

RESEARCH ARTICLE

Clinical Application of Endoscopic Inguinal Lymph Node Resection after Lipolysis and Liposuction for Vulvar Cancer

Qiang Wu^{1*}, Yi-Bing Zhao¹, Zhi-Hua Sun², Jing Ni¹, Yu-Zhong Wu¹, Heng-Hua Shao¹, Jun-Wei Qu¹, Xin-En Huang³

Abstract

Aim: To examine lymph nodes obtained after lipolysis and liposuction of subcutaneous fat of the inguinal region of female vulvar cancer patients to explore the feasibility of clinical application. **Methods:** The field of operation was on the basis of the range of the conventional resection of inguinal lymph nodes. We injected lipolysis liquid fanwise, started liposuction after 15-20 minutes; then the subcutaneous fatty tissue was sucked out clearly by suction tube. We selected the first puncture holes located on 2-3 cm part below anterior superior spine, the others respectively being located 3cm and 6cm below the first for puncturing into the skin, imbedding a trocar to introduce CO₂ gas and the specular body, and excise the lymph nodes by ultrasonic scalpel. The surgical field chamber was set with negative pressure drainage and was pressured with a soft saline bag after surgery. **Results:** A lacuna emerged from subcutaneous of the inguinal region after lipolysis and liposuction, with a wide fascia easily exposed at the bottom where lymph nodes could be readily excised. The number of lymph nodes of ten patients excised within the inguinal region on each side was 4-18. The excised average number of lymph nodes was 11 when we had mature technology. **Conclusion:** Most of adipose tissue was removed after lipolysis and liposuction of subcutaneous tissue of inguinal region, so that the included lymph nodes were exposed and easy to excise by endoscope. This surgery avoided the large incision of regular surgery of inguinal region, the results indicating that this approach is feasible and safe for used as an alternative technology.

Keywords: Vulvar cancer - lymph nodes - liposuction - laparoscopy

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Introduction

Endoscopic surgery has been used in various malignant tumor surgeries of Gynecology and dominated many tumor surgeries such as lymph nodes resection and hysterectomy of endometrial cancer or cervical cancer, etc. The endoscopic surgery is characterized by small incision, quick healing, beautiful healing of skin and mucosa at the small incision and less impact on functions of internal organs.

The inguinal lymph nodes resection of vulvar cancer is the necessary step in radical surgery of vulvar cancer on the grounds that inguinal lymph nodes are common metastasis parts in vulvar cancer, only lymph nodes excision can attain the radical intents and provide basis for subsequent therapies such as radiotherapy. The regular inguinal lymph nodes resection has many serious problems such as large surgical incision, difficult incision healing, obvious depression in the surgical field after healing and impact on lymph return of lower limbs after surgery, even delayed incision healing, contracture of incision scar

and lymphedema of lower limbs (known as elephantiasis).

The endoscopic surgery has not been used as regular surgery in the inguinal lymph nodes resection of vulvar cancer. There were some reports of endoscopic inguinal lymph nodes resection of penile cancer but few of vulvar cancer. No technical report of endoscopic inguinal lymph nodes resection of vulvar cancer after lipolysis and liposuction surgery was found. Therefore, based on the review of common methods, such as lipolysis and liposuction, used in aesthetic plastic surgeries and endoscopic axillary lymph nodes resection of breast cancer (Guo et al., 2006; Aponte-Rueda et al., 2009), we explored the endoscopic inguinal lymph nodes resection of vulvar cancer to study the feasibility of this method as regular methods of inguinal lymph nodes resection of vulvar cancer.

In our initial report, we have reported our surgical process of 2 patients in detail (Wu et al., 2011). We conduct a summary and report as we have formed the complete technical route and obtained good surgical results on the basis of ten patients.

¹Department of Gynecologic Oncology, ²Department of Radiation of Gynecologic Oncology, ³Department of Chemotherapy, the Affiliated Jiangsu Cancer Hospital of Nanjing Medical University & Jiangsu Institute of Cancer Research, Nanjing, China *For correspondence: wqjsh@126.com



Figure 1. Inject the Lipolysis Liquid Fanwise, Suck out the Subcutaneous Fatty Tissue and Puncture into the Skin and Imbed Trocar

Materials and Methods

Patients

Select 7 cases of vulvar cancer patients received and treated at the Department of Gynecologic Oncology of Jiangsu Cancer Hospital and 3 cases of patients subject to consultation in other hospitals. Six cases were suffered the first operation and the others were received complement operation after local excision of vulvar cancer in other hospital.

This group of patients aged 30 to 68 years old, average 47.2 years old. They suffered vulvar tumor that was in the diameter of 3-4 cm from 4 months to 5 years. 2 cases had obviously enlarged inguinal lymph nodes, 4 cases were detected the enhancement of inguinal lymph nodes by Computed tomography (CT).

The standard of the patient include the following aspects, who has the indication of inguinal lymph node excision; under the age of 70 and without complications such as hypertension, diabetes or have been treated.

Methods

The field of operation: We take the inguinal region as surgical field, with 3 cm part above inguinal region ligament as upper bound, 10 cm part below inguinal region ligament as lower bound, inner side of anterior superior iliac spine as outer bound and outer side of tuberculum pubicum as inner bound.

Lipolysis and liposuction: After disinfection and draping, we used long puncture needle to puncture into subcutaneous fatty tissue from upper outer side of the operating field (2-3 cm part below anterior superior spine); injected lipolysis liquid fanwise (sterilized distilled water 250ml and physiologic saline for injection 250 ml and 2% lidocaine 20 ml and 0.1% adrenalin 1ml, applicable for both sides) (Guo et al., 2006); each side was injected with 150-200 ml; started liposuction after 15~20 minutes; then the subcutaneous fatty tissue was sucked out clearly (Figure 1).

Puncture into the skin and imbed trocar: We selected the first puncture holes that was located on 2-3cm part below anterior superior spine, and the others were respectively located on 3cm and 6cm part below the first



Figure 2. Up: The subcutaneous fatty tissue in the cavity of inguinal region was mostly dissolved after lipolysis and liposuction. **Middle:** Three lymph nodes (negative) were completely isolated from the fascia lata of inguinal region. **Down:** The right side of the inguinal lymph nodes had been removed, in which three lymph nodes were positive. **Stitch up all puncture holes and connect the drainage tube**

for puncturing into the skin and imbedding trocar to fill CO₂ gas (set the pressure as 8mmHg) (Figure 1).

Excision of inguinal lymph node: We observed the distribution of lymph nodes in the cavity firstly; separated and cut off araneose fat intervals, part of minute vessels and lymphatic with an ultrasonic scalpel; found the fascia lata at the bottom and excised the superficial inguinal lymph nodes in the cavity. Then we separated the great saphenous vein along the saphenous hiatus up, slightly separated tissue on the tributaries of great saphenous vein, excised femoral lymph node. Small lymph nodes could be directly excised and directly taken out from the trocar; as to the lymph node whose minimum diameter was larger than 1cm, directly used vessel forceps lightly pull out or enlarge the incision near the end of operation to take out the 1cm trocar after cutting off the lymphatic and small vessels linking to it (Figure 2).

Process after operation: After resection of lymph nodes in the operating field, we placed children stomach vessel with multihole under the operating field as drainage tube, stitched up all puncture holes with absorbable suture inside, connected the drainage tube to negative pressure absorbing ball after the end of operation, and oppressed the operating field with soft bag of normal saline after operation (Figure 2).

Adopt 2009 FIGO vulva cancer new staging method (Pecorelli, 2009) for operation pathological stage after operation.

Research experience

We have enough experience in conducting medical researches, including clinical researches, and have

Table 1. The Description of Ten Cases

Case	Age	History of the disease	Physical examination	
			Inguinal lymph nodes	Vulva
1	45	suffering right vulvar tumor for 4 months and finding the ulceration for 1 month	2x2x1cm on right	4x3x2cm on right
2	55	suffering right vulvar tumor for 5 years, obvious enlargement recently, and underwent an operation of local resection in other hospital	no obvious lymph node on both sides	visible surgical scar and subcutaneous induration in the size of 2x0.5x0.5cm on right
3	50	suffering vulvar tumors for 1 year on right region	touchable slightly enlarged lymph nodes in diffused distribution on right	multiple nodules on right, one of the biggest was in the diameter of about 1cm
4	35	Suffering right vulvar tumors for 9 months	touchable slightly enlarged lymph nodes in diffused distribution on right	4x2x1cm on right
5	30	17 days after the operation of resection of vulvar tumor in other hospital	touchable slightly enlarged lymph nodes in diffused distribution on right	a visible incision scar in the length of about 7 cm on right vulva
6	31	9 days after the operation of resection of vulvar tumor in other hospital	no obvious lymph node on both sides	a visible incision scar in the length of about 6cm on right region
7	60	suffering right vulvar tumor for 6 months	no obvious lymph node on both sides	4x3x2cm on right
8	68	Three years after VINIII excised	touchable slightly enlarged lymph nodes in diffused distribution on right	4x4x2cm on right
9	40	19 days after the operation of resection of vulvar tumor in other hospital	1x1x0.5cm on right	The incision was not healed on right region
10	58	suffering vulvar tumors for 3 months year on left region	no obvious lymph node on both sides	3x2x2cm on left

CM, centimeter; VINIII, vulvar intraepithelial neoplasia

Table 2. Comparison of Pathology of Vulva and Inguinal Lymph Nodes

Case	Preoperative pathology	Preoperative CT (LN)	Post-operation pathology (vulva)	Post-operation pathology (LN)	Time to remove drainage tube(days)
1	VINIII , Suspicious infiltration	positive	SCC,degree I-II	Left 1/4 Right 0/4	13 13
2	syringe-carcinoma	negative	Cancer remaining; foreign body reaction	Right 0/4	8
3	VINIII	positive	VINIII	Right 0/4	6
4	SCC?	negative	SCC,degree I	Right 0/8	7
5	SCC	negative	No remainder	Right 0/6	9
6	SCC	negative	No remainder; foreign body giant cell reaction	Right 0/5	10
7	SCC	negative	SCC, degree I	Right 0/11	10
8	SCC	positive	SCC, degree I	Right 2/18	9
9	poorly differentiated adenocarcinoma	positive	Adenocarcinoma, degree III	Right 3/12	8
10	SCC	negative	SCC, degree I	Left 0/17	10

LN, lymph nodes; SCC, Squamous cell carcinoma



Figure 3. Comparison the Right Inguinal Region in Operation and after 7 Months Follow-up of the Same Patient, Who Has Three Small Healing Incision with Slightly Skin Retraction of Inguinal Region

published some results elsewhere (Jiang et al., 2010; Gao et al., 2011; Huang et al., 2011; Li et al., 2011; Li et al., 2011; Li et al., 2011; Xu et al., 2011; Xu et al., 2011; Xu et al., 2011; Yan et al., 2011; Zhang et al., 2011; Gong et al., 2012; Gong et al., 2012; Gu et al., 2012; Li et al., 2012; Yu et al., 2012; Zhan et al., 2012; Zhan et al., 2012; Deng et al., 2013; Huang et al., 2013; Liu et al., 2013; Liu et al., 2013; Lu et al., 2013; Ni et al., 2013; Wu et al., 2013; Yin et al., 2013; Yin et al., 2013).

Results

Table 2 and Figure 3 showed all pathological results during and after operation and recovery of local groin after operation of all patients.

The patients of all 10 cases underwent CT examination before operation, and four cases showed inguinal lymph nodes enlargement obviously, three of which were demonstrated to be lymph node metastasis in pathological diagnosis after operation, FIGO IIIa-IIIb; another one case of VINIII patient showed one lymph node slight enlargement in groin and partial reinforcement through CT, and the pathological diagnosis after operation was negative. The lymph nodes in the groin of the rest patients were all negative. Ninety-three lymph nodes were excised in the operation of resection of lymph node in groin on 11 sides under the improperness mirror of the 10 cases in total, an average of 8.5 ± 1.6 . In the later 7 cases performed with technical skills, the amount of excised lymph nodes ranged from 5 to 18, an average of 11.0 ± 1.9 . We found that the number of lymph nodes examined by pathologist was approximately equal to the number of excised lymph nodes

that we photographed during the operation especially in the final 3 cases, which were 12, 18 and 17, an average of 15.7 ± 1.9 . In conclusion, it was showed that the amount of lymph nodes excised with mature technology of resection of lymph nodes in groin was comparable with that excised with conventional technology of resection of lymph nodes in groin.

During the operation of all 10 cases of patients, there was no significant bleeding. After operation, the inguinal region was oppressed with negative pressure drainage and oppression of the soft bag of normal saline, for which the time for tube drawing is 6-13 days, an average of 9.8 ± 0.8 days. The skin and subcutaneous tissue hardening of inguinal region of 4 patients returned to normal within 6 months, in consistent with the time the recovery of abdominal wall hardening after plastic operation of lipolysis and liposuction of abdomen took.

Discussion

The vulvar cancer is a rare gynecological oncology, the cause of which is persistent infection of high-risk type HPV as same as cervical cancer. We should focus on it because of the rising incidence in recent years. The conventional vulvar cancer surgery includes extensive resection of the vulva and inguinal lymph node resection. The common operation for inguinal lymph nodes resection normally adopts a 15 cm-long vertical incision at the partial inner side of medial midpoint crossing inguinal ligament, requiring stripping large subcutaneous fat that contains many lymph nodes within 15cm from top to the bottom of inguinal ligament which extends to anterior superior iliac spin and pubic tubercle. This operation creates large wound, probably which will not healing and need long-time dressing changing. The surgical scar is long and it's easy to form scar contressentire and keloid which are not beautiful.

Endoscopic inguinal lymph nodes resection surgery is adopted in the male carcinoma of penis and obtained a better effect (Tobias-Machado et al., 2008; Schwentner et al., 2013; Zhou et al., 2013). Place the laparoscope by piercing through skin below the navel and push it to the inguinal region after it was separating in the fat layer (Tobias-Machado et al., 2008). Or puncture into the subcutaneous fat along the middle of thigh upward, create small lacuna below the subcutaneous fat of inguinal region using the laparoscope and inject CO₂ to form air space and then cut the adipose and lymphoid tissue like traditional surgery. Recently, there also have several reports (Xu et al., 2011) about such operation used in vulvar cancer. This operation has the similar operation area with the conventional section operation and obtains good efficacy. However, there is no report on endoscopic inguinal lymph nodes resection surgery by using lipolysis and liposuction to remove the adipose tissue of the inguinal region to show the lymph nodes.

The lipolysis and liposuction are widely used in plastic surgery for many years which is safe and effective for plastic and cosmetic operations. Injection of normal saline blending with lidocaine and adrenergic (Tumescent Technique) was proposed by Klein in 1987 firstly and now

it is used also in the treatment of tumor.

It is common to use the laparoscopic operation with lipolysis and liposuction in the breast cancer auxiliary lymph nodes resection surgery (Guo et al., 2006; Aponte-Rueda et al., 2009). On this basis, we firstly applied the lipolysis and liposuction in the endoscopic inguinal lymph nodes resection of vulvar cancer surgery and obtained a good operation result. The lipolysis and liposuction are conducted for the subcutaneous fatty tissue at the operative region. This method is conducive to the adequate exposure of operating field as well as to the avoidance of uneven operative area after operation, and this method is the critical step for a successful operation. The hypotonic effect of lipolysis agent may cause swelling fracture of fat cells which is conducive to the removal of the adipose tissue; the effect of contracting blood vessel of the lipolysis agent could reduce the amount of bleeding during the liposuction and operation which is conducive to the display and operation in the operative field; the liposuction uses a metal sucker with side hole to connect the central vacuum aspiration (sucking pressure is 0.04-0.08 Mpa) and this will be conducive to controlling and avoiding damage of skin and vessels. All cases in this group received well-distributed liposuction and the saline bag was evenly distributed to the surgical field of inguinal region after operation, the appearance of the inguinal region was smooth. The liposuction removed most parts of adipose tissue in this area which only left the subcutaneous fat space and lymph vessel as well as the "hanging" lymph nodes, so that it was easy to remove the lymph nodes one by one.

This operation has small wound on the skin (5 mm, 10 mm) that can be sutured inside with absorbable suture material with small scar after healing. Negative pressure drainage shall be placed after the operation with a saline bag pressing the wound to make the wound healed evenly. The lymph drained by the drainage tube will disappear 9.8 ± 0.8 days. The three small incisions will heal at the phase I and have less impact on the lymphatic return of lower limbs. The negative pressure suction and the saline bag respectively placed inside and outside the inguinal fold will play an important role in healing of the wound and smooth of the skin at the inguinal region after operation.

Compared with regular operation, the endoscopic inguinal lymph nodes resection surgery don't need to remove large area of adipose tissue as well as cut the lymph vessels crossing the lymph of low limbs. With the assistance of size of tumor and preoperative imaging CT, the side of groin to be conducted through endoscopic inguinal lymph nodes resection surgery can be identified. The lymph vessels and surrounding connective tissue would be cut after the lipolysis and liposuction, then the exposed lymph nodes could be removed with small wound. The average amount of lymph nodes excised with mature technology of resection of lymph nodes in groin was 11, which is more than most of the previous reports. Based on the exfoliative cytological examination of flushing fluid postoperation, endoscopic inguinal lymph nodes resection surgery will not increase the risk of tumor metastasis (Guo et al., 2009). As the number of lymph vessels which has been cut is not as many as that in the

regular operation, it has less impact on the lymphatic return of low limbs as well as the function of low limbs. Parts of patients had subcutaneous tissue hardening on the inguinal region for a short time after the operation that was caused by partial lymph left in the inguinal region after pulling out the drainage tube and was a common reaction of lipolysis and liposuction. This hardening appears that hypodermic hardening blocks of inguinal region which will be scattered after absorption and be totally absorbed after 3 to 5 months with elastic skin and smooth surface but the color of the skin is normal. The lymphoedema will disappear after the lymph vessels recover.

Compared with reported endoscopic inguinal lymph nodes resection, our operation has the following characteristics. (1) Our unique Surgical incision is located on the upper outer side of operations field that is different from the others (Figure 1-3). (2) Our operation field is a potential cavity whose wall is relatively flat, therefore we can separate the fascia lata clearly without incising fascia lata to muscular tissue which is used as the bottom boundary of inguinal lymph node resection (Figure 2). Superficial inguinal lymph nodes lie above the fascia lata, below the inguinal ligament and along the femoral vessels which are exposed by endoscopy and removed one by one. Deep inguinal lymph nodes are deeply buried in the inside of femoral vein that is located in the inside of the tributaries of great saphenous vein. We lift the remaining adipose connective tissue inside of the tributaries of great saphenous vein to show the lymph nodes the number of which is usually 1-4 and remove them without cutting and removing the tunica vaginalis of femoral artery and femoral vein. We retain the fascia lata when remove the deep inguinal lymph nodes and achieve good effect in accordance with the methods that reported by Bell (Bell et al., 2000) from 2001. Guidelines on vulvar carcinoma reported on FIGO Cancer Report 2012 recommended that it is not necessary to excise the fascia layer in order to cut off the deep inguinal lymph nodes and suggested that the deep inguinal lymph nodes which are in inside of the tributaries of great saphenous vein and around saphenous hiatus could be excised directly without removing the tunica vaginalis of femoral artery and femoral vein. (3) Women contrasts with men are richer in fat tissue on the inguinal region so it is easier to lipolysis and liposuction. The surface of skin and fascia lata in the inguinal cavity is relatively flat after sucking out the dissolving fat. The inguinal region is also covered with elastic and smooth skin under postoperative negative pressure attraction and external oppression (Figure 3).

The endoscopic inguinal lymph nodes resection after lipolysis and liposuction surgery had no obvious bleeding because of the adrenaline in the lipolysis liquid and the operation was stable with no complications, which is also safe; the post-operative small incision at the outer side of inguinal region healed at phase I with small scars. The lymphedema at the inguinal region disappeared within short time and the skin was also elastic and smooth. All of the above show that the endoscopic inguinal lymph nodes resection after lipolysis and liposuction surgery has minimally invasive surgery as well as a cosmetic surgery, which is also effective, the number of groin lymph nodes

removed in this surgery is more than that the average number of anatomic lymph nodes and removed by other technologies. We think that our surgery has significant advantages that can replace the conventional large incision inguinal lymph nodes resection surgery as an alternative regular surgery. We hope to expand clinical cases to get better results.

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