2. Classification of compensatory sweating

Classification	Feature
No CS	–
Mild	Notice sometimes in sweaty or non-sweaty sometimes
Moderate	Always aware but not troublesome or trouble but controlled by clothing
Severe	Causes embarrassment or regret having had ETS

Meanwhile, the patient's QOL was also studied by a questionnaire devised by de Campos et al,^{6,7} consisting of 22 questions scored as above in four domains: sweating symptoms, intimacy, emotional responses and special circumstances. QOL was classified to five different satisfaction levels based upon the summed total scores from the protocol (range from 20 to 100) before and after the surgery. A summed total score of greater than 84 before surgery indicated a very poor quality of life (from 69 to 84, poor; from 52 to 68, good; from 36 to 51, very good; and from 20 to 35, excellent). A summed total score of greater than 84 after surgery was considered much worse (from 69 to 84, a little worse; from 52 to 68, the same; from 36 to 51, a little better; and from 20 to 35, much better).^{7,8}

Surgical procedures

In both groups, the procedure was performed by the same surgical team under general anesthesia with double-lumen endotracheal intubation and selective one lung ventilation was used. The patient was placed on the operating table in a semi-sitting position with arms abducted more than 90°. Only one incision of 15 mm was made in the fourth intercostal space on the anterior axillary line.⁹ An 10 mm, 30-degree thoracoscope (Karl Storz GmbH & Co. Tuttlingen, Germany) and endoscopic instruments were inserted into the thoracic cavity through an obtuse-head trocar. With selective blockage of the lung ipsilateral to the operative side, lung was deflated; the sympathetic chain was identified by inspection and palpation running down over the necks of the ribs. At the level where crosses the neck of fourth rib, the sympathetic chain was treated by electrocautery hook or titanium clip. Basically, we only sectioned the sympathetic trunk; we did not remove any segment of the sympathetic nerve or ganglion. In addition, the Kuntz fiber around the T4 ganglia was transected. then, the thoracoscope and endoscopic instruments were removed. A catheter was inserted into the thoracic cavity, and the external end of the catheter was placed into a bowl of sterile water to create a water seal. After the lung reinflated and continuous positive

pressure was exerted for a few seconds, the catheter was removed quickly, then the incision was closed. No closed chest drainage was performed. The same procedure was performed on the contralateral side. Postoperatively, orally administered analgesics were adequate for pain control. Patients could move early and while most of them were discharged the next day.

Data collection

All patients answered the questionnaire in telephone interview. The mean postoperative follow-up was 2 months. The characteristics of patients, postoperative complications, degree of CS and QOL were included.

Statistical analysis

The chi-square test and independent-samples *t* test were used to analyze the results between two groups through SPSS 11.0 for Windows (SPSS Inc., IL, USA). A *P* value less than 0.05 was considered statistically significant.

RESULTS

All patients successfully underwent sympathetic block. Neither perioperative mortality nor serious complications such as cardiac arrhythmia and arrest were observed during the operation. Neither bradycardia nor Horner's syndrome was encountered. Three patients in electrocautery hook group and one in titanium clip group had a unilateral pneumothorax on chest X-ray, but none of them was necessary to have a chest drainage. The average duration of the operation was 39.5 minutes (range, 23 to 51 minutes). Palmar hyperhidrosis was cured in all patients, and the temperature in the palm increased by 1.5–3.0°C compared with that before surgery. The mean hospital stay was 1.3 days (range, 1 to 2 days). All patients resumed their normal life and work within 2 weeks after discharge from hospital. Two months' follow-up time were available for 112 patients after operation; 8 of them lost contact.

CS of different severity occurred immediately or at day 1 after surgery. CS often occurred in the back and chest, occasionally occurred in the waist buttock and thigh. CS occurred more common in patients in electrocautery hook group than those in titanium clip group ($P=0.001$). Moderate and severe CS was few in patients, there was no significant difference between two groups ($P=0.193$). Results are shown in Table 3.

Table 3. Compensatory sweating after surgery (*n* (%))

Severity	Electrocautery hook	Titanium clip	Total	<i>P</i> values
No	26 (47.2)	44 (77.2)	70 (62.5)	
Mild	16 (29.1)	5 (8.8)	21 (18.6)	0.001*
Moderate	10 (18.2)	6 (10.5)	16 (14.3)	0.193†
Severe	3 (5.5)	2 (3.5)	5 (4.5)	
Total	55	57	112	

*Comparison of mild, moderate and severe CS; †Comparison of moderate and severe CS.

The QOL before and after surgery is shown in Table 4. All patients presented with a poor QOL before the

treatment, most of the people bare “very poor” QOL (63.3%). No statistical difference was found between groups at this time point ($P=0.705$). In the interview performed after surgery, the QOL of most patients had improved, with no statistical difference between the groups ($P=0.588$).

Table 4. Quality of life before and after surgery (*n* (%))

Items	Electrocautery hook	Titanium clip	Total	<i>P</i> values
Before surgery (<i>n</i>)	60	60	120	0.705
Excellent	0	0	0	
Very good	0	0	0	
Good	0	0	0	
Poor	23 (38.3)	21 (35.0)	44 (36.7)	
Very poor	37 (61.7)	39 (65.0)	76 (63.3)	
After surgery (<i>n</i>)	55	57	112	0.588
Much better	28 (50.9)	33 (57.9)	61 (54.5)	
Better	11 (20.0)	10 (17.5)	21 (18.8)	
The same	5 (9.0)	6 (10.5)	11 (9.8)	
A little worse	6 (10.9)	4 (7.0)	10 (8.9)	
Much worse	5 (9.1)	4 (7.0)	9 (8.0)	

DISCUSSION

Palmar hyperhidrosis is a socially embarrassing and functionally incapacitating condition. The first sympathectomy for treatment of hyperhidrosis was performed in 1920. The minimally invasive approach to the sympathetic trunk started in 1942,¹⁰ with local anesthesia, in semi-sitting position, with two entry portals. Recently, with the advances in video endoscopic technology, it had replaced open surgery, because of shorter hospital stay and recovery time, lower morbidity rates, less pain, and better cosmetic results.¹¹⁻¹³

Sympathetic is a kind of peripheral nerve composed of visceral motor fiber and sensory fiber. The visceral motor fiber controls the function of perspiration. In addition, it is more easily damaged by pressure. Denny-Brown et al¹⁴ confirmed that the pressure generated by the clip is high enough to block transmission of the sympathetic impulses. Moreover, video-assisted thoracic sympathetic block is a slightly modified version in which the sympathetic chain is interrupted instead of destroying the ganglia.¹⁵ For this reason, we select titanium clip to block up the redundant transmission of the sympathetic impulses, thus to treat the palmar hyperhidrosis.

Compared with T2 and T3 level sympathetic block, it seemed that sympathetic block at the T4 levels was a more effective approach, which could minimize postoperative complications, including palmar over dryness, presence of CS, and regions of CS. It considers that T4 level is now the level most indicated for treating palmar hyperhidrosis.^{16,17} In our study, palmar hyperhidrosis was cured in all patients shortly after surgery with warm and dry hands. Moderate and severe CS was seen only in 18.8% of all patients.

CS is the most common complication of video-assisted thoracic sympathetic block, and its incidence ranged from

60% to 90% in previous studies.¹⁸⁻²⁰ This variability likely reflects the heterogeneity of the patient populations, as well as the variability in surgical techniques. The onset of CS occurred within the first month after surgery; there was no change in the severity or extent of the CS during the follow-up period.²¹ At present, the exact mechanism of CS remains unclear; there is no consensus for the definition and classification of CS.^{7,22} It is debated whether or not the extent of a sympathetic resection leads to a higher or lower risk of this complication.²³ One of our main aims was to test which method for treatment of palmar hyperhidrosis can reduce the degree of CS: electrocautery hook or titanium clip? In our study, all of the patients came from the same outpatient clinic and were treated by the same surgical team following the same care except for the type of scalpel. No differences were seen between the groups in terms of age, gender, age and family history or resection level, and thus two homogenous groups of patients were formed. The surgical technique used by either electrocautery hook or titanium clip was standardized and concordant.

From the upper thoracic sympathetic chain anatomy perspective, reducing the range of nerve transaction or lower cut-off level of the chain segments are meant to pay the probation of a more localized, in theory may reduce the incidence of CS.²⁴ Because of the minor range of nerve transaction and less heat released, CS occurred not more common in patients with titanium clip group than in those with electrocautery hook group ($P=0.035$). Moderate and severe CS was few in all patients, not significantly different between two groups ($P=0.134$). Furthermore, because of no smoke and carbonization are produced when using titanium clip, the viewing of the surgical field was improved.

The evaluation of QOL in our study has been confirmed and used in several studies in the literatures that have focused on hyperhidrosis symptoms in different daily life situations and their influence on patients.²⁵ In both groups of our study, the preoperative QOL was poor, without any difference between the groups ($P=0.789$), and the predominance of “very poor” rating is 63.3%. After the operation, we observed a notable improvement in the QOL, 73.3% of patients feel better or much better, only 16.9% of patients feel little or much worse. Nevertheless, there was no statistical difference between the groups ($P=0.588$). It is well known that patients with palmar hyperhidrosis present with a poor QOL that is dependent on the intensity of the hyperhidrosis and on how well the patient adapts to his or her situation.²⁶ Some patients do not have very severe hyperhidrosis, but they may complain a very poor QOL, whereas other patients with severe hyperhidrosis may display with not-so-poor QOL if they have been accommodated it. The preoperative factors currently associated with a decrease in the QOL after the treatment of palmar hyperhidrosis are surgical failure, higher levels of ganglion resection.²⁷

Since the improvement in postoperative QOL has to be

confirmed in the study, the short follow-up time and the small number of patients bear the risk to bias the study results. Additionally, a more objective, overall, and precise research tool is needed to evaluate the QOL.

Our study provides a comparison of the CS and QOL among patients who underwent video-assisted thoracic sympathetic block for primary hyperhidrosis. Our results suggest that both electrocautery hook and titanium clip used for sympathetic block at the T4 levels provided adequate treatment for palmar hyperhidrosis. Because of the lower severity of CS and the similar improvements in the QOL after operation, we prefer to the use of titanium clip for treating palmar hyperhidrosis.

REFERENCES

- Li X, Chen R, Tu YR, Lin M, Lai FC, Li YP, et al. Epidemiological survey of primary palmar hyperhidrosis in adolescents. *Chin Med J* 2007; 120: 2215-2217.
- Fischel R, Cooper M, Kramer D. Microinvasive resectional sympathectomy using the harmonic scalpel. A more effective procedure with fewer side effects for treating essential hyperhidrosis of the hands, face or axillae. *Clin Auton Res* 2003; 13 (Suppl 1): 166-170.
- Wei X, Pan TC, Li J, Tang YX, Hu M, Chen T, et al. Needleoscopic thoracic sympathectomy for palmar hyperhidrosis. *Chin J Surg (Chin)* 2006; 44: 949-951.
- Lear W, Kessler E, Solish N, Glaser DA. An epidemiological study of hyperhidrosis. *Dermatol Surg* 2007; 33: S69-S75.
- Prasad A, Ali M, Kaul S. Endoscopic thoracic sympathectomy for primary palmar hyperhidrosis. *Surg Endosc* 2010; 24: 1952-1957.
- de Campos JR, Kauffman P, Werebe Ede C, Andrade Filho LO, Kusniek S, Wolosker N, et al. Quality of life, before and after thoracic sympathectomy: report on 378 operated patients. *Ann Thorac Surg* 2003; 76: 886-891.
- Yazbek G, Wolosker N, de Campos JR, Kauffman P, Ishy A, Puech-Leão P. Palmar hyperhidrosis--which is the best level of denervation using video-assisted thoracoscopic sympathectomy: T2 or T3 ganglion? *J Vasc Surg* 2005; 42: 281-285.
- Yazbek G, Wolosker N, Kauffman P, Campos JR, Puech-Leão P, Jatene FB. Twenty months of evolution following sympathectomy on patients with palmar hyperhidrosis: sympathectomy at T3 level is better than at the T2 level. *Clinics* 2009; 64: 743-749.
- Chen YB, Ye W, Yang WT, Shi L, Guo XF, Xu ZH, et al. Uniportal versus biportal video-assisted thoracoscopic sympathectomy for palmar hyperhidrosis. *Chin Med J* 2009; 122: 1525-1528.
- Kux M. Thoracic endoscopic sympathectomy in palmar and axillary hyperhidrosis. *Arch Surg* 1978; 113: 264-266.
- Ohta M, Ishikawa K. Minimally invasive surgery for primary hyperhidrosis. *Kyobu Geka* 2006; 59 (8 Suppl): 736-741.
- Hashmonai M, Kopelman D, Assalia A. The treatment of primary palmar hyperhidrosis: a review. *Surg Today* 2000; 30: 211-218.
- Tu YR, Li X, Lin M, Lai FC, Chen JF. Video-assisted thoracoscopic sympathectomy for the treatment of palmar hyperhidrosis in 588 cases. *Chin J Surg (Chin)* 2007; 45: 1527-1529.
- Denny-Brown D, Brenner C. Lesion in peripheral nerve resulting from compression by spring clip. *Arch Neurol Psychiatry* 1944; 52: 1.
- Eisenach JH, Atkinson JL, Fealey RD. Hyperhidrosis: evolving therapies for a well-established phenomenon. *Mayo Clin Proc* 2005; 80: 657-666.
- Montesi J, Almeida EP, Vieira JP, Abreu Mda M, Souza RL, Montesi OV. Video-assisted thoracic sympathectomy in the treatment of primary hyperhidrosis: a retrospective study of 521 cases comparing different levels of ablation. *J Bras Pneumol* 2007; 33: 248-254.
- Liu YG, Yang J, Wang J, Liu J, Li JF, Jiang GC, et al. A comparison of T3 sympathectomy versus T4 sympathectomy in the treatment of primary palmar hyperhidrosis. *Natl Med J China (Chin)* 2006; 86: 2318-2320.
- Dumont P, Denver A, Robin P. Long-term results of thoracoscopic sympathectomy for hyperhidrosis. *Ann Thorac Surg* 2004; 78: 1801-1807.
- Efthymiou CA, Thorpe JA. Compensatory hyperhidrosis: a consequence of truncal sympathectomy treated by video assisted application of botulinum toxin and reoperation. *Eur J Cardiothorac Surg* 2008; 33: 1157-1158.
- Sun GZ, Xu LH, Zhou B. The choice of thoracoscopic sympathectomy in the treatment of palmar hyperhidrosis among different procedures. *Natl Med J China (Chin)* 2010; 90: 2065-2067.
- Libson S, Kirshtein B, Mizrahi S, Lantsberg L. Evaluation of compensatory sweating after bilateral thoracoscopic sympathectomy for palmar hyperhidrosis. *Surg Laparosc Endosc Percutan Tech* 2007; 17: 511-513.
- Li X, Tu YR, Lin M, Lai FC, Chen JF, Dai ZJ. Endoscopic thoracic sympathectomy for palmar hyperhidrosis: a randomized control trial comparing T3 and T2-4 ablation. *Ann Thorac Surg* 2008; 85: 1747-1751.
- Efthymiou CA, Thorpe JA. Compensatory hyperhidrosis: a consequence of truncal sympathectomy treated by video assisted application of botulinum toxin and reoperation. *Eur J Cardiothorac Surg* 2008; 33: 1157-1158.
- Wang J, Liu YG, Liu J, Cui J, Zhao H, Zhou ZL, et al. Craniofacial hyperhidrosis treated by video-assisted thoracoscopic sympathectomy. *Chin J Surg (Chin)* 2005; 43: 631-634.
- Boley TM, Belanqee KN, Markwell S, Hazelrigg SR. The effect of thoracoscopic sympathectomy on quality of life and symptom management of hyperhidrosis. *J Am Coll Surg* 2007; 204: 435-438.
- Munia MA, Wolosker N, Kaufmann P, de Campos JR, Puech-Leão P. Sustained benefit lasting one year from T4 instead of T3-T4 sympathectomy for isolated axillary hyperhidrosis. *Clinics* 2008; 63: 771-774.
- Wolosker N, Munia MA, Kauffman P, de Campos JR, Yazbek G, Puech-Leão P. Is gender a predictive factor for satisfaction among patients undergoing sympathectomy to treat palmar hyperhidrosis? *Clini Sci* 2010; 65: 583-586.

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