Thoracoscopic Sympathicotomy for Disabling Palmar Hyperhidrosis: A Prospective Randomized Comparison Between Two Levels

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Background. Thoracoscopic sympathicotomy is highly effective in treating disabling palmar hyperhidrosis. The ideal level to maximize efficacy and minimize the side effect of compensatory hyperhidrosis (CH) is controversial. This study compared sympathicotomy over the second (R2) vs third (R3) costal head relative to these variables in patients with massive palmar hyperhidrosis.

Methods. This prospective, randomized study enrolled 121 patients with disabling palmoplantar hyperhidrosis assigned to bilateral sympathicotomy (sympathetic transection), which was done over R2 in 61 (n = 122 extremities) or R3 in 60 (n = 120 extremities). Patients were questioned at 6 months and at 1 year or more to assess efficacy, side effects, and satisfaction with the procedure.

Results. Sympathicotomy at R2 failed to cure palmar hyperhidrosis in 5 of 122 (4.1%) extremities, but only 2 (1.6%) were to a truly profound dripping level of recurrence. Sympathicotomy at R3 failed to cure palmar hyperhidrosis in 5 of 120 extremities (4.2%), and all were dramatic failures with dripping recurrent sweating. The patients whose palmar hyperhidrosis was not completely cured were aged 19.7 ± 2.5 vs 26.4 ± 8.0 years ($p = 0.04$). Two R3 patients with failure underwent three redo R2 sympathicotomies, with curative results. R2 patients showed a trend toward a higher level of CH vs R3 patients at 6 months and after 1 year. The CH severity scale was 4.7 ± 2.7 (n = 38) for R2 vs 3.8 ± 2.8 (n = 36) for R3 (p = NS) at 6 months and 4.7 ± 2.5 (n = 43) for R2 vs 3.7 ± 2.8 (n = 37) for R3 (p = NS) after 1 year. Younger age, male sex, and higher levels of preoperative and postoperative plantar sweating were predictors of failed sympathicotomy. Increased age was associated with increased CH.

Conclusions. R2 and R3 sympathicotomy for massive palmoplantar hyperhidrosis are highly effective, with low recurrence and incidences of severe CH. R2 tends to have a higher level of CH vs R3, and a higher incidence of dramatic failures is suggested in R3 patients, for which reoperation at the R2 level will likely be curative.

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Classic palmar hyperhidrosis is a unique diagnosis within the broad and nondescript classification of hyperhidrosis and exists in almost all patients in its palmoplantar form [1]. Preliminary studies suggest this is an autosomal-dominant disorder with variable penetrance localized to chromosomes 14 or 5, or both [2–4]. Although notable exceptions occur, the typical form of palmoplantar hyperhidrosis has four unique characteristics: massive palmar sweating to the point of dripping or near dripping, severe sweating of the soles of the feet, bimodal onset in childhood or puberty (or exacerbation at puberty), and severe provocation of the sweating with ordinary hand lotion [1, 5, 6].

Massive palmar sweating clearly has a disabling effect on patients' professional and social lives [7], and sympathetic thoracoscopic intervention appears to be superior to medical management in definitively curing patients of the disorder [1, 6, 8, 9]. However, controversy and important unanswered questions remain about what constitutes the best sympathetic procedure for a given situation. One such controversy is the question of the specific level of the sympathetic intervention. We wished to address whether sympathicotomy over the second (R2) or third (R3) costal head was superior for patients in efficacy and in limiting side effects. Patients with debilitating palmar hyperhidrosis were enrolled into a prospective, randomized trial designed to gain insight into this question. Specifically, we wished to test the hypotheses that R2 sympathicotomy may be more reliable and may also result in increased compensatory hyperhidrosis (CH) compared with sympathicotomy at the R3 level.

Material and Methods

A total of 121 consecutive patients with the classic manifestations of disabling palmoplantar hyperhidrosis [6] were prospectively randomized to R2 or R3 sympathicotomy. These manifestations included massive palmar sweating to a dripping or near-dripping level, similar level of plantar sweating, onset in early childhood or puberty, and provocation with ordinary hand lotion.

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Table 1. Patient Demographics for R2 vs R3 Sympathicotomies

Variable[a]	R2 Group	R3 Group
Patients	61	60
Age, years	26.1 ± 7.9	26.0 ± 8.0
Sex		
Female	31	38
Male	30	22
Race		
Asian	26	20
White	16	19
Hispanic	16	19
Other	3	2

[a] Continuous data are mean ± standard deviation; categoric data expressed as number.

Random allocation was used to assign patients to an R2 or R3 intervention. The demographics of the R2 and R3 groups are tabulated in Table 1, without statistical differences identified between the populations.

These 121 patients had bilateral procedures (ie, 2 sympathicotomies per patient) for a total of 142 procedures (122 R2 and 120 R3). The surgical techniques were as previously described [10]. Simple electrocautery was used to perform a single sympathicotomy transection per side at the R2 or R3 level. In all cases, an active search was performed for any accessory nerves of Kuntz which, if found, were severed.

Patients were questioned at 6 months and after 1 year by phone or mail survey. Continuous variables of levels of palmar, plantar, axillary, and CH sweating were on a subjective patient-rated scale of 0 to 10. The patient scale estimates were assessed using landmarks of 0, no sweating; 5, moderately uncomfortable sweating; and 10, severe dripping sweating with significant discomfort and interference with daily activities. These variables were assessed preoperatively and at 6 months and 1 year or more.

The Wilcoxon rank sum test was used for differences in continuous variables between sympathicotomy groups. The Pearson χ^2 test with Yates continuity correction was used for differences in dichotomous outcomes. Logistic regression analysis was used to analyze multiple category exposures. The study design and subject informed consent form were reviewed and approved by the Doctors Surgery Center Institutional Review Board.

The patients frequently were treated with medical management before they sought consultation for surgical consideration. This consisted of one or more of the following: prescription or over-the-counter topical aluminum chloride, oral anticholinergics, antidepressants, sedatives, β-blockers, iontophoresis, and *Botulinum* toxin A (Botox, Allergan Inc, Irvine, CA) injections. For those patients without prior medical treatments and whose insurance carriers so required, we initiated topical aluminum chloride hexahydrate 20% (Drysol, Person & Covey, Glendale, CA) or 6.25% (Xerac AC, Person & Covey) in anhydrous ethyl alcohol, oral glycopyrrolate (Robinul, Shionogi USA Inc, Florham Park, NJ) at progressively increased dosages, or iontophoresis with the Drionic device (General Medical, Los Angeles, CA), despite the realization that these medical treatments would likely fail. Surgical candidates were then randomized to R2 or R3 sympathicotomy after informed consent.

Results

All operations were done as outpatient procedures, and no complications developed, including Horner syndrome, bleeding, pneumothorax, or infection.

Table 2 depicts satisfaction rating for individual sympathicotomy procedures at 6 months and at 12 or more months. More than 90% of both R2 and R3 patients were "very satisfied" with the procedure at 6 months and after 12 months. For R2 procedures, the lesser levels of satisfaction were primarily a result of CH. For R3 procedures, lesser levels of satisfaction were primarily due to recurrence of the palmar sweating.

Recurrence of Palmar Hyperhidrosis/Procedure Failure

Unilateral or bilateral extremity surgical failures occurred in 5 of 121 patients (4.1%), with recurrent palmar sweating developing to a bothersome level. This included 5 of 120 (4.2%) R3 sympathicotomy "failures," and 5 of 122 (4.1%) R2 "failures." There was no overall statistically significant difference in overall failure rate between R2 and R3 levels. Four of these 6 patients were considered to have truly dramatic failures of their sympathicotomy procedures with dripping palmar sweat postoperatively or requiring Robinul for palliation, or both. The dramatic failures in these 4 patients included 5 of 120 (4.2%) R3 procedures and 2 of 122 (1.6%) R2 procedures (p = NS).

Details of the 6 patient failures are reported in Table 3. Failures were bilateral in 4 patients and unilateral on the right side in 2 patients. The failures in R2 patients were overall less severe and took longer to recur than the more fulminant R3 failures. R3 patients 1 and 2, with failures involving 3 extremities, underwent reoperation, this time with an R2 sympathicotomy, leading to curative results at the 1-year follow-up. These three redo sympathicotomies were not included as separate R2 procedures in the data analysis.

Table 2. Satisfaction Rating at 6 Months and After 1 Year for T2 and T3 Sympathicotomies

R Group	No.	Very Satisfied No. (%)	Moderately Satisfied No. (%)	Dissatisfied No. (%)
R2				
6 months	37	34 (91.9)	3 (8.1)	0 (0)
≥1 year	41	37 (90.2)	4 (9.8)	0 (0)
R3				
6 months	37	35 (94.6)	0 (0)	2 (5.4)
≥1 year	40	38 (95.0)	1 (2.5)	1 (2.5)