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Bilateral sympathicotomy for hyperhidrosis without using single-lung ventilation

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Background/aim: The goal of this retrospective study was to evaluate the outcomes and complications of bilateral videothoracoscopic sympathicotomy without using single-lung ventilation in the treatment of primary hyperhidrosis and facial blushing.

Materials and methods: We retrospectively reviewed 154 consecutive patients (70 females and 84 males) who underwent bilateral sympathicotomy for palmar, axillary, and facial/scalp hyperhidrosis or facial blushing from February 2005 to June 2013. The patients were intubated with single-lumen endotracheal tube, and then sympathicotomies were performed via videothoracoscopy during controlled apnea periods.

Results: Sympathicotomies were performed at costal levels 2, 3, and 4. No perioperative mortality or conversion to open surgery was recorded. Mean operation time was 31.2 ± 2.4 min and mean hospital stay was 1.1 ± 0.6 days. One patient experienced a unilateral pneumothorax that required treatment. There were no abnormal hemodynamic parameters measured during the perioperative apnea periods. The long term follow-up period was 21.4 ± 5 months. Twenty-nine cases (18.8%) were complicated by compensatory sweating. No recurrence was observed during the follow-up period.

Conclusion: Video-assisted thoracoscopic sympathicotomy without lung isolation provides effective cure of primary hyperhidrosis and facial blushing. This procedure can shorten the operative time without any aberrant hemodynamic shifts.

Key words: Hyperhidrosis, sympathicotomy, complications

1. Introduction

Primary hyperhidrosis is an idiopathic disorder characterized by excessive sweating. Its prevalence rate in the general population ranges from 0.3% to 4.5%. Video-assisted thoracoscopic sympathectomies have been successfully performed for many years in the treatment of this condition (1). The operation can be done as sympathicotomy, where the sympathetic chain is transected, or as sympathectomy, where the chain and ganglia are resected or ablated (2).

Video-assisted thoracoscopic surgery (VATS) is usually performed under general anesthesia with double-lumen endotracheal tube intubation (3). The undesired complications of double-lumen intubation are airway injury, decrease in oxygen saturation, increase in airway pressure, poor lung ventilation, and displacement of the tube during the operation (4).

There are several studies indicating the use of single-lumen endotracheal tubes in VATS with CO_2 insufflations in the hemithorax (5).

In this retrospective study we evaluate the efficacy, safety, and long-term results of videothoracoscopic sympathicotomy without lung isolation utilizing single-lumen endotracheal tube intubation.

2. Materials and methods

One hundred and fifty-four patients, 70 (45.5%) females and 84 (54.5%) males, who underwent one-stage bilateral thoracoscopic sympathicotomy to treat palmar, axillary, or facial/scalp primary hyperhidrosis or facial blushing, were retrospectively analyzed from February 2005 to June 2013 (Table 1). The mean age was 24.8 ± 5.6 (18–36) years.

2.1. Operation

Patients were intubated by a single-lumen tube and placed in the supine position with the arm abducted to 90°. The back was elevated to 40°. At first, patients were hyperventilated with 100% O_2, and when the O_2 saturation of the hemoglobin was 100%, the apnea period was initiated. During the apnea period we inserted two ports into the chest cavity, one located at the axillary region

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Table 1. Patient characteristics.

Mean age	24.8 ± 5.6 years	n (%)
Sex	Male	70 (45.4)
	Female	84 (54.5)
Localization of	Palmar and axillary (R3–R4 transected)	45 (29.2)
hyperhidrosis	Isolated palmar (R3 transected)	67 (43.5)
	Facial blushing or (R2 transected)	42 (27.2)
	Hyperhidrosis	
Complications	Compensatory sweating	29 (18.8)
	Pneumothorax	1 (0.64)
Recurrence		0 (0)
Mean operation time	31.2 ± 2.4 min	
Mean hospital stay	1.1 ± 0.6 days	

and the other at the midclavicular line between the third (R3) or fourth (R4) ribs. Gravity and controlled apnea were used to descend the lung from the apex to perform the sympathicotomy, because there are no pressurized gas insufflations with this technique. The part of the sympathetic chain overlying the rib was transected by electrocautery on a high costal level, sparing the sympathetic ganglia. A sympathicotomy was performed at the second costal (R2) level for facial/scalp hyperhidrosis or facial blushing. An R3 sympathicotomy was performed for isolated palmar hyperhidrosis and an R3–R4 sympathicotomy for axillary hyperhidrosis. In all cases the transection was extended to 2 cm laterally over the rib to transect accessory nerve fibers. The O_2 saturation of the hemoglobin was allowed to drop to 90%, and then the patients were ventilated again. The right side was approached first. When the procedure was completed, a temporary small feeding tube was inserted into the chest during closure of the soft tissue and was removed before the skin closure. A postoperative chest X-ray was performed to exclude pulmonary and pleural abnormalities.

The data, including characteristics of patients; surgical procedures; operating time; hemodynamic parameters such as blood O_2 saturation, end-tidal CO_2 levels, and arterial blood pressure measured during the intraoperative apnea periods; and postoperative complications and recurrence were all analyzed.

3. Results

A total of 308 video-assisted thoracoscopic sympathicotomies were performed on 154 patients by the same surgical team. No conversion to open surgery was necessary and there were no aberrant hemodynamic shifts during the procedure. None of the patients experienced Horner's syndrome, intercostal neuralgia, or hemothorax, neither postoperatively nor in the long-term follow-up after this procedure. However, one patient experienced a pneumothorax that required treatment by a chest tube. There was no operation-related mortality.

Hyperhidrosis was observed in the palmar and axillary region in 45 (29.2%) patients and only in the palmar region in 67 (43.5%) patients. Furthermore, facial blushing or hyperhidrosis was observed in 42 (27.2%) patients.

One-stage bilateral video-assisted thoracoscopic sympathicotomy was performed for all patients. R2 sympathicotomy was performed for 42 patients for facial hyperhidrosis or blushing, and R3 transection was performed for 67 patients for palmar hyperhidrosis only. R3–R4 sympathicotomy was performed for 45 patients for axillary and palmar hyperhidrosis.

The mean operation time from intubation to extubation was 31.2 ± 2.4 min, whereas the mean time from skin incision on one side to skin closure on the contralateral side was 17.8 ± 1.6 min. Mean hospital stay was 1.1 ± 0.6 days.

The hemodynamic parameters measured during the perioperative apnea periods were as follows: mean oxygen saturation measured by pulse oximetry was 95.6 ± 4.5%, end tidal carbon dioxide was 38.7 ± 6.7 mmHg, and mean systolic and diastolic arterial blood pressure was 120.4 ± 10.4/75.9 ± 8.8 mmHg (Table 2).

In the palmar hyperhidrosis group all patients had dry hands immediately after the surgery and during their hospitalization. In the palmar and axillary hyperhidrosis group we observed dry hands in all patients but in 3 patients axillary hyperhidrosis had decreased after the

Table 2. Perioperative hemodynamic data.

Mean SpO_2	95.6 ± 4.5%
Mean end-tidal CO_2	38.7 ± 6.7 mmHg
Mean arterial blood pressure	120.4 ± 10.4/75.9 ± 8.8 mmHg

surgery, but was not completely resolved. Furthermore, 2 patients with facial hyperhidrosis complained of still having hyperhidrosis around their upper lip area after the surgery (Table 3). No patients experienced a recurrence of hyperhidrosis during the follow-up period.

All patients were advised preoperatively that long-term follow-up was necessary, and they were contacted and assessed by follow-up evaluations, telephone interviews, and questionnaires. The follow-up period varied from 6 to 40 months (mean: 21.4 ± 5 months).

The evaluation of compensatory hyperhidrosis showed that 8 patients (5.1%) who only had palmar hyperhidrosis, 12 (7.7%) who had palmar and axillary hyperhidrosis, and 9 (5.8%) who had facial/scalp hyperhidrosis or facial blushing developed new mild sweating on the lower back, abdomen, buttocks, and thighs, yet this did not bother them (Table 4). The total compensatory hyperhidrosis rate was 18.8% (29 patients). In 4 patients the compensatory sweating occurred during the first postoperative month. It was seen in 15 patients during the third postoperative month, and in the remaining 10 patients it did not appear until 2 years after the surgery.

4. Discussion

Primary hyperhidrosis presents most often in adolescents. It is a pathological condition of excess sweating, which is required for thermoregulation, but it can also occur as a psychological response to an unknown etiology. The sweating usually affects the palms or axillae but may also be seen in other areas of the body (6).

Table 3. Effectiveness of sympathicotomy.

	Percentage (n)
Palmar and axillary hyperhidrosis	93.3% (42)
Isolated palmar hyperhidrosis	100% (67)
Facial blushing or hyperhidrosis	95.2% (40)
Total	96.7% (149)

Table 4. Compensatory sweating rates.

	n (%)
Palmar and axillary hyperhidrosis	12 (7.7)
Isolated palmar hyperhidrosis	8 (5.1)
Facial blushing or hyperhidrosis	9 (5.8)
Total	29 (18.8)

Many reports have found that thoracic sympathectomies for palmar hyperhidrosis are efficient, even after long-term follow-ups (7,8). In this study, there was no recurrence after a mean follow-up period of 21.4 months.

The effectiveness of sympathicotomy for axillary hyperhidrosis is slightly lower than for palmar hyperhidrosis and it varies between 86% and 93% (9). In this study, the effectiveness of sympathicotomy for axillary hyperhidrosis was 93.3%. It was 100% for the isolated palmar group and 95.2% for the facial blushing or hyperhidrosis group.

Compensatory sweating appears to be a relatively common side effect after these procedures, with an occurrence rate between 60% and 90% having been reported in some series (10,11). Several studies described fewer side effects of sympathicotomy (7,12). Our rate was 19.7%. We think this low compensatory hyperhidrosis rate occurred because we only transected the sympathetic chain and did not remove or injure the ganglia of the chain or the axons from the spinal cord neurons innervating the ganglia. Therefore, we think that this approach decreases the synaptic reorganization at the sympathetic chain level, which may cause a reduction in compensatory hyperhidrosis.

Several undesired complications of endobronchial intubation with double-lumen endotracheal tube have been reported in the literature (13,14). In a major study, the rate of complications of endobronchial intubation were reported as follows: decreased O_2 saturation of hemoglobin 9%, increased airway pressure 9%, poor lung isolation 7%, air trapping 2%, and airway injury 0.4% (4). During video-assisted thoracoscopic sympathicotomy, different techniques are used for intraoperative ventilation. Double-lumen endotracheal tube is the most common ventilation method, but there are some reports stating that the use of laryngeal masks or surgery under sedation with spontaneous ventilation provided satisfactory results (15). In this study, we performed video-assisted thoracoscopic

sympathicotomy during the controlled apnea periods by utilizing single-lumen endotracheal tubes, and there were no aberrant hemodynamic shifts perioperatively. Moreover, our results were effective, with a low rate of complications.

In some reports, mean operation times for bilateral sympathectomies vary from 30 to 91 min (16,17). In this study, the mean operation time from intubation to extubation was 31.2 ± 2.4 min, whereas the mean time from skin incision on one side to skin closure on the contralateral side was 17.8 ± 1.6 min. This was considerably shorter than in other studies in the literature, and it is because of only transecting the sympathetic chain and shortening the duration of the anesthesia procedure.

In conclusion, bilateral videothoracoscopic sympathicotomy or sympathectomy is currently a standard surgical technique to treat primary hyperhidrosis. Our results are promising and suggest that videothoracoscopic sympathicotomy without lung isolation utilizing single-lumen endotracheal tube intubation is a valid and safe treatment for primary hyperhidrosis. This procedure can shorten the operation time with a low complication rate compared to other large series of patients in which different techniques were used.

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