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Surgical Treatment of Axillary Hyperhidrosis with Liposuction Equipment: Risks and Benefits

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SUMMARY Axillary hyperhidrosis poses a serious problem to the affected patients. So far, the conservative measures employed seem to be disappointing, operations with axillary skin excision, undermining and/or skin reconstruction may cause secondary functional and cosmetic problems, whereas botulinum A toxin injections need to be repeated frequently. The aim of this study was to establish the safety, efficacy, and durability of subdermal (subcorial) suction sweat gland curettage in the treatment of axillary hyperhidrosis. So far, the method seems to be devoid of possible risks and drawbacks. In the last 4.5 years, 15 patients with axillary hyperhidrosis were operated on with the use of liposuction tools. First operations were performed in general anesthesia, then in tumescent anesthesia. The procedure of suction curettage was performed with the use of 3- to 4-mm wide liposuction cannulas. The patients were closely monitored during early stages of the healing process; then they were evaluated at 1 and 3 months, and finally at 1-4 years of the operation, when they were asked to assess the effects of the operation. Four patients had recurrence of the disease within 3 months; three of them were reoperated on, with good result. At 1-4 years of the operation, all our responders (ten of 15 patients) stated that the disease had completely subsided. The following complications were observed during the process of healing: hematomas, transient skin unevenness, and partial skin flap necrosis. In conclusion, subdermal suction curettage seems to be superior to botulinum A toxin injections by the effect durability, and to the surgical methods with skin excision and undermining by the probably lower complication rates.

KEY WORDS axillary hyperhidrosis; surgical treatment; liposuction

INTRODUCTION

Axillary hyperhidrosis is a genetic, autosomal dominant hyperactivity of the eccrine glands of the axilla, resulting from the increased sudomotor impulses, generated mainly during waking hours by mental, emotional and sensory stimuli (1). The disease begins usually in puberty. The quantities of clear eccrine sweat are excessive, the disease may be defined as secreting over 125 mg/5 min in one armpit, measured gravimetrically. The hyperactive glands do not show any pathologic changes on histologic examination. The axillary and volar (palmoplantar) form of hyperhidrosis may be simultaneous. Because clothing is constantly stained, the work may be impaired, and social activities become difficult. Mapping of the axillary sweat gland is enabled by Minor's technique of

Acta Dermatovenerol Croat
2005;13(4):212-218

iodine and starch, the resulting patterns constituting the basis for various methods of axillary resection techniques.

Treatment of axillary hyperhidrosis

Various conservative methods of hyperhidrosis treatment have been put forward. Topical application of formaldehyde, aluminum sulfate, or aluminum-zirconium salts have been tried, whereas buffered 20% aluminum chloride hexahydrate applied under occlusion during sleep proved most efficient (1-4). Commercial antiperspirants are usually ineffective. Water iontophoresis, also with the addition of anticholinergics, is possible but difficult to perform in axillary region. Psychotherapy may also be considered (1-3). General medication like anticholinergics (glycopyrrolate, bornaprine HCl), calcium blockers, analgesics (propoxyphene), antihypertonics (clonidine), or sedatives suppress sweating, however, usually at side effect producing dosages (1-4).

Since 1996, when first papers concerning the use of botulinum A toxin injections in the treatment of axillary hyperhidrosis were published, the treatment has gained wide acceptance (5). The treatment has proved to be efficient and simple, comprised intradermal or superficial subcutaneous injections of about 50 to 70 IU botulinum A exotoxin *per* axilla at 15 to 20 injection sites 1-2 cm apart from each other (4,6-10). The first therapeutic effect may be visible after one week, while full suppression of sweating should take place after one month. The most serious drawback is the relatively short durability of the effect ranging from 4 to 9 months, as injections usually need to be repeated after this period of time (4,10-12).

A number of surgical methods of axillary hyperhidrosis treatment have been proposed. Because of their possible risks, trial with one of pharmacological approaches should be suggested before undertaking surgery. Until the early 1960s, axillary hyperhidrosis was managed with sympathectomy, usually of upper thoracic ganglia II and III; later, endoscopic transthoracal sympathectomy was also proposed. However, it was more effective for palmar, and not routinely for axillary hyperhidrosis. Besides, the method could produce serious side effects (1-4). Sympathetic blockade and sclerotherapy were also tried (3). Currently, the disease constitutes the indication exclusively for local axillary ablative surgery. First observations concerning the cessation of sweating were made in patients who underwent radical mastectomy with extensive axillary dissection (1). In the early 1960s, Hurley and Shelley (13) described an operation based on mapping of the sweating loci. The central part of the locus was excised with transverse fusiform excision, usually measuring 5x2 cm. The surrounding skin was undermined and the glands were excised to the margins of each locus of sweating. Because of their greater dimensions apocrine glands are better visible, however, as they are closely mixed with eccrine glands, both are excised at the same time. A similar operation but with “zigzag” excision was proposed in Eldh-Fogdestam operation (1-3,14). The Skoog-Thyresson method advocated wide skin incisions in the form of four flaps and broad glandular removal over the entire axilla by means of undermining and gland dissection (1-3,14). The broad excision of the full thickness axillary skin and closure with the use of Z-plasty was described in Bretteville-Jensen operation. In most advanced cases the excision of the whole axillary skin and coverage with the split thickness skin graft was suggested (1-3). All methods with excision and undermining were associated with possible complications such as hematoma, infection, wound dehiscence, skin necrosis, scar contracture, or unacceptable cosmetic outcome. The idea of subcorial damage of sweat glands was originally employed in operations with the use of subcutaneous tissue shavers (safety razor) or curettes (15). Such operations have become easier to perform and less traumatic with the introduction of tumescent anesthesia and liposuction curettes. That is why the procedure of curettage of the axilla with liposuction cannulas performed in tumescent anesthesia (subcutaneous-subcorial sweat gland suction curettage) has gained wider acceptance. The method is considered to be relatively simple, almost completely free of complications, and effective for life (16,17).

Aim of the study

The aim of our study was to establish the safety, efficacy and durability of the subcorial-subcutaneous sweat gland suction curettage.

PATIENTS AND METHODS

In our practice, 15 patients with axillary hyperhidrosis (13 women and two men) were operated on with the use of liposuction tools in the last 4.5 years. The first three operations were performed in general anesthesia, and the following ones in infiltration tumescent anesthesia. Usually, the injection of 100-250 ml of the anesthetic solution according to Klein formula was administered into one axillary region (18). The 500-ml anesthetic

Acta Dermatovenerol Croat
2005;13(4):212-218

mixture was usually composed of 0.5 g lidocaine, 10 ml 8.4% bicarbonate and 0.5 mg adrenaline, dissolved in physiologic saline solution (0.9%) immedialtely before the intervention.

After short observation, the area of hyperhidrosis was outlined with a marker (Fig. 1). Infiltrations were performed with the use of rotation infusion pump or pressure bags and spinal needles (Fig. 2). The whole armpit was usually infiltrated within 5 to 10 minutes. First generation cephalosporins were administered to prevent infectious complications.

Figure 1. The area of hyperhidrosis, comprising virtually the whole surface of the armpit, was outlined before the operation.

Figure 2. The tumescent anesthesia solution was injected with the use of spinal needle and peristaltic pump or pressure bag. After 10-15 minutes, the skin turned pale.

Surgical maneuvers were performed through 3-4 mm long incisions, usually 3 in number, with the use of liposuction cannulas 3-4 mm in diameter (Fig. 3). Cannulas with one or two holes located on one side of the needle were needed. During the procedure the holes were directed to the skin surface.

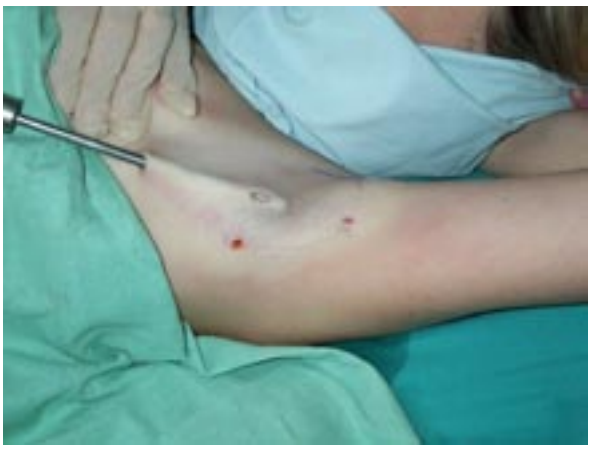

Figure 3. The 3-4 mm cannula with hole(s) located at one side was introduced through 2-3 tiny incisions into subdermal plane. During the procedure of curretage, the hole was directed to the surface.

The procedure on both armpits usually took 30 to 45 minutes. After the procedure, axillary areas were covered with antibiotic ointment and abundant gauze dressing, pressed with elastic adhesive tape. Patients were instructed to avoid abduction of arms. On the next day the wounds were disinfected and another dressing was put in a similar manner. From the second postoperative day only minor dressings covering entrance holes were preferred. The healing process was usually monitored to day 7 of the operation.

All patients were called for follow-up examinations after 1 and 3 months, whereas a group of patients operated on earlier were called after at least 1 to 4.5 years after the last operation (first or reoperation if done). On each visit patients were asked to comment on the operative results, thus allowing for qualifying the results as good or insufficient, and making a unique scale of measuring the effects. The grade of axillary sweating was also checked by observation lasting for about 3 minutes. However, we found such observation not valid because of the emotional dependence of sweat secretion. Similarly, after first attempts, gravimetric testing was not used anymore because of possible fluctuations of the results and technical difficulties. Axillary skin was additionally observed to evaluate the possible disfigurement.

RESULTS

Patients accepted tumescent anesthesia and surgical interventions well. The prolonged analgesic effect of lidocaine tissue deposits after tumescent anesthesia ensured almost painless postoperative period. Usually during the second day of

Figure 4. On postoperative day 2, the skin appeared almost unchanged.

Figure 5. Several weeks after the operation, the scars usually looked inconspicuous, and the axillary skin was almost unchanged.

the operation, the axillary skin looked almost unchanged (Fig. 4). The wound heald completely in 7 days. Patients resumed their daily routine in 2-7 days.

At 1 month, all patients were satisfied with the results, including those with impaired wound healing. The scars were usually inconspicuous and axillary skin looked normal (Fig. 5). At 3 months of the operation, four (26.6%) patients observed recurrence of the disease. Recurrent hyperhidrosis was noticed unilaterally in one and bilaterally in three patients. Three of them were reoperated on, with a longlasting good result, whereas one has been scheduled for reoperation (Table 1). The symptom free period lasted from 2 months to 4.5 years, mean 20 months. During the late follow-up (at 1-4.5 years), all ten responders declared satisfaction with the results (Table 1).

The healing process was impaired in 5 cases (Table 1). In two cases, hematomas developed to

Table 1. Patients with axillary hyperhidrosis and their follow up after subcutaneous suction curettage

Patient No.	Sex (M/F)	Age (yrs)	Cessation of symptoms at 1 month	Cessation of symptoms at 3 months	Reoperation	Complications	Long-lasting cessation of symptoms at 1-4.5 years	Symptom-free period from the first operation or reoperaton (if done) (months)
1	F	30	Good	Good	No	No	Good	54
2	F	22	Good	Good	No	No	Good	37
3	M	26	Good	Good	No	Necrosis Transient unevenness	Good	37
4	F	30	Good	Good	No	No	Good	36
5	F	29	Good	Good	No	Hematoma	Good	30
6	F	24	Good	Good	No	No	Good	23
7	F	38	Good	Good	No	Hematoma	Good	18
8	F	27	Good	Insufficient	Yes	No	Good	12
9	M	34	Good	Good	No	Transient unevenness	Good	13
10	F	36	Good	Good	No	No	Good	13
11	F	24	Good	Insufficient	Yes	No	Good	10
12	F	27	Good	Insufficient	Yes	No	Not known	7
13	F	29	Good	Good	No	Necrosis Transient unevenness	Not known	9
14	F	25	Good	Good	No	No	Not known	5
15	F	25	Good	Insufficient	Planned	No	Not known	2

Acta Dermatovenerol Croat
2005;13(4):212-218

Figure 6. Hematomas were observed in two cases but resolved spontaneously without any further surgical intervention.

dissolve completely in 10 days (Fig. 6). In 3 cases, transient hardening (fibrosis) of the subdermal plane developed, causing surface unevenness. It usually began in the second week postoperatively and subsided completely in 1-3 months (Fig. 7). Two patients developed areas of skin necrosis bilaterally. In one case the areas measured 2x2 cm and 1x1 cm, and in the other 1x1 cm and 0.5x1 cm. The problem was diagnosed when the central part of the skin in the armpit dome appeared ischemic on the first and second day of the procedure. The healing process led to spontaneous demarcation of devitalized tissues, which was quite clear on postoperative day 4-6. In one case, a large area of necrotic skin was excised, while the other side was left without additional intervention. Approximately 5 weeks of the operation, the secondary intention healing was completed. The scars did not affect the mobility of arms. In the other case, minor areas of necrosis separated spontaneously (Fig. 8) and healed secondarily to leave nearly invisible traces.

Figure 7. The surface uneveness and subcutaneous fibrosis were observed in three cases, to completely disappear within three months.

Figure 8. Partial skin necrosis was observed in two cases. Two weeks of the operation, spontaneous healing of the central defect measuring 1x1cm with subcutaneous hardening occurred. Finally, the scar appeared inconspicuous and unevenness subsided.

DISCUSSION

Many patients and physicians may not be aware that successful treatment of axillary hyperhidrosis is possible. Nevertheless, contemporary dermatosurgery offers a variety of efficient solutions of the problem. The most popular are botulinum A exotoxin injections, employed widely because of simplicity and good outcome. Subcutaneous ablation of the axilla in tumescent anesthesia (subcutaneous-subcorial sweat gland suction curettage) is also regarded as a simple and effective measure (16,17). Side effects are considered to be minor, and patients' acceptance is high (19). Scars are usually minimal and well hidden, infections are rare, and recovery is rapid. Profound hemostasis characteristic of tumescent anesthesia diminishes the risk of hematoma, and prolonged anesthesia provides for a comfortable postoperative recovery (17,18). Opinions about the durability of the procedure differ to some extent. It is regarded to last for at least 24 months (19), or to be permanent (20). Nevertheless, such a surgical procedure has lately gained more advocates (20).

Nevertheless one should take into account certain risks and drawbacks. In our series of 15 patients, there were 2 cases of skin necrosis, 4 cases of inadequate result, 2 cases of hematoma, and 3 cases of transient subdermal hardening. All these problems affected nine patients (five with healing complications and another four with primarily insufficient result). Taking these problems into account, we have concluded that the operation should be neither too aggressive (to avoid delayed healing)

nor too delicate (to ensure adequate effect) to obtain a satisfactory outcome. We found avoidance of too wide skin flap separation from the underlying tissues and preservation of the fibrous septa connecting the subcutanous tissue and the skin, at least to some extent, to be of special importance. In the cases complicated with skin necrosis, the skin undermining was almost complete all over the armpit area. The other possible cause of the problem was the lack of proper compression of dressing, due to the patient hyperactivity during the night. The problem may possibly be ameliorated by restricting the patient hyperactivity with the use of strong sedatives. Ischemia sets in immediately upon the operation; proper local and general treatment performed on the next days could not revitalize the already necrotic tissues. In our male patient, a disfiguring scar remained, however, it did not affect the patient's later acceptance of the procedure, possibly because of the sex. In our female patient with minor areas of skin necrosis, the remaining scars were barely visible.

All patients were operated on with a similar technique; finally, the symptoms of the disease recurred in 3 months in four patients, three of them with the extremely abundant form of hyperhidrosis. One may suppose that such aggressive hyperhidrosis may also be more resistant to curettage. To avoid recurrence, particularly thorough curettage should be considered in such cases.

The axillary subdermal scarring did not seem to be frequent (21). Nonetheless, it was observed in three patients in our series (Table 1). In all cases it was transient and subsided within 3 months. During this period, good relationship with the patients and reassurance permitting them to handle the condition properly proved to be very important. To accelerate the maturation of subdermal fibrosis, patients were prescribed conservative treatment with heating, massage, gels and ointments with onion flavonoids or heparin. We feel that such measures may be undertaken not only in the treatment of the already existent subdermal scarring but also in its prophylaxis. In our opinion, it should begin 3 weeks after the operation and be continued until the third month.

Another interesting side effect, also found in some patients, was slower regrowth of the axillary hair. The exact number of such cases is so far not known, because at first we failed to pay due attention to the symptom. At the beginning we performed Minor's starch-iodine trials before the intervention. With time, as we did not find them beneficial, they were abandoned. The trials proved to be time consuming and difficult to perform. They also seemed to be unnecessary, because of the ease of reaching virtually the entire area of the armpit by the working instrument, without significant risk enhancement. The curettage area limitation only to the diagnosed loci of hypersecretion could, in our opinion, unnecessarily diminish the operation efficacy.

Despite possible complications, in comparison with surgical methods based on skin excision and undermining, subdermal suction curettage seems to be more tissue-sparing, atraumatic, and probably associated with a lower complication rate. The mean durability of the results observed so far in our series has reached 20 months and makes the method superior to botulinum A toxin injections (Table 1). As some of our patients have been symptom free for as long as 54 months, and the majority of them for more than one year, we hope that the good effect will hold for the lifetime.

CONCLUSION

The procedure (surgical treatment of axillary hyperhidrosis with liposuction equipment) may be associated with complications such as hematoma, transient surface unevenness, partial skin necrosis, or recurrence of the disease. Despite the possible risks, subcorial suction curettage is generally well tolerated by the patients, and relatively safe and efficacious for a long time as the treatment of axillary hyperhidrosis.

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