

SURGICAL TREATMENT OF AXILLARY HYPERHIDROSIS IN 123 PATIENTS

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Abstract. 123 patients suffering from axillary hyperhidrosis have been operated on as outpatients under local anaesthesia, with radical ablation of sweat glands. All except 7 patients were satisfied with the result. There were few complications. A group of patients and controls were extensively studied including quantitative sweat testing and axillary biopsy. Apart from increased axillary sweating during the test, no differences could be found. The basic etiology of the condition is still unknown.

Key words: Hyperhidrosis; Sweat; Sweat glands; Z-plasty

Patients suffering from excessive axillary sweating, not controllable by medical treatment, should be considered for surgical treatment.

Until the early 1960s this meant cervical sympathectomy to denervate the axillary sweat glands as apparently first carried out by Kotzareff (9). This is a fairly major operation and several types of complications have been reported, ranging from pneumothorax and phrenic nerve damage, to Horner's syndrome, gustatory sweating, dysphagia and reduced sensibility related to 2nd and 3rd intercostal nerves (5, 10, 11).

During the last 10 years a more local approach has been adopted. Skoog & Thyresson (12) removed sweat glands from the undersurface of skin flaps raised in the axilla, and Hurley & Shelley (7) removed both skin and sweat glands, but fear that removal of too much skin would jeopardize closure caused them to limit their excision somewhat.

At our unit, 40 patients with axillary hyperhidrosis were operated upon according to these principles. Unfortunately the results were frequently less satisfactory, and we found it necessary to alter our technique. For the last three years our patients have undergone radical excision of all the axillary sweat glands (1).

In order to evaluate the results of this operation, and in an attempt to elucidate some etiological and pathological aspects of the condition, the following study was carried out.

MATERIAL AND METHODS

From November 1971 to April 1973, we have operated upon 123 patients for hyperhidrosis axillae by a radical sweat gland ablation (Fig. 1). Indication for operation was based upon the patients' subjective complaints of sweating and damage done to their clothing. All patients had both sides treated simultaneously, under local anaesthesia and as outpatients. The last 55 patients in the study filled in an extensive questionnaire preoperatively, and the amount of sweating from each side was estimated by applying weighed dry cotton wool to the axilla, letting the patient rest, lying down for 10 minutes. The increase in weight is taken as a measure of the axillary sweating. The area of sweating was measured by the iodine-starch technique. The excised area was fixed in 4% formalin (ph 7.1) and sent for histology. It was mounted vertically in paraffin, sections 4-6 μ m were made and stained using the haematoxylin-eosin and Van Gieson Hansen method. The linear distribution of eccrine glands per cm was estimated by counting the number of glands per cm parallel to the epidermis. The apocrine glands were estimated by noting their number, size and content of secretion. Finally a note was made as regards the number of peripheral nerves and signs of previous inflammation.

The patients were followed up in the outpatient department until healed. Six months post-operatively all 123 patients answered a follow-up questionnaire and 50 of these answered a further follow-up questionnaire 12 months after the operation. Those who reported a poor result or presence of complications were contacted for re-examination.

A control series of 20 patients (hospital personnel and suitable patients) were tested for axillary sweating, and 14 had a small central axillary biopsy taken.

CLINICAL FEATURES

Most of our patients are young women. Symptoms tend to start at puberty and a family history is common. Many have associated palmar and plantar hyperhidrosis, though less troublesome. The severity of sweating is not related to physical effort, but is present both at work and at leisure. Many patients have professions where they have frequent contact with other people, and mental stress situations seem to accentuate the sweating. The odour is well con-

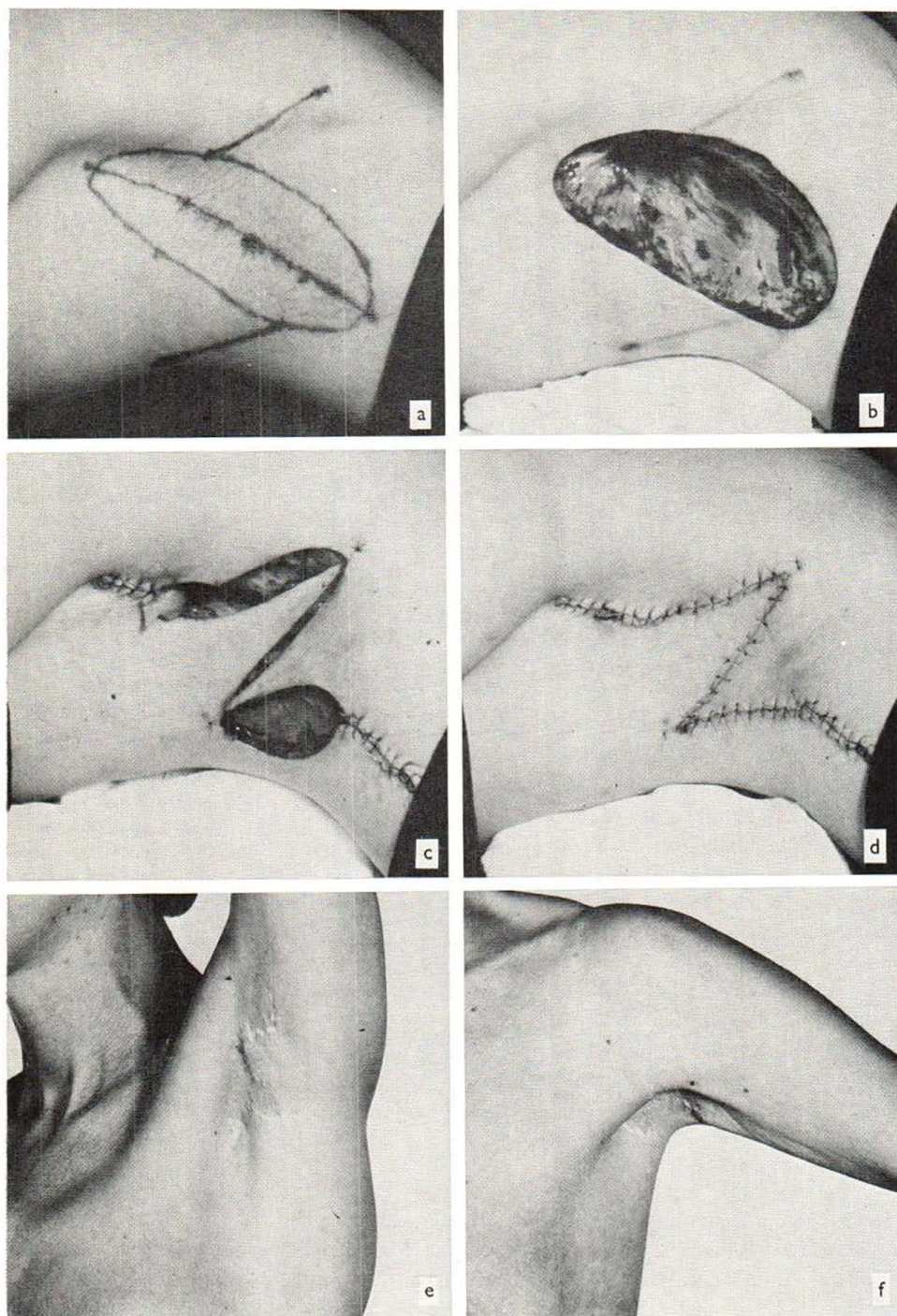


Fig. 1. Technique for radical sweat gland ablation for axillary hyperhidrosis. (a) Left axilla. The hairy area to be excised and the limbs of the Z-plasty are outlined. Size of ellipse approximately 4.5×10 cm. (b) Skin and underlying sweat glands excised. (c) The flaps of the Z-plasty are mobilized and sutured in position. Soft rubber drain inserted. (d)

Suturing completed. A bulky dressing fixed with "Tenso-plast" will be applied, to be removed with the drain after 48 hours. Suture removal in 10 days. (e), (f) One year post operatively. Scar does not extend over the anterior axillary fold and will not normally be visible. Note, no contractures, keloid formation or hairs.

trolled by cleanliness and deodorants. The constantly wet axilla is virtually unaffected by both local and oral drug therapy. Objectively we find the patient alert, clean and well informed, few are overweight. Usually pearls of sweat are running down from the axilla.

RESULTS

Age and sex distribution are shown in Fig. 2, and the frequency of some relevant features in the last 55 patients are listed in Table I.

Preoperative sweat testing (Fig. 3) shows that 80% of the patients had secretion of more than 0.5 g sweat/10 min compared with 10% in the control group.

The sweat producing area (measured by the iodine-starch technique) corresponds fairly accurately to the hairy area, and is of similar size in patients and controls, without relation to the degree of hyperhidrosis. However, the highest values in the sweat test were found in patients with large hairy areas.

No correlation between preoperative sweating and the histological picture was found. The average linear count per cm of active eccrine glands in the patient group was 4.15 on the right side and 4.45 on the left side. In the control group the average count was 4.32. The distribution and number of apocrine glands was equally similar in the two groups as also was the number of nerves and nerve endings, and the amount of hypertrophy of the myoepithelium. Both groups had similar amounts of lymphocytes and plasma cells around the sweat ducts and hair follicles.

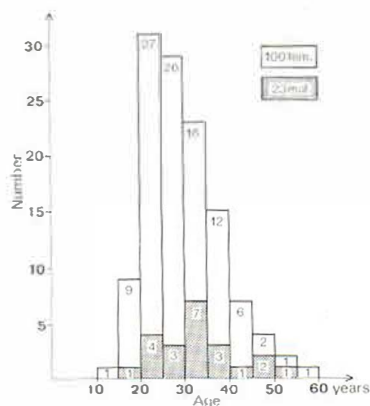


Fig. 2. Age and sex distribution of 123 patients operated for axillary hyperhidrosis.

Table I. Frequency of relevant features in 55 patients with axillary hyperhidrosis

Features	No. of patients	%
Family history	25	45
Symptoms started at puberty	35	64
Previously treated for nervous disorder	15	27
Palmar hyperhidrosis, moderate degree	12	22
Plantar hyperhidrosis, moderate degree	14	25
Sweating continuous throughout the day	41	75
No effect from local treatment	45	82
No improvement from systemic treatment	34	62
Axillary eczema	11	20
Bromidrosis	16	29
Married	33	60
Employment outside the home	44	80

Table II shows that 116 patients were satisfied with the result of the operation. Two of the remaining 7 patients had excessive palmar hyperhidrosis, and a reduction in their axillary sweating had only been of limited value. Four patients had tufts of hair with pearls of sweat in the hairy areas, indicating an inadequate excision. One patient was not re-examined.

The 50 patients with the repeat questionnaire after 12 months assessed the result and amount of post-operative sweating to be the same as 6 months after the operation.

COMPLICATIONS

Six patients developed a haematoma in one axilla. Three of the patients were reoperated immediately

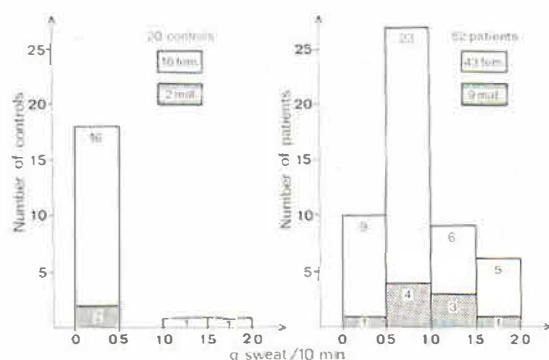


Fig. 3. Amount of sweat collected during 10 min from both axillae in 20 ordinary persons and 52 patients complaining of axillary hyperhidrosis.

Table 11. *Results of radical sweat gland ablation in 123 patients, as assessed by the patients after at least 6 months*

Patients' personal assessment	No. of patients	%
Very good, patient satisfied and sweat reduction 100-75 %	71	57
Good, patient satisfied and sweat reduction 75-50 %	45	36
Poor, patient dissatisfied or sweat reduction less than 50 %	7	6

and the healing was thereafter normal. The other 3 patients were not reoperated, which resulted in infection, sloughing of flaps and wound breakdown, and delaying healing for up to 8 weeks. The final result was satisfactory in all cases.

Ten patients had smaller postoperative complications such as seroma under the flaps, suture tracks with abscess formation and small sweat cysts. Five had limited necrosis of the flaps in the Z-plasty. No hospitalization was necessary, healing was not unduly delayed, and the final results were satisfactory without signs of scar contractures.

DISCUSSION

It is generally accepted that axillary hyperhidrosis is caused by an increased secretion from the eccrine sweat glands (7). A quantitative measurement of axillary sweating demonstrated that the patients have a higher resting secretion than is normal. Our values compare well with those reported by Gillespie & Kane (3) but probably, as we did not apply any specific thermal or emotional stimulation, they are lower than those reported by Hurley & Shelley (7). We did not perform a postoperative sweat test in the patients who were satisfied, as we felt the information obtained would be of only limited value, since we would be comparing secretion from an emotionally excited patient ready to undergo an operation, with a relaxed and satisfied, fully treated patient.

Previous examinations of sympathetic nervous tissue and histology of sympathetic ganglions have generally failed to show any abnormalities (6). The amount of acetylcholin esterase in the nerve fibres and the innervations of the glands has been found to be within normal limits (7).

The concentration of eccrine glands was estimated according to Green (4) and was similar to her findings. The area where sweating occurs corresponds well with the hair-bearing area, but the size does not correlate with the degree of hyperhidrosis. We do not usually employ the starch-iodine test, as recommended by Hurley & Shelley (7) and Davis (2). Like Harris & Jepson (6) we find that the test does not supply us with enough information, and, as we are always able to close the defects, we tend to remove the whole hairbearing area, and closure is facilitated by the Z-plasty.

Both Skoog & Thyresson (12) and Hurley & Shelley (8) admit that some wetness remains in the axilla after their treatment. We found this disappointing to our previous patients in several cases. Among the patients in this material are 8 who previously had a less radical operation. They reported the results after the first operation to be satisfactory for 2 or 3 months, whereafter sweating gradually returned. They all obtained a lasting satisfactory result when operated on with the present technique. The poor results in this series were found in patients where hair was left behind and though a postoperative sweat test showed a considerable sweat reduction (and much more than the patients themselves assessed) they were all interested in a further excision. We have never found any problem with an axilla being too dry, as suggested by Hurley & Shelley (7).

A small though fairly frequent problem is the widening of the scars and this occurs in spite of primarily uncomplicated healing. In 3 patients the scars are as wide as the originally excised area. Surprisingly, this has given no functional trouble and cosmetically it is well tolerated due to the position. We make a point of discussing this possibility with the patient before the operation, and it seems to be a minor problem. As a whole, complications and problems have been few and controllable, the technique is the standard procedure for our patients, and we find the results satisfactory. This has been substantiated by the large number of patients who on their questionnaire have included additional comments on how satisfied and happy they are, relieved from the trouble of the hyperhidrosis.

Our etiological and pathological studies do not suggest any definite differences between the patients and the controls. We tend to look upon the patients as otherwise normal persons, where the amount of sweating is in the upper range of normality. Their

attitude to this relatively high degree of sweating makes them seek treatment. As sweating is considered more a masculine trait, and male clothing more easily conceals the problem, fewer males request treatment, and this, we think, accounts for the predominance of females in our material.

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Fig. 1 (a-f) is reproduced by kind permission of the Editor and Publishers of the British Journal of Plastic Surgery.

REFERENCES

1. Bretteville-Jensen, G.: Radical sweat gland ablation for axillary hyperhidrosis. *Br J Plast Surg* 26: 158, 1973.
2. Davis, P. K. B.: Surgical treatment of axillary hyperhidrosis. *Br J Plast Surg* 24: 99, 1971.
3. Gillispie, J. A. & Kane, S. P.: Evaluation of a simple surgical treatment of axillary hyperhidrosis. *Br J Dermatol* 83: 684, 1970.
4. Green, L. M. A.: The distribution of eccrine sweat glands of Australian Aborigines. *Aust J Dermatol* 12: 143, 1971.
5. Greenhalgh, R. M., Rosengarten, D. S. & Martin, P.: Role of sympathectomy for hyperhidrosis. *Br Med J* 1: 332, 1971.
6. Harris, J. D. & Jepson, R. P.: Essential hyperhidrosis. *Med J Aust* 2: 135, 1971.
7. Hurley, H. J. & Shelley, W. B.: A simple surgical approach to the management of axillary hyperhidrosis. *JAMA* 196: 109, 1963.
8. — Axillary hyperhidrosis. *Br J Dermatol* 78: 127, 1963.
9. Kotzareff, A.: *Revue Medicale de la Suisse Romande* 40: 111, 1920.
10. Midholm, S. & Taarnhøj, P.: Hyperhidrosis axillae. *Ugeskr Laeg* 134: 1528, 1972.
11. Rask, B. E. & Stefansson, T. A.: Sympatektomi ved hyperhidroses. *Ugeskr Laeg* 135: 699, 1973.
12. Skoog, T. & Thyresson, N.: Hyperhidrosis of axillae. *Acta Chir Scand* 124: 531, 1962.

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