

Hyperhidrosis and Its Surgical Treatment

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Summary

111 sections of high thoracic sympathectomies in 60 cases suffering from primary palmar hyperhidrosis are reported. Surgical results and postoperative complications are discussed in detail. Complications were few in number and were of a transitory nature. No mortality occurred in our series. Various surgical and non-surgical procedures of treatment are reviewed. Surgical intervention remains the treatment of choice in essential idiopathic hyperhidrosis.

Keywords: Hyperhidrosis; high thoracic sympathectomy; "Gustatory sweating".

Hyperhidrosis is a pathological condition of excessive sweating. It may be essential (or idiopathic) or secondary to a variety of peripheral, local and systemic diseases. The phenomenon of hyperhidrosis causes emotional, social and professional embarrassment.

Various conservative treatments have been tried but were unsatisfactory. The treatment of choice consisting of surgical removal of sympathetic nerve supply seems to be the ideal method for the cure of palmar hyperhidrosis.

We report our experience in the surgical treatment of hyperhidrosis, in 60 patients, by high thoracic sympathectomy.

Case Material

Table 1 summarizes the sex and age distribution of surgically treated patients. In 25% of our patients a familial tendency of the disease was found. This percentage corresponds to the incidence of familial involvement in patients with Chinese ancestry, reported by Shih and Wang (1978)¹⁵. In one of our cases five members of the family suffered from hyperhidrosis. Two girls included in the series were identical twins. In the majority of the cases the first signs of hyperhidrosis appeared in infancy. Only in a few instances, the signs were noted at puberty. All patients underwent various conservative treatments without effect and sought surgical relief.

Tables 2 and 3 summarize the surgical results and complications. The level of sympathetic denervation is summarized in Table 2. The majority of sections were performed at the level of T₂-T₃ in order to

avoid Horner's syndrome. In three cases in which the operation was complicated by transient Horner's syndrome (Table 3) the level of resection was at T₁-T₂.

In our series the first 20 cases were operated by the White method^{20, 21} modified by Smithwick^{16, 17} and Love and Jurgens¹³, *i.e.*, in two stages. After 1969 we adopted the Cloward⁷ method of simultaneous bilateral sympathectomy through a midline incision, with slight modification regarding the section of the ramus communicans albus in the neighbourhood and postganglionic fibres (Kuntz's nerve).

Results

We performed 111 resections of the sympathetic chain in 60 patients. Preganglionic section of the sympathetic trunk was performed in a third of our cases. Total or partial resection of the trunk with adjacent ganglia including ramus communicans, upper and lower, was done in the remaining patients. During surgery at T₁-T₂ the upper part of the T₁ ganglion was

Table 1. Sex and Age Distribution of Surgically Treated Patients

Sex	Age					Total
	14-19 years	20-25 years	26-30 years	31-35 years	35-41 years	
Male	7	16	1	1	4	29
Female	13	12	4	2	—	31
Total	20	28	5	3	4	60

Table 2. Level of Resection of the Sympathetic Chain

Level	T ₁ -T ₂	T ₂ -T ₃	T ₃ -T ₄	Total
Male	2	38	13	53
Female	6	36	16	58
Total	8	74	29	111

Table 3. *Complications Following High Thoracic Sympathectomy*

Patients	Horner's syndrome	Pneumothorax	Infections	Gustatory sweating	Pleural effusion	Wound dehiscence
Male	1	2	1	—	1	1
Female	2	2	1	2	1	—
Total	3	4	2	2	2	1

preserved, in order to avoid possible damage to the stellate ganglion by traction and the ensuing occurrence of Horner's syndrome. We obtained good to excellent results in 59 patients out of 60. In Table 3 are listed postoperative complications which appeared in our series. The most frequent was pneumothorax in four cases. This complication occurred in an early group of 20 cases. This may be avoided by applying gentle and precise techniques whilst separating the pleura from the costovertebral junction. An interesting and rare complication occurred in two female patients—"gustatory sweating". In one patient gustatory sweating disappeared after a few months and in the second this sequela remained, although in a light form. No mortality occurred in our series.

As mentioned previously we used the Cloward technique⁷ with slight modifications and achieved good to excellent results in all but four cases. In the first group of 20 patients routine frozen section of the surgical specimen was not done. In two cases of this group the operation failed to put an end to the excessive sweating. Histological examination of the permanent sections of their surgical specimens did not reveal the presence of sympathetic nervous tissue. In the other two patients the operative result was not satisfactory although histological examination revealed the presence of ganglionic cells. We presume that the resection in these last two cases was not radical enough. Three of these patients were subjected to re-operation and complete arrest of excessive sweating of the hands was achieved by the second operation. The fourth patient declined further surgical intervention. It is mandatory to verify at operation the presence of ganglion cells and sympathetic fibres in the removed specimen.

Discussion

In hyperhidrosis conservative therapy may be divided into two approaches: topic and systemic treatments. Medical treatment is still in wide use but as mentioned previously often does not give satisfactory results and may be accompanied by unpleasant side effects.

High thoracic sympathectomy is the treatment of choice in order to eliminate the excessive sweating in these patients. The best results are obtained by resection of the sympathetic chain and the neighbouring ganglia.

The first sympathectomy for hyperhidrosis was performed by Kotzareff (1920)¹⁰. The early reports on this subject were published by Braeucker (1928)⁶, Adson and Brown (1932)², White *et al.* (1933)²⁰, Leriche (1934)¹², Pearl and Shapiro (1935)¹⁴. The surgical technique was described by White *et al.*²¹ and modified by Smithwick, Love and Jurgens (1964)¹³. An additional modification was described by Cloward (1969)⁷. All the above operative procedures are based on a posterior approach with denervation at the level of T₂-T₃. Other operative approaches such as the supraclavicular, advocated by Telford (1935)¹⁸, and the axillary, advocated by Atkins (1954)⁵, are still in practice. These, however, are accompanied by a relatively high percentage of complications, such as Horner's syndrome, pneumothorax and brachial plexus lesions.

There are four main surgical approaches for upper thoracic sympathectomies: 1. A supraclavicular approach (Telford)^{18, 19}. 2. A transaxillary approach (Atkins)⁵. 3. A paravertebral dorsal approach (Adson)^{3, 4}, (Smithwick)^{16, 17}. 4. A dorsal midline, bilateral, approach (Cloward)⁷.

In order to achieve an almost complete sympathectomy for the cure of palmar hyperhidrosis, denervation at the level of T₂-T₃ ganglia should be done. The T₂ ganglion is considered to be a key ganglion for sympathetic denervation of the upper extremities, as the greatest number of the sympathetic fibres pass through it. In our opinion for anatomico-physiologic purposes it is mandatory to section also the neighbouring ramus communicans albus (preganglionic fibers) as well as the so-called Kuntz's nerve, *i.e.*, postganglionic fibres which arise from the 2nd or 3rd thoracic ganglion and run to the brachial plexus. Section above or traction of the T₁ ganglion can cause Horner's syndrome.

The supraclavicular surgical approach to the high

sympathetic ganglia may involve the stellate ganglion and cause in a relative high percentage of cases Horner's syndrome (Adar *et al.*)¹. The transaxillary approach may be complicated by damage to the brachial plexus and consequent causalgia in the upper limb. The anterior transthoracic approach necessitates a thoracotomy and has a mortality rate of 2%, which is unacceptable for such a benign disease. In order to avoid these complications we adopted the dorsal approach.

Other non-surgical procedures are being developed. Endoscopic selective sympathectomy was used by Kux since 1949¹¹ and by Wittmoser²³ since 1951 in cases of hyperhidrosis and erythrodermia. Unilateral or bilateral upper thoracic sympathectomy may be achieved by percutaneous radio-frequency as described by Wilkinson (1984)²². He performed unilateral upper thoracic percutaneous radiofrequency sympathectomy on 27 sides in 20 different procedures, seven of which involved bilateral lesions at the same sitting. He followed up his patients from one month to five-and-a-half years. Wilkinson reports good sympathetic interruption in 24 of the 27 sides. The complications of his method include pneumothorax in two cases, troublesome but transient (2–3 months) brachial neuralgia in three patients, pathological hyperhidrosis and vascular insufficiency in the contra-lateral hand after unilateral sympathectomy for asymmetric Raynaud's disease in one case. Persistent partial Horner's syndrome in one case. Reversible prelesion heat testing led to a transient Horner's syndrome in another case and the T₁ lesion was omitted. Our impression is that it is too early to assess the benefits and complications with this promising and interesting method which involves a minor and technically simple procedure. In our opinion the percentage of complications in this small group is still relatively high but we feel that with more experience and perfecting its technique this method may become a commonly used procedure.

In 20% of our patients, included in the group of "good results", excessive sweating ceased and the patients reported a return to normal sudation. Twenty-eight patients reported a transient increase in sweating in the axillae, over the chest and abdomen. On the other hand a few patients reported a transient decrease in sweating in the lower limbs. Cloward⁷ describes the appearance of dryness in the lower limbs in 22% of cases after high thoracic sympathectomy. In his opinion this phenomenon is due to abnormal cortical representation of the sudomotor function. If the tract from these areas descends entirely in the sympathetic chain, surg-

ical section of the chain could explain the postoperative paralysis of sudomotor function in the feet. We did not observe in our material permanent paralysis of sudomotor function in the lower limbs. In some of our patients there appeared a feeling of dryness over the whole body which started in the immediate postoperative period and continued for about four days. Possibly this phenomenon is of reflex origin and disappears after a short period.

In our series "gustatory sweating" occurred in two cases about two to four weeks after surgery. This phenomenon was described by Haxton (1948)⁸. The syndrome may develop spontaneously but after sympathectomy according to White *et al.* (1952)²¹ the appearance of this symptom is indicative of incomplete denervation or regeneration, as it can be interrupted by procaine block of the cervical sympathetic trunk. The theory of partial section of nerves which is responsible for gustatory sweating seems plausible. As regards the theory of regeneration of sympathetic fibres we wonder whether in the short interval elapsed between section of the sympathetic trunk and the appearance of gustatory sweating—2–4 weeks in our cases—sufficient regeneration can occur to cause this phenomenon. This point needs further investigation and clarification. This strange sudomotor response—"gustatory sweating"—presumably might be due to pathological transmission between pre-ganglionic and ganglionic components after incomplete disconnection at sympathectomy, producing in addition an excessive response in sensitized sweat glands. The phenomenon of gustatory sweating is probably related to disrupted chemical equilibrium due to excitation of the cervical sympathetic trunk.

A few of our patients reported pre-operatively excessive sweating in stress situations. They noted that even the idea of sweating induced hyperhidrosis. Undoubtedly there is an influence of the cerebral cortex on the functioning of the autonomic nervous system (Jackson)⁹.

We obtained good to excellent results in 59 patients out of 60. These results do not differ significantly from the ones obtained by Adar *et al.*¹ in his series of 100 patients treated by the supraclavicular approach, and with Cloward⁷ who reports complete relief of excessive sweating in 92% of 74 cases operated upon by him from the dorsal approach. Shih and Wang (1978)¹⁵ report success in 455 cases out of 457. In their series 453 were operated upon by the dorsal approach.

The end results—cessation of excessive sweating—are satisfactory whether the approach is dorsal or supraclavicular. The main difference lies in the percen-

Table 4. Comparison of Postoperative Complications in 4 Series

	No. of cases	No. of UDS***	Horner's syndrome		Pulmonary* pleural lesions	Infection	Facial gustatory sweating	Compensatory sweating late sequelae	Brachial plexus contusion	Tear of bifurcation of CCA** and subclavian A.	
			Total	Transient							Permanent
Cloward 1969	74	148	9	4	5	9	not reported	not reported	17	—	—
Arad <i>et al.</i> 1976	100	198	57	17	40	24	not reported	not reported	59	11 (transient)	—
Shih and Wang 1978	457	915	—	—	—	4	1	—	not reported	—	1
Gruskiewicz <i>et al.</i> 1985	60	111	3	3	—	6	2	2	28	—	—

* Pneumothorax, hemothorax, hemopneumothorax, hemofibrothorax, pleural effusion.

** Common carotid artery.

*** UDS—upper dorsal sections.

tage of complications occurring in the various approaches. There is a significant decrease in the number of complications by the dorsal approach as compared to the supraclavicular procedure.

Table 4 summarizes the complications which occurred in Cloward's, Adar's, Shih and Wang's and our series.

We advocate that the treatment of choice for palmar hyperhidrosis is high thoracic sympathectomy by the dorsal approach. The main complications of the surgical procedures are a tear of pleura and Horner's Syndrome. With improvement of surgical techniques and a ganglionectomy limited to T₂-T₃ these complications may be avoided.

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