

Complications in Patients with Palmar Hyperhidrosis Treated with Transthoracic Endoscopic Sympathectomy

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OBJECTIVE: To assess the complications in a group of patients with palmar hyperhidrosis treated with transthoracic endoscopic sympathectomy. The extraordinarily high incidence of postoperative compensatory hyperhidrosis in our series is stressed and explained.

METHODS: The retrospective study included chart reviews and outpatient assessments. Seventy-two patients underwent T2 or T2-T3 endoscopic sympathectomy for primary palmar hyperhidrosis. Patients' hyperhidrosis severity, precipitating factors, postoperative complications, surgical results, and satisfaction were assessed. Severity of palmar hyperhidrosis and compensatory hyperhidrosis was classified by two grading scales.

RESULTS: The success rate of sympathectomy was 93%. All patients except one suffered from compensatory sweating, which was the main cause of patients' dissatisfaction postoperatively. Seventeen percent of the patients (12 of 72 patients) experienced new symptoms of gustatory sweating (facial sweating associated with eating). Twenty-one patients experienced other complications, including pneumothorax, Horner's syndrome, nasal obstruction, and intercostal neuralgia.

CONCLUSION: Transthoracic endoscopic sympathectomy is an effective and simple modality to treat palmar hyperhidrosis. However, all patients need to be warned of the common complications, particularly compensatory hyperhidrosis, before surgery. (*Neurosurgery* 41:110-115, 1997)

Key words: Complications, Compensatory hyperhidrosis, Gustatory sweating, Palmar hyperhidrosis, Sympathectomy

Palmar hyperhidrosis (PH) is a common disorder that may interfere with functional activities for many patients (1, 13, 21). The symptoms of PH usually appear in early childhood or puberty. However, they may persist through adult life and cause a long-term problem. Treatment of PH includes variable surgical and medical procedures. Transthoracic endoscopic sympathectomy (TES) is a popular surgical technique to treat PH, because it is a safe, effective, minimally invasive, and time-saving method (7, 11, 14, 24). It is also the preferred treatment in Taiwan. However, long-term follow-up reports of this simple operation are rare (3, 7, 8, 10, 18). In addition, postoperative compensatory hyperhidrosis (CH), i.e., excessive sweating in nondenervated areas after a successful operation, sometimes is so incapacitating that some patients regret having undergone the operation. PH is a subjective complaint and tolerance of excessive sweating varies among patients (7). This report provides a grading scale to classify the severity of PH and postsympathectomy CH. It also addresses patient satisfaction and the other postsympathectomy complications.

PATIENTS AND METHODS

From July 1992 to June 1995, 104 patients with primary PH had undergone bilateral TES (T2 only or T2-T3 ganglionectomy) at National Cheng-Kung University Hospital in Taiwan. Patients complained of palmar excessive sweating that interfered with their school, work, or social activities. This study included retrospective chart reviews and follow-up assessments. Information of preoperative conditions, including hyperhidrosis severity and precipitating factors, were acquired by record reviews. Early operative results and complications were obtained by follow-up assessments in the outpatient clinic within 1 month after the operations. Patients were contacted by telephone to report their late operative outcome, persistent complications, and satisfaction. Seventy-two patients (69.2%) had received complete follow-up assessments and were included for the basic data analysis in this study. There were 39 male and 33 female patients, with an average age of 21.7 years. The mean length of follow-up was 18 months (range, 3-37 mo). Of these 72 patients, bilate

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T2-T3 ganglionectomy was performed in 52 patients and bilateral T2 ganglionectomy in the remaining 20 patients. None of the patients had undergone a previous hyperhidrosis operation. Three-fourths of the patients experienced excessive sweating since childhood and the remaining since their teenage years. Precipitating factors, including warm weather, emotional changes, and exercise, were noted for 65 patients (Table 1). Fifty-five patients (76.4%) complained of excessive plantar sweating associated with PH. Forty patients (55.6%) revealed a positive family history. The severity of PH in all patients is presented in Table 2. Fifty-seven patients (79.2%) were classified as having severe hyperhidrosis. The cosmetic results of palms, degrees of CH, patient satisfaction, and other complications were also evaluated.

Grading of hyperhidrosis

The severity of PH was classified according to the following criteria: mild (palms were frequently moist), moderate (palmar sweat was profuse enough to drench a handkerchief), or severe (palmar sweat was spontaneously dripping similar to a faucet leak when the patient made a fist). The degree of postoperative CH was classified as follows: mild (undergarments remained dry despite heavy sweating), moderate (undergarments were sometimes soaked with sweat but were tolerable), and severe (undergarments were soaked with excessive sweat and became intolerable, requiring several changes a day). Patients were placed in the dissatisfied group category if they regretted undergoing such an operation because of the undesirable cosmetic results, postoperative complications, or any other causes.

Operation

Patients were placed in a supine position with both arms abducted by 90 degrees. All 72 patients underwent surgery under general anesthesia; double-lumen endotracheal tubes were used in 66 patients and single-lumen endotracheal tubes were used in the remaining 6 patients. A thoracoscope was inserted through a trocar at the anterior axillary line under alternating one-lung ventilation. Sympathetic ganglia and trunks were identified on a television monitor through a camera video system (Endovision Telecam; Karl Storz GmbH & Co., Tuttlingen, Germany). Second and third thoracic sympathetic ganglia were cauterized bilaterally with a unipolar diathermy probe. To avoid the recurrence of PH that might be caused by the regeneration of the destroyed ganglia, the

TABLE 1. Precipitating Factors of Palmar Hyperhidrosis

Factors	No. of Patients	%
Warmth	57	79.2
Emotion	62	86.1
Exercise	50	69.4
None	7	9.7

TABLE 2. Grading of Palmar Hyperhidrosis

Grading	No. of Patients	%
Mild	3	4.1
Moderate	12	16.7
Severe	57	79.2

ganglia were totally burned out. The unilateral procedure required 15 minutes and was performed for both sides consecutively. Chest roentgenography was performed postoperatively to ensure no residual pneumothorax. Patients were discharged the next day after surgery.

RESULTS

There was no operative mortality or major morbidity that required surgical intervention. The success rate of dryness of both hands after endoscopic sympathectomy was high (93.1%). Five patients failed to relieve the excessive sweating (four patients with unilateral and one with bilateral failure). The reasons for these failures included difficulties in performing thoracoscopic procedures because of severe pleural adhesions in two patients (one patient with bilateral failure) and incompleteness of the sympathectomy because of the thickened periganglionic adipose tissue in one patient and a possible mislocalization of the target ganglia in the other two patients. Surgical results are presented in Table 3. All patients except one complained of compensatory sweating, and most of them suffered from moderate (41.7%) to severe (43.1%) CH (Table 4). In the 40 patients with family history, 12 experienced severe CH (30%); in the subgroup of patients with severe PH before surgery, the incidence of postoperative severe CH was 45.6% (26 of 57 patients). CH frequently appeared on the back, chest, and thighs (62, 45, and 44 patients, respectively). This side effect often developed within 1 month after sympathectomy. Twelve patients (16.7%) developed gustatory sweating. Five patients (6.9%) developed ptosis (four patients with unilateral and one with bilateral ptosis). Six patients developed postoperative pneumothorax that resolved spontaneously or was cleared with overnight chest tube drainage. Operative complications are presented in Table 5. Regarding patient satisfaction, 77.7% of patients were satisfied with the operative results. However, 16 patients were dissatisfied and regretted undergoing the operations. Most of them (11 patients) were not able to accept the consequences of CH, even though their palms had become dry postoperatively.

TABLE 3. Operative Results

Results	No. of Patients	%
Success	67	93.1
Failure (uni- or bilateral)	5	6.9

TABLE 4. Grading of Compensatory Hyperhidrosis

Grading	No. of Patients	%
Mild	10	13.9
Moderate	30	41.7
Severe	31	43.1

TABLE 5. Postoperative Complications

Complications	No. of Patients	%
Compensatory sweating	71	98.6
Gustatory sweating	12	16.7
Pneumothorax	6	8.3
Horner's syndrome	5	6.9
Nasal obstruction	5	6.9
Intercostal neuralgia	5	6.9

DISCUSSION

PH has been a significant medical problem for many Asian adolescents and young adults, causing much discomfort and inconvenience. It is well recognized that surgical treatment is superior to medical therapy in the cure of this disease (1, 3, 6, 7, 9, 10, 17, 22, 23). In recent years, TES has been extensively used to treat PH in Taiwan and other countries because of its simplicity and effectiveness (3, 7, 10-13, 15). The target second and third sympathetic ganglia can be visibly identified under an endoscope and can be destroyed precisely. Stereotactic ganglionectomy by percutaneous thermocoagulation may not be able to localize the ganglia precisely and may increase the risk for surgeons by exposing them to the fluoroscopic radiation (4, 16, 25).

In our study, 67 patients (93.1%) achieved relief of their symptoms and required a mean hospital stay of only 2 days, experiencing much less pain than the pain resulting from open sympathectomy (1, 5, 17, 21). The success rate was comparable with the rates of previous reports (3, 7, 10, 14, 15). However, CH seemed to be unavoidable in any surgical modality. Some authors regard compensatory sweating as a common postsympathectomy complication (1, 3, 7, 10, 14). The cause of this compensatory response is obscure. Guttman (8) reported that this response might be related to the mechanism of heat regulation. In our study, all patients except one (98.6%) suffered from postoperative CH, and, of these patients, 43.1% were graded as severe. Several factors, including the family history and the extent of PH, were analyzed, but no definite relationships were determined between the severity of CH and the family history or the extent of PH before surgery. Most of the compensatory sweating (80%) developed because of hot weather or high temperatures in the environment. It was proposed that sweating of innervated skin in the trunk and thighs increased to compensate for the abolished thermoregulatory function of denervated palms. There is a great discrepancy between our series and previous reports regarding the incidence of CH (1, 3, 7, 9, 10, 14, 18). It is possible that the hot and humid climate in Taiwan plays an important role in the high incidence of compensatory response in our series. CH seemed to be the most common complaint of patients who

were dissatisfied postoperatively despite the successful operations (1, 18). In our series, of the 16 patients who were dissatisfied with the operative results, CH was considered the main cause of dissatisfaction by 11 patients (68.8%). Many patients with CH frequently experienced wet undergarments; 40% of these patients needed to change their undergarments during the day.

It is well known that T2 is the key ganglion responsible for palmar sweating. Ablation of T2 ganglion results in dryness of the palms. After palmar sweating ceases, sweating in the skin with intact sympathetic innervation may increase in compensation (1, 5, 11, 18, 20, 21). Shelly and Florence (19) and Berguer and Smit (2) concluded that the incidence of CH was correlated with the extensiveness of the sympathectomy. O'Riordain et al. (18) postulated that the low incidence of compensatory sweating might be explained by the limited extent of the sympathectomy and advocated that limited sympathectomy might minimize the incidence of CH. However, there was no significant difference in the incidence of CH between the T2 and T2-T3 sympathectomy groups in our series. The value of modified sympathectomy, e.g., limited ganglionectomy, deserves further evaluation. However, we do not think that modified sympathectomy would decrease the incidence and the extent of CH. Although the incidence and the extent of CH may seem to be decreased, the relief may only be temporary because of an incomplete treatment, or the symptoms may recur because of the potential regeneration of the incompletely destroyed ganglia. Shih and Lin (20) reported that removal of T2-T3 ganglia produced abnormalities in the quantitative distribution of thermoregulatory sweating in response to external heat. It is possible that CH may serve a thermoregulatory response to maintain heat balance by sweat redistribution. In addition, a hot environment may augment the compensatory phenomenon. Authors from several countries, such as Israel, Austria, Ireland, and England, had reported incidences of CH ranging from 40 to 75% (1, 3, 7, 9, 10, 14). The weather in Taiwan is hotter and more humid than in those countries, and, therefore, the incidence of CH in our series is much higher.

Gustatory sweating was observed in 17% of our patients. This sweating might be caused by an aberrant anastomosis between sympathetic trunk and vagus nerve (1, 7, 9, 10, 17). Five patients developed ptosis (four patients unilateral and one bilateral ptosis) postoperatively. One patient with bilateral ptosis requested plastic reconstruction of the eyelids. We observed the frequency of Horner's syndrome to be 6.9%, which falls within the range of 0 to 10% reported in the literature (3, 7, 14, 24). The causes of Horner's syndrome may include an anatomic variation of the stellate ganglion, an electric current relayed to the stellate ganglion, or a mistake of the localization of the target ganglion. Accurate localization and minimized electric current might reduce the incidence of Horner's syndrome. Postoperative pneumothorax and intercostal neuralgia were well controlled and occurred as only minor complications by our patients. They did not cause any dissatisfaction with the surgery.

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CONCLUSION

In this case study, TES was observed to be an effective procedure for the control of PH. However, there was a high incidence of CH, which was the major reason for patients' dissatisfaction with the surgery. The very high incidence of CH in our study is probably related to the hot and humid climate in Taiwan. We suggest that patients need to be warned of this potential complication before surgery.

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COMMENTS

Lai et al. review the complications of transthoracic endoscopic sympathectomy for hyperhidrosis. The incidence of compensatory hyperhidrosis (CH) seems high when compared with results from an open operation. This is probably because of the authors' removal of the T2 and T3 ganglions rather than limiting the resection to T2, or it may be because of the choice of laser. In our series, the incidence of Horner's syndrome was high (6.9%) compared with open T2 ganglionectomy. In our reported series (1), there was one case of Horner's syndrome in 326 patients who underwent bilateral T2 ganglionectomy. I do not have an explanation for the high incidence of this particular complication in the authors' series. I do not think that it was caused by anatomic variation of the stellate ganglion, as the authors suggest, because this would be true for any surgical technique. More likely, I think it is mislocalization of the target ganglion, which may be a limitation of endoscopic sympathectomy.

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Lai et al. provide a candid report of operative and postoperative complications among patients treated with transthoracic endoscopic sympathectomy for hyperhidrosis. Their most remarkable finding was the alarmingly high incidence of CH (71 of 72 patients) and gustatory sweating (12 of 72 patients). The CH was moderate or severe in 84.8% of patients.

Despite achieving the patients' goal of controlling their hyperhidrosis, only 77% of patients were satisfied with the results of surgery because of the side effects. The undesirable poten-