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Original Research Paper

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STUDY ON NEW MODIFIED TECHNIQUES TO REDUCE HEMATOMA RATE ON OSMIDROSIS SURGERY

Noi-siong, Lau Department Of Dentist, Kang-shuan Dental Clinic, New Taipei City, Taiwan, ROC.

Wen-tsao, Ho* Department of Dermatology, Ho Wen Tsao skin clinic, New Taipei city, Taiwan *Corresponding Author

ABSTRACT

BACKGROUND: The removal of axillary osmidrosis requires a surgical procedure to be totally eradicated. The current surgical treatment includes the minimally invasive surgery by performing a subcutaneous incision and using a liposuction-assisted curettage to excise the apocrine gland and the traditional surgery by removing the apocrine glands through a large subcutaneous incision. The course of operation carries adverse effects such as hematoma, subcutaneous infection, subcutaneous necrosis, etc. The most common and bothersome of which is the subcutaneous hematoma.

OBJECTIVE: To reduce the occurrence of subcutaneous hematoma by improving the original surgical method in an innovative and easy way.

METHODS: This study intends to use a more innovative and improved method to increase the blood drainage channel. In view of the fact that the occurrence of hematoma is closely related to the skill of the surgeon, we used the same clinician throughout the study to put forth a more reliable research. The research was done on two groups of axillary osmidrosis patients: the first group, consisting of 28 patients, received the original method of surgery from September 2015 to August 2016; the second group, consisting of 53 patients, received an improved surgical operation, in addition to the original method, from September 2016 to August 2017. In the research, no. 11 blade was used to make a 2-3 mm incision on the axillary flap of 10 patients from the second group after the Quilting Sutures. Tie over bandages are used to reduce the chance of hematoma.

RESULTS: The second group of patients received a modified small incision method, showing a reduced occurrence of hematoma from 20% (12/56) in the first group to 4.7% (5/106) in the second group. In spite of the fact that the sample size in the study is small, the statistics show a significant difference between the two groups. However, there is no statistical difference found between the two groups with regards to flap ulceration, flap necrosis, and abscess infection. The hematoma statistics show that the new and improved approach is effective and worthy of promotion

CONCLUSION: According to the physical principle of capillary action and siphon, exudates and blood are "exuded" from the small incision in the flap through the perforation. The capillary action is the ability of a liquid to flow in a confined space without the aid of an external force such as gravity or even vice versa. The siphon principle is the flow of liquid from a higher level to a lower level. The conclusion of this study is that this new and improved method is effective and worthy of promotion.

KEYWORDS :

INTRODUCTION

Treatment of axillary osmidrosis, from the simplest, includes Botox injection[1-3], antiperspirant, deodorant, 1444nm: Nd:YAG[4] yttrium chrome laser, microwave thermolysis[5-6], radio frequency, etc. The aforementioned methods are relatively non-invasive treatments. However, total removal of axillary osmidrosis requires a radical surgical procedure to be totally eradicated. The current surgical treatment includes the minimally invasive surgery by performing a subcutaneous incision and using a liposuction-assisted curettage to excise the apocrine gland and the traditional surgery by removing the apocrine glands through a large subcutaneous incision. In the course of operation, the most concerned acute complication is hematoma.

When the operation causes trauma in the skin tissue, there will be blood accumulation in the dead space. If the blood accumulates in the dead space and the hemostasis is bad, it is easy for blood to accumulate in the dead space. Because of the presence of blood clot between the skin flap and the subcutaneous tissue, hematoma causes the wound to fail to heal smoothly. In addition, the poor blood flow in the skin flap is usually accompanied by skin necrosis. The blood clot gradually becomes fibrotic in the later stages and the axillary fibrosis becomes harder. Hence, the postoperative hematoma is a relatively serious complication for patients.

COMMON COMPLICATIONS AFTER THE AXILLARY OSMI DROSIS SURGERY

Acute and Subacute Stage Hematoma Hematoma are the most common postoperative complications of axillary osmidrosis surgery. It is possible not to treat contusion. However, with hematoma, there is usually a large accumulation of blood. If not treated well or if not treated in time, it may lead to severe skin necrosis of the flap, wound infection, scar contracture, and delayed healing. Why does hematoma occur? One reason is that the hemostasis in the operation is not thorough enough, electrocautery is not enough to stop the bleeding, the quilting suture fell off and so on. Another possible reason for hematoma is the inappropriate excessive activity of the upper limbs after the surgery.

ACUTE AND SUBACUTE STAGE SUBCUTANEOUS EFF USION

Because the flap and the tissue does not close up well coupled with an excessive movement of the upper extremities, a subcutaneous fluid under the skin forms into subcutaneous effusion. When touched, the skin flap gives an undulating sensation. A pale yellowish serum can be seen with a needle aspiration. The cause of the occurrence of subcutaneous effusion is mainly due to the existence of a cavity between the flap and the subcutaneous tissue at the early stage after the operation.

SKIN NECROSIS

Skin necrosis is the worst postoperative complication of axillary osmidrosis surgery. It is generally believed that the main reason for this complication is that the flaps are trimmed too thin resulting in the destruction of the dermis and the subdermal vascular network. Another reason is understand to be caused by the improper fixation of the postoperative

dressing. At the early stage, the necrotic skin appears to be pale. After a week, the necrotic skin forms a black callus.

COMPREHENSIVE COMPARISON OF METHODS TO PREVENT HEMATOMA

Some of the many ways to solve the problem of hematoma are:

QUILTING SUTURES

In this study, the skin flap and the subcutaneous tissue are affixed together by means of suture. This article was published in the Journal of Dermatology. The study shows that a nylon line is used to evenly stitch the space between the flap and the subcutaneous tissue. This procedure is called simple suture where the skin flap and subcutaneous tissue are stitched up to reduce the dead space[14,15].

Looking at the data from this study, quilting suture can significantly reduce the chance of hematoma. Despite that, this method cannot be applied to every operator as the occurrence of hematoma is directly related to the experience of the surgeon and the way the surgery is performed and the method indicated in this paper uses a liposuction-assisted curettage. This study significantly shows that quilting suture can remarkably reduce the chance of hematoma, the same is true inferentially.

FIBRIN

Fibrin method was published in an article issued in 2009. The study[16-17] concludes that, whether fibrin is used or not, there is no statistically significant difference in the amount of blood flow. Hence, the study concludes that the use of fibrin after axillary osmidrosis surgery does not reduce the postoperative bleeding and that there is no way to increase its adhesion.

TIE OVER BANDAGE

Tie over bandage[18] (Fig 1) is used to absorb tissue fluid. With the application of external pressure, where the patient clamps the bandage, the skin flap is pressed back to the subcutaneous tissue reducing the dead space and possibility of bleeding.

First is to reduce the dead space and the second is to stop bleeding – these two approaches reduce the chance of bleeding. However, there is no particular analysis presented in the literature showing the percentage it can actually reduce the occurrence of hematoma.

Fig1 Tie-over bondage is to prevent hematoma

DRAIN TUBE

This method puts a drain tube in the dead space extracting the blood with the tube. This method is used in most surgical procedures. The disadvantage is that when the drain tube is removed, a gap is left in the area where another amount of time is needed to attach the flap and the subcutaneous tissue. The drain tube is usually removed three days after the surgery. After that, additional time is needed for the wound and the path from the drain tube to heal. In rare cases, the dead space is situated far from the drainage tube and the hematoma could not be extracted because of its location.

RESEARCH METHOD

In this research, we will be modifying the established methods to reduce the risk of hematoma.

RESEARCH OBJECTS

Patients with osmidrosis who agreed to have surgery at our clinic in Taiwan were divided into two groups: 28 in the first group and 53 in the second group, with a total of 81 persons.

GROUPING OF THE EXPERIMENTAL OBJECTS

This research compared and analyzed retrospectively the records of the first group of patients who received the axillary osmidrosis surgery from September 2015 to September 2016 with the second group of patients who received improved axillary osmidrosis surgery from September 2016 to September 2017. Among the 28 patients from the first group of objects, those who received the surgery from September 2015 to September 2016, were found mild to moderate side effects, especially hematoma. Consequently, this study modified the surgical approach to reduce the risk of hematoma. On that account, the surgeries performed to the 53 patients of the second group of objects after September 2016 employed additional new modifications.

METHODS AND PROCEDURES

ESTABLISHED PROCEDURES FOR GROUP ONE PATIENTS

After removing the apocrine sweat gland, the wound is stitched together by quilting sutures with bondage gauzed secured on it.

MODIFIED PROCEDURES FOR GROUP TWO PATIENTS

After the removal of the apocrine sweat gland, approximately ten or more 2-3 mm incision was made in between quilting sutures on the axillary flap of the second group objects with the use of No. 11 blade. Tie over bandage gauze was in the same manner secured on the wound to reduce the chance of hematoma, as seen in Fig. 2.

All patients underwent subcutaneous removal of the apocrine glands. The bilateral armpits were sterilized then injected with swelling agent anesthesia on the pre-marked area of the axillary producing a "peau d'orange" effect on the covered tissue.

The formula used for the swelling agent anesthesia solution is composed of 500 ml saline, 20ml 2% lidocaine, 1ml 1:1000 epinephrine and 12.5 ml sodium bicarbonate.

A 1-1.5cm long incision was made in the center of the creased axillary and the apocrine gland was removed through the incision with the use of a pair of scissors. This process is repeated throughout the axillary until the whole area basically becomes a thin flap.

The surgical process starts with the sterilization of the armpit. It is followed by the infiltration of anesthesia and the swelling agent, the proportion of which is 500 ml of saline, 20 ml sodium bicarbonate solution and 1 ml epinephrine; about 50-100 c.c. is used on each side. A No. 10 hollow needle is used, matched with a No. 27 needle, to inject the solution between the skin flap and the dermis to hold the skin open. After the infiltration, a No. 15 blade is used to make a small incision, about 3-4 mm, at the middle of the armpit. An IRIS scissor is then used to separate the skin flap from the subcutaneous tissue. After the separation, a rotating knife is used to scrape off all the apocrine glands. The excision of the apocrine glands is done one by one through minimally invasive holes. The incision is closed with Quilting Sutures. Finally, a tie over bandage, about the size of a fist, is used to press against the skin flap and the dermis and is fastened with sutures. After the Quilting Sutures, a No. 11 blade is used on the group 2 patients to make approximately ten 2-3mm incision on the skin flap. Afterward, the tie over bandage is used to reduce the chance of hematoma.

The patients were asked to return three days after the surgery.

During the first visit, the fixed suture is cut and the tie over bandage is removed. In this study, we can see that on the third day, the color of the blood on the tie over bandage turned brown or black, not a bright red color, only a few wounds have bright red color, telling us that removing the tie over bandage on the third day, as intended in this study, is reasonable. The brown or black color refers to oxidation, which means that there is no occurrence of bleeding.

Fig. 2 After the Quilting Sutures, a No. 11 blade is used on the group 2 patients to make approximately ten 2-3mm incision on the skin flap.

POST-OPERATIVE MANAGEMENT

The tie over bandage was removed 3 days after the operation (Fig. 3). The removal of the suture was set 7 days after the surgery and the removal of the wound suture was set 14 days after the surgery.

Fig 3 Blood absorbed by bondage gauzes 3 days after removal.

POST-OPERATIVE EVALUATION

Possible complications include hematoma, seroma, skin ulceration, infection and delay in wound healing. Recording of data lasted for 2 weeks for both group 1 and group 2 patients.

EXPERIMENTAL RESULTS

Calculation formula and significance analysis, where t is statistical value:

$$t = \frac{d}{S_d/\sqrt{n}}$$

The equation of the degree of freedom is:
V = subnumber – 1

T TEST PROCEDURE:

The *t* value of the required statistics is calculated. This study selected different statistical calculation methods for different types of problems.

a. To decide the degree of difference between the average of a small sample and the average of its population, the statistical value *t* is calculated as follows:

$$t = \frac{\bar{X} - \mu_0}{\sqrt{\frac{S}{n-1}}}$$

b. To evaluate the degree of difference between the two groups of samples and their average, the formula for calculating the statistical value t is as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{n_1+n_2-2} \times \frac{n_1+n_2}{n_1 \times n_2}}}$$

This study compares the obtained t value with the theoretical t value and further deduce the probability of occurrence. Judgment is made based on the relationship between the t values given in Table 1 and the significance of the difference.

Table 1 The T and P value definitions

t	P Value	Significance of difference
t ≧t(df)0.01	P≦0.01	Difference is very significant
t ≧ t(df)0.05	P≦0.05	Difference is significant
t <t(df)0.0	P >0.05	Difference is insignificant

RESULT

An independent sample T test was used to analyze the results of the two groups of data on hematoma, seroma, infection, skin surface ulceration, and skin necrosis. The results of the analysis are shown in Table 2. Table 2 shows that hematoma has a significant value of $p<0.05$, indicating that there was a significant difference in the postoperative occurrence of hematoma. The mean value for the first group of data, calculated as 0.21, is greater than the mean value of the second group of data, computed as 0.05. Therefore, it can be said the surgical method on the second group of patients yields a better result than the surgical method on the first group of patients in terms of hematoma complication. The value of significance for the seroma, infection, skin surface ulceration and necrosis were greater than 0.05 denoting that there was no significant difference in the postoperative occurrence of complications in the form of seroma, infection, ulceration and necrosis. That is, the two surgical methods conducted on the two groups of patients does not improve nor does it increase the occurrence of complications such as seroma, infection, ulceration, and necrosis.

To sum up, the result of the surgical method on the second group is better that of the first group.

Table 2 Analysis of outcomes between A-B surgical techniques

Item	Group	N	Mean value	Standard deviation	t	p
Hematoma	Group 1	12/56	0.21	0.41	2.829	.006
	Group 2	5/106	0.05	0.21		
Seroma	Group 1	1/56	0.02	0.13	1.000	.322
	Group 2	0/106	0.00	0.00		
Septic infection	Group 1	2/56	0.04	0.19	1.000	.326
	Group 2	0/106	0.00	0.00		
Skin ulceration	Group 1	20/56	0.36	0.49	0.501	.618
	Group 2	3/106	0.30	0.46		
Delayed healing	Group 1	11/56	0.18	0.39	1.001	.322
	Group 2	9/106	0.09	0.29		
Skin necrosis	Group 1	2/56	0.04	0.19	0.460	.647
	Group 2	2/106	0.02	0.14		

DISCUSSION

Many doctors use different methods to reduce the risk of hematoma, seroma, and so on with the use of suture, bandages, tissue glue, and drainage tubes.

In this study, we can see that the second group of patients, who received a more improved surgical method, showed a reduced occurrence of hematoma at 4.7% (5/106) as compared to the first group at 20% (12/56).

It is interesting to note that the occurrence of hematoma on the right side for both groups of patients is slightly higher. The postoperative complications of the two groups of patients were not related to their profession/activity, age, sex and smoking history. The research encouraged patients with smoking history to quit smoking. It is suspected that those with smoking

history have more problems but found no increased risk.
The new surgical approach appeared to have greatly improved hematoma complications but yielded no positive effect on other complications such as infection, ulceration and delayed healing.

During the study, once hematoma occurred, no matter in which group, the blood clot is cut and drained. Patients are requested to return to the clinic every day until the bleeding stops. Prophylactic antibiotics are also given.

CONCLUSION

The method used here is capillary action or wicking. Capillary action is the ability of a liquid to flow in a narrow space without the aid of, or even in opposition to, external forces like gravity. The siphon principle[19-20] is the flow of liquid from a higher level to a lower level. The second group of patients received a modified punctured method that showed the reduced occurrence of hematoma with 20% (12/56) from group 1 patients decreasing to 4.7% (5/106) from group 2 patients. Regardless of the small sample size of the study group, the statistics show a significant difference between the two groups. However, there was no statistical difference between the two groups with regards to skin ulceration, skin necrosis, and abscess infection. The conclusion of this study is that this new and improved method is effective and worthy of promotion.

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