Sequential Extended Thoracoscopic Sympathicotomy for Palmo-Axillo-Plantar Hyperhidrosis

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Background. **Palmo-axillo-plantar hyperhidrosis (HH) exists in approximately 70% to 100% of patients complaining of HH. Many studies have documented variable effects of thoracoscopic sympathicotomy (TS) on plantar sweating. The present trial evaluated sequential extended thoracoscopic sympathicotomy for the treatment of palmo-axillo-plantar HH regarding its feasibility and outcome on each domain of HH, particularly the plantar domain**

Methods. **Forty-two patients with severe palmo-axillo-plantar HH underwent sequential extended (T3 to T12) thoracoscopic sympathicotomy. Improvement in HH was assessed using visual analog scale and iodine-starch test, and quality of life was evaluated using the Keller quality of life questionnaire preoperatively and 2 years postoperatively.**

Results. **Included were 16 men and 26 women with a mean age of 24.3 ± 5.3 years. The average preoperative VAS for the palmar, axillary, and plantar HH was 9 ± 0.66, which declined significantly ($p < 0.0001$) at 24 months of follow-up to a mean of 0.74 ± 0.4 for the palmar and axillary domains and to 1.26 ± 0.7 for plantar HH. Improvement in quality of life was observed in all patients at 24 months of follow-up as the overall median score decreased from 120.5 to 3.5.**

Conclusions. **Sequential extended thoracoscopic sympathicotomy proved to be an effective method for the treatment of combined HH because it achieved satisfactory and sustained improvement of palmar, axillary, and plantar sweating. Although the benefits of sequential extended thoracoscopic sympathicotomy outweigh its drawbacks and technical difficulties, further prospective studies are required to ascertain the effectiveness of this new technique.**

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Hyperhidrosis (HH) is the production of sweat in excess of that required for the normal thermoregulatory mechanism. The incidence of HH is approximately 1% of the general population [1]. Two types of HH exist: the primary idiopathic type and the secondary type.

The diagnostic criteria of primary HH include "Excessive sweating of 6 months or more located in axillary, palmar, plantar or craniofacial region without apparent secondary causes, including two or more of the following: (a) Bilateral and symmetric (b) Absent nocturnally (c) Episodes at least weekly (d) Onset at age 25 years or younger (e) Positive family history (f) Impairment of daily activities" [2]. Primary HH is sometimes associated with other vasomotor symptoms, such as excessive facial blushing, palpitation, and vasomotor rhinitis, which can be attributed to sympathetic overactivity [3].

Various treatments have been advocated for primary HH, including topical aluminum chloride 20% solution, topical and systemic anticholinergics, botulinum toxin type-A injection, iontophoresis, laser, microwave energy, and thoracoscopic sympathicotomy (TS) [4]. TS, being a safe, effective, and minimally invasive method, is considered the optimal treatment for primary HH owing to its high success rate, minimal complications, long-lasting effect, and technical feasibility [5].

Palmo-axillo-plantar HH is considered a unique variant of primary HH that was presumed to be a hereditary autosomal-dominant disease with a familial incidence ranging from 12.5% to 56.5% [5, 6]. Some studies estimated that palmo-plantar and palmo-axillo-plantar variants present in approximately 70% to 100% of patients with HH [7, 8]. Excess plantar sweating represents an embarrassing problem to the patient and is usually treated with lumbar sympathectomy that is associated with technical difficulties, complications, such as retrograde ejaculation, and sometimes failure due to inadequate removal of the sympathetic chain [9].

The Supplemental Table can be viewed in the online version of this article [http://dx.doi.org/10.1016/j.athoracsur.2017.04.035] on http://www.annalsthoracicsurgery.org.

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Management of combined palmo-axillo-plantar HH is a challenging problem because two separate procedures, TS for palmo-axillary HH and lumbar sympathectomy for plantar HH, are required, entailing double morbidity and higher cost. The present study evaluated the technical feasibility, efficacy, complications, and patients' quality of life of a new procedure, sequential extended TS, for the treatment of palmo-axillo-plantar HH.

Extended sympathicotomy was performed to ensure division of a major part of the sympathetic fibers supplying the lower limbs. The sympathetic supply of the lower limbs may originate from (T10 to L2) or from (T11 to L2) [10–12]. Therefore, TS was extended to include T10 to T12 in addition to the ascending fibers from L1 to L2 ganglia. Another anatomic variation that justifies performing extended sympathicotomy is the highly variable levels of emergence and relay of the preganglionic and postganglionic sympathetic fibers in the spinal cord [10].

Patients and Methods

Study Design and Setting

Prospectively collected data of patients with palmo-axillo-plantar HH who were treated with sequential extended TS in the general and vascular surgery departments of Mansoura University Hospitals between January 2010 and June 2014 was retrospectively reviewed. Follow-up of patients continued for a minimum of 24 months after the last patient. Ethical approval was obtained the Mansoura Faculty of Medicine Institutional Review Board.

Patients

The study included 42 adults with American Society of Anesthesiologists Physical Status Classification I and II with combined palmo-axillo-plantar HH (Fig 1).

Exclusion Criteria

- Isolated palmo-axillary or craniofacial HH
- Bradycardia (resting heart rate <60 beats/min) or other cardiac conduction defects
- Ejection fraction of less than 0.60
- Concomitant lung pathology, frozen mediastinum, pleural effusion, or history of intercostal tube insertion or thoracotomy
- Uncorrected coagulopathy
- Azygos lobe variant of the right hemithorax (detected intraoperatively)

Sample Size Calculation

We determined from the annual admission rate of patients with palmo-axillo-plantar HH that a sample size of 45 patients was required over 3 years to ensure a study power of 80% at a confidence level of 95%. Because of

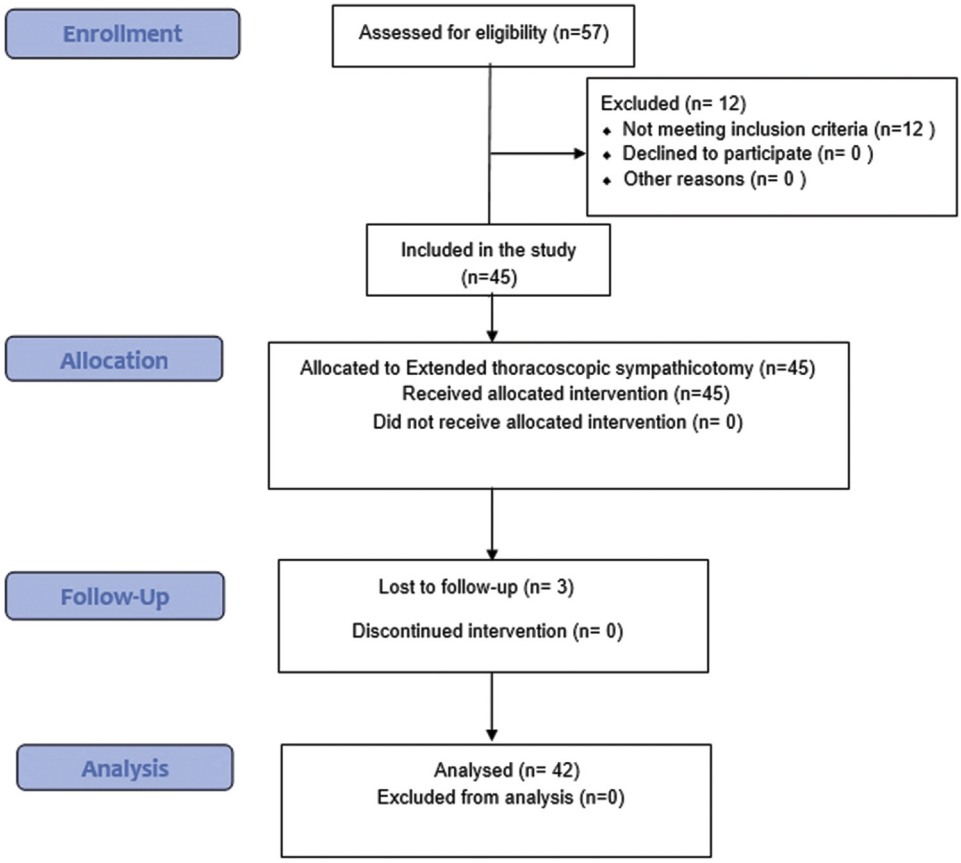

Fig 1. Flow diagram for patient recruitment.