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Comparison Between Modified Wittmoser Method and Conventional Thoracoscopic Sympathectomy in Treating Patients with Primary Hyperhidrosis

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ORIGINAL ARTICLE

A Comparison Between the Modified Wittmoser Method and Conventional Thoracoscopic Sympathectomy in Treating Patients With Primary Hyperhidrosis

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Abstract

Background: **Although thoracoscopic sympathectomy is a documented safe and effective procedure in managing hyperhidrosis patients, some patients may develop compensatory sweating or recurrence after the procedure. That is why surgeons always seek modification of the conventional thoracoscopic procedure to obtain better outcomes. Herein, we evaluated the advantages of the modified Wittmoser technique (division of the rami communicants and interganglionic fibers) compared to the conventional one in patients with primary hyperhidrosis.**

Patients and methods: **Fifty patients met our criteria and were divided into two groups: group A had the conventional technique, and group B had the modified Wittmoser technique. Follow-up was done for 6 months after the procedure.**

Results: **The modified Wittmoser technique was associated with a significant prolongation of operative time. Both approaches led to significantly declining sweating severity in the affected regions. However, the incidence of compensatory hyperhidrosis was significantly higher in the conventional group (32 vs. 4% in the Wittmoser group). Although both groups expressed significant improvement in their quality of life, that improvement was more noticeable in the Wittmoser group. The incidence of early complications, pain scores, and hospitalization periods were comparable between the two approaches. No patients developed recurrence within the 6-month follow-up period.**

Conclusion: **Although the conventional sympathectomy technique is safe and effective in managing hyperhidrosis patients, the modified Wittmoser technique had some advantages manifested mainly in the decreased incidence of compensatory sweating and the better improvement in the quality of life.**

Keywords: Hyperhidrosis, Modified Wittmoser technique, Thoracoscopic sympathectomy

1. Introduction

Hyperhidrosis is a chronic pathological skin condition characterized by focal or generalized sweating disorder beyond physiological function.[1,2] That condition could be either idiopathic (primary) or secondary (to different illnesses, including metabolic disorders, febrile diseases, neurological disorders, or medications).[1,3]

Although the primary type could affect the entire human body, it can also be confined to a certain area like the hands (palmar), armpits (axillary), face and neck (craniofacial), or the foot (plantar).[4] Despite being benign, primary hyperhidrosis had a significant negative impact on the quality of life (QOL) secondary to low self-esteem, withdrawal from social activities, and feelings of shame.[5–7]

Nonsurgical options are available for such patients, including topical or systemic agents. The topical ones include iontophoresis, astringents, and botulinum toxin injection, while systemic therapies include anticholinergic medications and psychological therapy.[8] However, most previous nonsurgical options are of low efficacy, require longer treatment duration, and have side effects (local irritation).[9] Consequently, the majority of these cases seek surgical consultation.[10]

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Thoracoscopic sympathectomy has been described as a safe and effective technique for managing of hyperhidrosis patients. Its success and satisfaction rates exceeded 90%, according to previous studies.[1,11] That procedure entails interruption of the thoracic sympathetic chain by ablation, transection, clipping, or clamping, which leads to the disruption of sympathetic impulses from the chain to the eccrine sweat glands.[1,12]

The main purpose of thoracoscopic sympathectomy is to complete the disruption of the nervous attachment between the sympathetic chain and the peripheral sweat glands. However, some nerve fibers may not be completely divided, leading to the postoperative reappearance of symptoms.[9] That is why Wittmoser has described his technique by exclusive division of the rami communicants to enhance postoperative outcomes.[13] That technique has also been modified to involve interruption of the interganglionic trunks of the ablated chain segments.[9]

We did not find multiple trials handling the beneficial impact of the modified Wittmoser technique in patients undergoing thoracic sympathectomy for primary hyperhidrosis. That encouraged us to perform the current study to elucidate if adding the modified Wittmoser technique to the conventional thoracoscopic technique had a significant impact on postoperative outcomes (mainly recurrence and compensatory hyperhidrosis).

2. Patients and methods

The current prospective randomized trial was performed at Almaza and Kobri Elkoba Military Hospitals after gaining ethical approval from the scientific and ethical committees. The study was conducted over a 1-year duration, from October 2022 till October 2023, and it was designed for primary hyperhidrosis patients whose diagnoses were done according to Hornberger's criteria,[14] whatever their ages, who presented to our outpatient clinic during the previously mentioned time period.

All patients received the standard preoperative assessment. That included history taking (focusing on the duration of the problem, affected body regions, and previous management options), clinical examination (focusing on BMI and skin changes), routine laboratory investigations (including thyroid profile), and detailed cardiopulmonary assessment (echocardiogram, ECG, and chest radiography). We excluded patients with secondary hyperhidrosis, recurrent hyperhidrosis after previous sympathectomy, previous chest surgeries, and psychological problems interfering with patient evaluation.

Fifty patients were found eligible for our trial, and all signed a written consent documenting their approval to participate in the study and showing their knowledge of the benefits and possible complications of each intervention. We used computer-generated randomization to randomly assign the included patients into two groups; group A included 25 patients who had the conventional technique, while group B included the other 25 patients who had the modified Wittmoser technique.

The patients were asked to express the severity of sweating in the affected areas using the 'visual analog scale' or VAS, with increasing numbers indicating more sweating severity.[15] Additionally, the impact of hyperhidrosis on the QOL was assessed via the 'de Campos' questionnaire, which ranges between 20 and 100, with increasing numbers indicating worse QOL.[16]

The surgical procedure was performed under general anesthesia when the patient was in a semi-Fowler position. After receiving general anesthesia, a broad-spectrum antibiotic was administered during the skin incision. The working anesthesiologist kept in mind to make the patient hypoventilated before puncturing the hemithorax with the Veress needle. After proper insufflation, the 5-mm working port was inserted into the fifth intercostal space in the anterior axillary line, followed by the insertion of the working port (5 mm) into the second or third intercostal space in the midaxillary line.

The sympathetic trunk was divided using a diathermy hook at T3–T5 levels in all patients. Nonetheless, we performed exclusive division of the rami communicants and interganglionic nerve fibers between the ablated chain segments. The hemithorax was deflated, with simultaneous lung inflation. The ports were closed with nonabsorbable sutures, and the procedure was repeated in the other hemithorax.

After the procedure, the patients were transferred to the surgical ward, where close assessment and monitoring were done. Postoperative oxygen saturation was frequently monitored, and a chest radiograph was ordered for all cases. Perioperative analgesia was maintained by i.v. acetaminophen and i.v. diclofenac (1000 mg/8 h and 50 mg/12 h, respectively, for adults and according to body weight in the pediatric population). The patients were asked to express their pain sensation according to the VAS, with increasing numbers indicating more pain 17. The VAS (for pain) was assessed every 2 h during hospitalization, and the mean value of intrahospital recordings was recorded. Any early postoperative complications (including

pneumothorax, hemothorax, and emphysema) were noticed and recorded.

The first follow-up visit for stitch removal was arranged 2 weeks after the operation. Then, other visits were arranged 1, 3, and 6 months after the procedure. Compensatory hyperhidrosis was diagnosed when the patient reported excessive sweating in an area with a normal preoperative sweating pattern,[18] while disease recurrence was defined as sweating re-emergence 1 month after its improvement.[19] The severity of compensatory hyperhidrosis was classified as mild, moderate, or severe, as described by Rodríguez et al.[19] At the last follow-up visit (6-month visit), sweating severity and its impact on QOL were assessed and compared to the corresponding baseline values.

The main outcome of this trial was the incidence of compensatory hyperhidrosis, whereas other outcomes included operative time, hospitalization period, the incidence of postoperative complications, changes in QOL, changes in sweating severity, and recurrence rate.

2.1. Sample size calculation

The study conducted by Divisi et al.[9] reported that the incidence of compensatory hyperhidrosis was 6.42% in the Wittmoser group versus 9.3% in the compensatory sympathectomy group (a difference of 2.88%). Assuming a difference of 12% between the two techniques in this current study, we needed to enroll 25 patients in each group to achieve a power of 80% and a 0.05 significance level.

2.2. Statistical analysis

We used the SPSS software (version 26.0) (Statistical Package for the Social Sciences, Chicago, USA) for Windows to statistically analyze the previously collected data. We expressed numerical data as means (with SD) or medians (with ranges). The Student t and Mann–Whitney tests were used for the previous data types, respectively. Categorical data were expressed as numbers (percentages) and compared using the χ^2 test. Changes in hyperhidrosis severity and QOL were assessed using Wilcoxon-signed rank and paired sample t tests, respectively. Any P value less than 0.05 was considered significant.

3. Results

In both study groups, the included patients' ages ranged between 10 and 40 days, with median values of 21 and 24 years in groups A and B, respectively. Men (or boys) represented 48% of group A patients and 60% of group B patients, whereas the remaining patients were women (or girls). The duration of their excessive sweating symptoms ranged between 2 and 10 days in both groups. According to statistical analysis, there was no discernible difference between the two groups for the aforementioned variables (Table 1).

No patients developed intraoperative complications in the current study. However, the duration of the surgical procedure increased significantly with the Wittmoser approach (43.84 vs. 31.68 min in the conventional group), as shown in Table 2.

Pain scores during the first postoperative day ranged between three and seven in both groups. No patients developed hemothorax or surgical site infection. One patient had pneumothorax in each group (4%), and that condition was detected on postoperative radiograph with no significant clinical findings or need for chest tube insertion.

Surgical emphysema occurred in 4 and 8% of patients in groups A and B, respectively. The hospitalization period range between 1 and 2 days in

Table 1. Basic demographic data.

	Group A ($N = 25$)	Group B ($N = 25$)	P value
Age (years)	21 (10–40)	24 (10–40)	0.838
Sex [n (%)]			
Male	12 (48)	15 (60)	0.395
Female	13 (52)	10 (40)	
BMI (kg/m^2)	23.92 ± 3.06	23.70 ± 3.69	0.816
Duration of symptoms (years)	6 (2–10)	7 (2–10)	0.416

Table 2. Intraoperative data.

	Group A ($N = 25$)	Group B ($N = 25$)	P value
Operative time (min)	31.68 ± 7.63	43.84 ± 7.91	<0.001*
Intraoperative complications	0	0	–

*Highly significant P-value.

Table 3. Postoperative pain, hospital stay, and early intraoperative complications.

	Group A ($N = 25$) [n (%)]	Group B ($N = 25$) [n (%)]	P value
Pain scores	4 (3–7)	5 (3–7)	0.796
Pneumothorax	1 (4)	1 (4)	1
Hemothorax	0	0	–
Surgical emphysema	1 (4)	2 (8)	0.552
Wound infection	0	0	–
Hospitalization period (days)	1 (1–2)	1 (1–2)	0.779

both groups (median = 1). Table 3 shows that the previous variables did not statistically differ when comparing the two groups.

Table 4 demonstrates that the severity of sweating in the three afflicted body locations decreased significantly with both approaches and that the drop was almost similar between the two groups.

Compensatory sweating was more encountered in the conventional group (32 vs. 4%; $P = 0.01$), which was of mild severity and affected the abdominal region in most cases (Table 5). All of these cases showed resolution of their condition within 40–60 days.

As expressed in Table 6, both approaches led to significant improvements in patients' QOL. Nonetheless, that improvement was more pronounced in association with the Wittmoser technique.

Table 4. Changes in the sweating severity in the affected body regions.

	Group A ($N = 25$)	Group B ($N = 25$)	P value
The palmar area			
Baseline	8 (6–10)	8 (6–10)	0.742
6-month follow-up	0 (0–2)	0 (0–2)	0.905
	<0.001	<0.001	
The axillary area			
Baseline	7 (6–9)	8 (6–9)	0.287
6-month follow-up	0 (0–3)	0 (0–3)	0.940
	<0.001	<0.001	
The plantar area			
Baseline	7 (6–9)	7 (6–9)	0.598
6-month follow-up	3 (2–5)	3 (2–5)	0.510
	<0.001	<0.001	

Table 5. Incidence and characteristics of compensatory sweating.

	Group A ($N = 25$) [n (%)]	Group B ($N = 25$) [n (%)]	P value
Incidence of compensatory hyperhidrosis	8 (32)	1 (4)	0.010*
Severity			
Mild	5 (62.5)	1 (100)	0.755
Moderate	2 (25)	0	
Severe	1 (12.5)	0	
Anatomical location			
Abdomen	5 (62.5)	1 (100)	0.755
Abdomen and backs	2 (25)	0	
Buttocks	1 (12.5)	0	
Duration			
Temporary	8 (100)	1 (100)	–
Permanent	0	0	

**Highly significant P-value.*

Table 6. Changes in quality of life after the procedure.

	Group A ($N = 25$)	Group B ($N = 25$)	P value
Preoperative	83.40 ± 9.51	84.28 ± 8.73	0.735
Postoperative	33.40 ± 9.87	28.32 ± 6.94	0.041*
P value	<0.001*	<0.001*	

**Highly significant P-value.*

4. Discussion

Although thoracoscopic sympathectomy is a documented safe and effective procedure in managing of hyperhidrosis patients, it has some drawbacks.[20,21] Some patients may develop compensatory hyperhidrosis after the procedure, while others may build symptom recurrence after the improvement of their condition. These two problems could be frustrating in most cases.[22]

That is why surgeons always seek modification of the original (conventional) thoracoscopic procedure to obtain better postoperative outcomes. Herein, we evaluated the advantages of the modified Wittmoser technique compared to the conventional one in patients with primary hyperhidrosis. To our knowledge, this is the first randomized trial conducted to handle the previous comparison. That poses a good advantage in our research, as it handled a topic not extensively elucidated in the literature.

Another apparent advantage in favor of this current study is the absence of significant differences between our two groups regarding all baseline demographic and preoperative data. That is a good sign for proper randomization we used in this current study. In addition, that should reduce the risk of bias, shifting our findings in favor of one approach.

The current study revealed that the conventional technique required less operative time than the modified Wittmoser approach. Although no studies have reported similar findings, the previous finding is a reasonable consequence as the latter approach entails more steps than the conventional technique. That would take more intraoperative time.

In the current study, both approaches led to a significant decline in the sweating severity. That is secondary to the adequate interruption of the nerve fibers between the sympathetic chain and peripheral sweat glands.[23] Other previous studies also confirmed that the thoracoscopic method was associated with a high success rate after the procedure, which was manifested by the decline in sweating severity in the affected body regions, whatever the approach used.[9,19,24–26]

Our findings showed that compensatory sweating increased significantly in the conventional group (32 vs. 4% in the other group). Previous studies in the literature stated that the same problem could occur in 3 up to 98% of patients undergoing thoracoscopic sympathectomy.[27–29]

We think that the interruption of the rami communicants and interganglionic fibers along with the main chain without performing gangliectomy has two advantages. Initially, it increases the radicality of the ramicotomy. Additionally, it carries less risk for the hypothalamic switch and compensatory dysreflexia. That leads to an increased incidence of compensatory sweating associated with the modified Wittmoser approach.

Another explanation also exists. By dividing sympathetic connections other than the main chain, nerve signal transmission to compensatory sweating areas is also affected, which decreases the incidence of the same complication.

Divisi et al.[9] contradicted our findings, as the incidence of the same adverse event was 6.42% in the modified Wittmoser group and 9.3% in the conventional group, and that difference was irrelevant in the statistical analysis ($P = 0.415$). The impact of the modified Wittmoser technique on that complication needs to be elucidated in future studies with a larger sample size and longer follow-up duration.

We noted that all of our compensatory hyperhidrosis patients were temporary in nature. Mahmoud et al.[30] reported that most of their patients who developed compensatory hyperhidrosis showed its resolution at the last 6-month follow-up (77.19%).

Recurrence was not encountered in any of our patients. The incidence of that adverse event in the current literature is reported to be up to 27% after thoracoscopic sympathectomy.[26,31] Although this current study is short-term, and that could not exclude the incidence of that complication that could occur three years after the operation, that event is unlikely to occur, as most patients develop that complication within the initial 6 months after the initial procedure.[32]

Postoperative pneumothorax developed in 4% of current study patients. Ibrahim et al.[33] reported an incidence rate (6%) near ours. Moreover, Plas et al.[34] reported a 4.4% incidence of the same complication.

In this current study, surgical emphysema occurred in 4% of group A patients and 8% of group B patients. This is in accordance with the literature that reported a range between 2 and 12.5% for the incidence of that complication after the same procedure.[26,30,31,35,36]

We noted that patients' QOL significantly improved after both approaches. Other studies reported significant improvement in the QOL after improvement in sweating following the sympathectomy procedure.[37–40]

Nonetheless, the improvement was more noticeable with the modified Wittmoser technique. That could be secondary to the decrease in the incidence of compensatory hyperhidrosis with that approach, which was reflected in patient satisfaction, as it is already known that compensatory sweating is truly distressing for the patients.[41]

Some limitations exist in the current study. The small sample of patients gathered from a single surgical institution is a major limitation. Additionally, the lack of intermediate-term and long-term follow-up is another one. More trials should be conducted to cover the previous limitations.

5. Conclusion

Although the conventional sympathectomy technique is safe and effective in managing hyperhidrosis patients, the modified Wittmoser technique had some advantages manifested mainly in the decreased incidence of compensatory sweating and the better improvement in the QOL. That modified technique should be encouraged for such cases to get better postoperative outcomes.

Conflicts of interest

There are no conflicts of interest.

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