Treatment of Axillary Hyperhidrosis ; Manual Subdermal Excision Combined with the Tumescent Liposuction and Subcutaneous Tissue Shaver

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Background: **Axillary osmidrosis is a distressing problem characterized by unpleasant odor, profuse sweating, and occasional wetting of clothes that may handicap those affected both socially and psychologically. A variety of surgical methods have been developed for the treatment of axillary osmidrosis.**

Objective: **To introduce the manual subdermal excision combined with the tumescent liposuction and subcutaneous tissue shaver for axillary osmidrosis.**

Methods: **Twenty-five patients with axillary osmidrosis were treated by the manual subdermal excision combined with the tumescent liposuction and subcutaneous tissue shaver.**

Results: **Twenty-one(84%) patients had good results, four(16%) fair, and none had a poor result or recurrence. Complications included one case of hematoma, two cases of partial skin necrosis. The wound complication rate was 6.0%(3/50) for the axilla and 12%(3/25) for patients.**

Conclusion: **The manual subdermal excision combined with the tumescent liposuction and subcutaneous tissue shaver is effective surgical procedure for the treatment of axillary osmidrosis with a low complication rate and recurrence. (Ann Dermatol 15(4) 139~143, 2003).**

Key Words : Axillary osmidrosis, Manual subdermal excision, Tumescent liposuction, Subcutaneous tissue shaver

Axillary osmidrosis is a common problem that causes serious personal and social handicaps, especially in Asian society[1]. The characteristic of axillary osmidrosis is usually excessive malodor caused by apocrine sweat in the axillary skin, which is induced by the influence of androgens[2]. Numerous treatments have been devised to treat axillary osmidrosis[3]. Medical treatment is often inadequate and various types of surgical procedures have been developed[3]. Hurley and Shelley, and others reported en bloc excision of the skin and subcutaneous tissue as a treatment method[2]. Selective surgical excision of the apocrine and eccrine glands, which removes only the subcutaneous tissue, was known as one of the most effective methods for treating osmidrosis[2]. This method was reported by Inaba and coworkers, and others[2]. Suction curettage which uses mechanical liposuction cannula or ultrasonic suction equipment and produces only a small axillary scar[2], but disappointedly has a high recurrence rate. Of the selective surgical excision methods, manual subdermal excison is currently considered as the most effective one, however this method requires high-skilled experience, and has a disadvantage of a long operation time, which is attributed to undermining at the superficial fat plane and bleeding control. The method using subcutaneous tissue shaver is more time-saving than manual subdermal excision, but it tends to be so traumatic that such complications as noticeable scarring, skin

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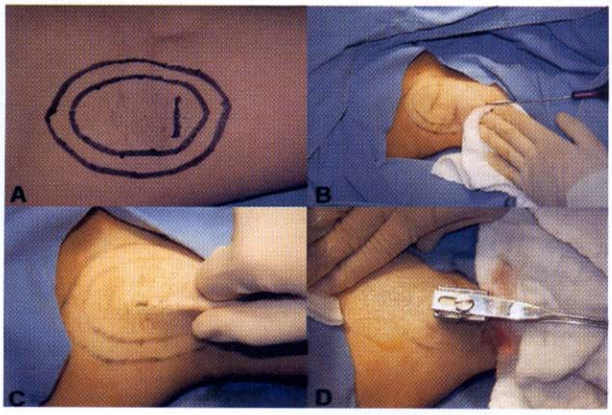

Fig. 1. A) Two circumferential markings and the single incision line. The inner circular line is the axillary hairline to be treated, and the outer line circles the area to be infiltrated with tumescent solution and undermined. B) The tumescent solution is infiltrated using the infusion cannula. C) The liposuction cannula removes the superficial subcutaneous tissue. D) The subcutaneous tissue shaver scrapes the undersurface.

flap necrosis, delayed secondary sutures could develop[3]. Tumescent anesthesia offers the advantages of a long lasting anesthetic effect and the vasoconstriction, which result in significantly reduced pain and bleeding, shorten the total operation time, and reduce complications that might occur without using it. In the present study, the tumescent liposuction was applied not only in order to partially remove apocrine glands, but also to ease undermining at the superficial fat layer. In addition, the subcutaneous shaver was used up to a certain point not to induce erythema on the skin, which could be a sign of severe trauma. We introduce a manual subdermal excision combined with the tumescent liposuction and subcutaneous tissue shaver. This method is safe and the most curative surgical technique for axillary osmidrosis.

MATERIALS AND METHODS

From March to November 2002, 25 patients with axillary osmidrosis(18 females and 7 males; age range 16-31 years, average age 23 years) were treated by the manual subdermal excision combined with the tumescent liposuction and subcutaneous tissue shaver.

SURGICAL PROCEDURE

1. Tumescent liposuction

The patient was placed in a supine position with the arms abducted about 110 degrees. The axillary hair was shaved in preparation for the procedure, and the surgical margin was drawn 1.0cm lateral to the hair-bearing area, where apocrine glands are thought to be located(Fig.1A). Then a tumescent anesthesia solution(formula: 1.0 L of 0.9% normal saline, 25ml of 2% lidocaine, 1ml of 1:1000 epinephrine, and 12.5ml of 8.45% sodium bicarbonate) was infiltrated subcutaneously using a 2.1mm infusion cannula (Tulip™, USA) through the hole which was already made at the area longitudinally lateral portion of the axilla using the Pocar(Tulip™, USA)(Fig. 1B). It is important to layer the tumescent solution as superficially as possible, creating a "peaud' orange" effect in the overlying tissue[4]. After approximately 15 minutes, the 3.7mm spatula-typed liposuction cannula(Tulip™, USA) was carefully inserted just into a superficial fat layer[4,5]. A 35mL syringe(Tulip™, USA) was used to create negative pressure. The spatula-type liposuction cannula removed superficial fat in a "windshield wiper" motion throughout the entire axilla. After the liposuction cannula was used to separate the dermis from the superficial subcutaneous tissue, the aperture of the instrument was turned up toward the skin and the cannula was used to scrape the overlying dermis in an attempt to injure any superficially residing apocrine glands[6,7](Fig. 1C).

2. Subcutaneous tissue removal

After performing the tumescent liposuction, the author made a single 2.0cm long transverse incision on the lateral side of each axilla, which, however, was 3.0cm medial to the hole for inserting the liposuction cannula. Enough undermining at the superficial fat plane was performed from the incision edges to make a wide subcutaneous tunnel, which could be more easily done through the tumescent liposuction performed beforehand. A subcutaneous tissue shaver(modified Inaba's shaver) then, scraped the undersurface without removing the skin up to a certain point not to induce erythema on the skin, which could be a sign of severe trauma[3](Fig. 1D). Residual subcutaneous tissue and glandular tissue attached to the dermis were totally removed using scissors. Coagulation was carefully carried out during the procedure. After irrigating the wound with chilled normal saline, once again we confirmed the residual area and

Table 1. Patient Satisfaction After Surgery

Result	No. of patients(n=25)
Good	21(84%)
Fair	4(16%)
Poor	0(0%)
Total	25(100%)

bleeding points. The incision was then closed in one layer without drainage. The skin was anchored to the subcutaneous tissue with sutures so as not to leave dead space. The wound was dressed with bulky gauze and compression bandage.

3. Postoperative management

The surgical procedures were performed on an outpatient basis. The total operating time for both axillas was approximately 1 hour. The patient was seen twice or three times per week for 2 or 3 weeks according to the condition of the wound. The stay sutures were removed 5 days and the stitches for the incision line remained unremoved so that unnatural folds could not be produced. Compression dressing was removed approximately 10-14 days postoperatively, depending on the condition of the surgical axillary wound, after which the remaining stitches for the incision wound was removed. The patient was permitted to take a bath after the removal of stitches, however recommended to limit full range of shoulder movement for 4 weeks postoperatively.

RESULTS

Twenty five patients(18 females, 7 males) ranging in age from 16 to 31 years, were treated for axillary osmidrosis during the past ten months. The results of malodor elimination were classified as good, fair, and poor[1,8]. A good result means neither the patient nor the persons nearby being aware of malodor. A fair result is defined that the malodor is reduced greatly, but occasionally noticeable to the patient only when sweating. A poor result implies both the patient and persons nearby are aware of malodor.

Follow-up ranged from 2 to 12 months(mean: 6 months). Twenty one(84%) patients had good results, four(16%) fair, and none had a poor result or recurrence(Table 1). There was no case in which reoperation was necessary.

Complications included one case of hematoma, two cases of partial skin necrosis(Table 2). The

Table 2. Complication

Complication	No. of patients(n=25)
Hematoma	1(4%)
Wound disruption	0(0%)
Infection	0(0%)
Scar contracture	0(0%)
Partial skin necrosis with delayed wound healing	2(8%)
Total	3(12%)

Legends for illustrations

wound complication rate was 6.0%(3/50) for axilla and 12%(3/25) for patients. Conservative therapy led to good results in the cases with complications, and scar contracture with limitation of full movement of the involved arm was not observed. Axillary hair growth and sweating were remarkably reduced after the operation in all patients.

DISCUSSION

Axillary osmidrosis is a socially embarrassing condition that severely lowers the quality of life and may result in psychological disturbance[3]. It also commonly occurs in Caucasians, but Asian people are far more likely to require the treatment for this condition[3,8].

It is believed that the apocrine glands are located in the axillary hair-bearing area, so the operative area is determined by the location of axillary hair growth[8,9]. Despite the usefulness of the starch-iodine technique for delineation of pre- and postoperative axillary sweating, this test was not applied here as the elimination of the malodor rather than reduction of the sweating was the primary operative purpose[4,8].

As axillary osmidrosis is not a life-threatening problem, surgery should be simple and efficient, and carried out with local anesthesia in an outpatient setting[9]. There are numerous surgical methods being used to treat axillary osmidrosis, and these procedures can be divided into three basic types[8,9]. Type I only removes subcutaneous tissue, type II removes skin and subcutaneous tissue en bloc, and type III involves partial removal of the skin and subcutaneous tissue as well as subcutaneous tissue of the adjacent area. Most of them, however, have complications such as hematoma, seroma, skin flap necrosis, local infection, and severe scarring. In addition, some operations need drains[10]. As histologic findings suggest, eccrine glands are dominant in the dermis, but most of the apocrine glands are located in

the subcutaneous tissue[3,11]. Apocrine glands play the key role in osmidrosis while eccrine glands play an important role in hyperhidrosis. Therefore the type I procedure which includes excision of the subcutis without removing skin, is more cosmetically acceptable and is a more effective procedure to treat axillary osmidrosis[2,3]. According to the comparison study reported by Park et al., manual subdermal shaving with scissors in type I is the best method for treatment of axillary osmidrosis although it is time-consuming, difficult, and requires high-skilled experience, which is attributed to undermining at the superficial fat plane and the bleeding control[2]. Therefore, some authors have invented shaving instruments or use a disposable plastic razor[2,12]. In the report of Inaba who developed a special device for subcutaneous shaving for small incision, 91.9% of the treated patients were satisfied with the results[13]. This method is more time-saving than manual subdermal excision, however it tends to be so traumatic that such complications as a noticeable scarring, skin flap necrosis, and delayed secondary sutures could develop[3].

Recently, liposuction has been recommended to avoid problems with wound healing, prolonged discomfort of the compressive dressing, and noticeable scars by several authors[4,6,7,14]. It is important to realize that the apocrine glands lie in the most superior portion of the subcutaneous fat, right below the junction of the dermis and subcutaneous fat. Thus liposuction should be performed as superficially as possible[4,7]. Often at the end of the liposuction, one can easily visualize the cannula's orifice through a thinned dermis[4]. However, as the liposuction technique was introduced for treatment of axillary osmidrosis, this method has been reported to have a high recurrence rate(3.5-30%)[2,9,10,14].

In the present study, we combined the manual subdermal excision with the tumescent liposuction and subcutaneous tissue shaver. The tumescent anesthesia also offered the advantages of using a larger volume of anesthetic agent without side effects, delayed absorption and lower peak blood plasma levels, and a longer lasting anesthetic effect. The vasoconstriction and anesthesia achieved by the tumescent method significantly decreased the pain and bleeding intraoperatively, resulting in the shorter operation time, and reduced complications that might occur without using it[15]. The liposuction technique provides more rapid and safe method for undermining at the subcutaneous level and elevating flaps with significantly less morbidity than sharp dissection method alone in addition to removing fat tissue[16]. Therefore we could more easily perform undermining at the superficial plane after applying the liposuction method. In addition, the subcutaneous shaver was used up to a certain point not to induce erythema on the skin, which could be a sign of severe trauma. However, the mean follow-up duration in this study was 6 months (ranging 2 to 12 months), and the observation of long duration should be made.

In conclusion, the manual subdermal excision is the best curative method for the treatment of axillary osmidrosis, even though it is time-consuming, difficult, and requires high-skilled experience. The harmonious combination of the manual subdermal excision with the tumescent liposuction and subcutaneous tissue shaver resulted in more effective removal of apocrine glands with low complication and recurrence. The advantages of our method are as follows. First, tumescent anesthesia reduced the pain and the risk of bleeding, and helped subdermal undermining. Second, the liposuction technique was applied not only in order to partially remove apocrine glands, but also to facilitate undermining at the superficial subcutaneous layer. Three, the pertinent use of the subcutaneous shaver compensated the drawback of manual subdermal excision to take much time. Therefore, with the help of tumescent liposuction and subcutaneous shaver, manual subdermal excision for the treatment of axillary osmidrosis could be performed more easily, resulting in the shorter operation time, lower complications, and no recurrence although it lacks a long-term follow-up.

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