Saphenous vein-preservation technique: the no more complications after inguinal lymph-node dissection

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Background
The upper part of the saphenous vein is removed in traditional inguinal lymph-node dissection. We believe that maintaining the saphenous vein during inguinal lymphadenectomy would reduce morbidity without compromising the oncological safety.

Introduction
The main step in the management of metastatic cancer involving the inguinal lymph node is inguinal lymph-node dissection, but this surgical method is accompanied with postoperative morbidity. The common surgical complications are wound dehiscence and lymphedema, and lowering the rate of their occurrence improves the patient's quality of life.

Aim
To evaluate saphenous vein-preservation technique during modified inguinal lymph-node dissection as regarding postoperative short-term and long-term complications.

Patients and methods
A prospective study of 53 patients with metastatic carcinoma to inguinal lymph node who underwent inguinal lymph-node dissection between January 2017 and January 2021 at the Surgery Department, Menoufia University Hospital, Egypt. Short-term and long-term postoperative complications were assessed.

Results
About 53 patients underwent 61 inguinal lymph-node dissections. In 58 patients, the saphenous vein was maintained. Cellulitis occurred in 12% of the patients, thrombophlebitis occurred in 5.1%, hematoma occurred in 3.4%, seroma occurred in 3.4%, deep-vein thrombosis occurred in 1.7%, and partial wound dehiscence occurred in 1.7%. Lymphedema occurred in 20.6% in the first 3 months, in 8.6% after 6 months postoperatively. Chronic lymphedema (12 months) was present in only 1.7% of the patients and disappeared completely in 18 months postoperatively. There is no locoregional tumor recurrence.

Conclusions
The technique of the saphenous vein-preservation strategy during inguinal lymph-node dissections minimizes both short-term and long-term postoperative problems while maintaining oncological safety outcome.

Recommendation
In patients undergoing inguinal lymph-node dissection, the saphenous vein is better preserved.

Keywords:
inguinal lymph-node dissection, lymphedema, saphenous vein preservation

Introduction

The main surgical treatment for regional management of metastatic inguinal lymph-node cancer is resection of the underlying malignant tumor with inguinal lymph-node dissection [1]. This surgical procedure is linked to a high rate of postoperative morbidity. Cellulitis, hematoma, phlebitis, deep-vein thrombosis (DVT), seroma, and wound dehiscence have all been recorded as wound complications with rates as high as 71% [2]. The occurrence is due to the incision for inguinal lymphadenectomy, which is associated with skin-flap devascularization and disruption of collateral lymphatic and vascular channels [3]. Chronic lymphedema is the most hazardous long-term consequence, lowering the patient's quality of life [4].

The traditional inguinal lymph-node dissection entails ligation of the upper segment of the saphenous vein, which drains medially into the femoral vein, and is frequently accompanied with surgical complications

such as lower-limb lymphedema, cellulitis, and wound dehiscence [5].

Many procedures, such as maintaining the muscle fascia [6], pedicled omentoplasty [7], and sartorius transposition, have been found to decrease the postoperative complications [8].

Aim

To evaluate the value of saphenous vein-preservation technique during inguinal lymph-node dissections for patients with metastatic inguinal lymph-node carcinoma as regards the short-term and long-term postoperative complication rate.

Patients and methods

This is a prospective study carried out on 53 patients (32 women, 21 men) who underwent inguinal lymph-node dissection with saphenous vein-preservation technique for metastatic inguinal lymph-node cancer between January 2017 and January 2021 were included in this study. Patient's informed consent was taken and the study was approved by the faculty ethical committee.

Preoperative evaluation

(1) Pathological evaluation of inguinal metastasis by fine-needle aspiration cytology or true-cut biopsy method was done. Open biopsy was done for the primary tumor. Diagnosis of nodal metastases: sentinel lymph-node mapping was performed when the tumor was early and lymph node is not palpable.
(2) Preoperative assessment of lower-limb circumference: measurements were done at the points of the medial malleolus, 10 cm below the medial tibial condyle (MTC), 10 cm above the MTC, and the midpoint between anterior–superior iliac spine and MTC.
(3) Duplex study was done to all cases to exclude DVT.

Operative technique

Prior to the inguinal lymphadenectomy, the main tumor was resected completely. If the tumor was unilateral in vulvar cancer, only ipsilateral inguinal dissection was performed (Fig. 1). But if radical vulvectomy will be done, bilateral inguinal lymph-node dissection was done (Fig. 2). In melanoma (Fig. 3) and metastatic inguinal cancer patients (Fig. 4), the tumor was removed primarily with

Figure 1

(a) A 60-year-old-female patient having unilateral vulva cancer. (b) Saphenous vein sparing inguinal lymph-node dissection. (c) Postoperative pathology specimen. (d) One-year follow-up shows no lymphedema.

safety margin according to its stage and primary reconstruction was done and then unilateral inguinal lymph-node dissection was done.

All inguinal lymphatic tissue (superficial and deep) and node-bearing tissue superior to the inguinal ligament but superficial to the external abdominal oblique apo neurosis are removed en bloc within the femoral triangle. A conventional 10–12-cm incision extending from 2 cm below the inguinal ligament to the apex of the femoral triangle was used to dissect the inguinal lymph nodes. The upper and lower skin flaps were raised. The muscle and abdominal wall fascia are used to define the dissection's borders. The anterior–superior of the iliac spine and the pubic tubercle serve as superior limits. The adductor longus and sartorius muscles form the inferior borders. The lower extent of dissection is marked by the apex of the femoral triangle (the point where these two muscles cross). All the fibro-fatty tissue that was embedded in these boundaries was completely removed en bloc.

Classical inguinal lymph-node dissection

The saphenous vein is sacrificed during the inguinal portion of the lymphadenectomy in classic inguinal lymphadenectomy, splitting the vein first distally near

Figure 2

(a) A 73-year-old female patient has bilateral vulva cancer. (b) Radical vulvectomy. (c) Saphenous vein sparing inguinal lymph-node dissection. (d) Bilateral inguinal wound incision. (e) Pathology specimen. (f) Patient 18 months postoperatively.

the apex of the femoral triangle and then proximally at the sapheno-femoral junction.

Classical inguinal lymph-node dissection

The saphenous vein is sacrificed during the inguinal portion of the lymphadenectomy in classic inguinal lymphadenectomy, splitting the vein first distally near the apex of the femoral triangle and then proximally at the sapheno-femoral junction.

Modified inguinal lymph-node dissection (saphenous vein-preservation technique)

The saphenous vein was identified and dissected at the level of the femoral vein entry site and was preserved during inguinal lymph-node dissection. All of the vascular-compromised skin was removed after the dissection was finished. Suction drains: Suction drains were used routinely in all patients.

Postoperative care

(1) For DVT prophylaxis, all of the patients were given low-molecular-weight heparin 12 h after surgery.

Figure 3

(a) A 54-year-old patient had lateral side foot melanoma. (b) A 37-year-old patient had upper-leg melanoma. (c) A 42-year-old patient had heal melanoma. (d) Saphenous vein sparing inguinal lymph-node dissection.

(2) All the patients were administered with prophylactic antibiotics.
(3) When the suction drain was less than 50 ml in 24 h, it was removed.
(4) All patients were scheduled for follow-up visits in the first and second weeks after surgery to monitor wound complications such as wound infection, seroma development, hematoma, DVT, and wound dehiscence.
(5) All patients were advised for regular visits at 3 months postoperative, 6 months postoperative, 12 months postoperative, and 18 months postoperative at the outpatient clinic for assessment of the long-term postoperative complication, lymphedema and locoregional recurrence.

Follow-up of lymphedema

Patients were followed up on for the development of lower-limb lymphedema, and preoperative limb-circumference measures were taken for both legs at the same time. Lymphedema was defined as the difference between the two legs equal to or greater than 7% of the sum of all circumferences (of the predetermined four circumference-measurement points) [9].

Figure 4

(a) A 67-year-old male patient having squamous-cell cancer leg. (b) Pathology specimen. (c) Saphenous vein sparing inguinal lymph-node dissection. (d) Postoperative wound and drain.

Results

This study involved 53 patients (32 women and 21 men) with metastatic inguinal lymph-node cancer. The median age of the participants was 59 years (range, 62.15±10.71 years). There were 13 patients with melanoma, 24 with vulva cancer, 15 with metastatic inguinal squamous-cell carcinoma lower limb, and one with penis cancer. Unilateral inguinal lymph-node dissection was done in 45 patients and bilateral inguinal lymph-node dissection was done in eight patients with the total number, 61 inguinal lymphadenectomies. In three patients with unilateral inguinal lymph-node dissection, the saphenous vein was ligated and these three patients were excluded from the study. The average follow-up duration was 3 months for 46 patients, 6 months for 37 patients, 12 months for 25 patients, and 18 months for nine patients, with three patients lost to follow-up (Table 1).

The inguinal area was the site of 16 (27.5%) early postoperative complications. There were seven (12%) patients with wound cellulitis and two (3.4%) patients with seroma, thrombophlebitis was noted in three (5.1%) patients, DVT occurred in one (1.7%) patient, and two (3.4%) patients had wound hematoma. There was only one (1.7%) patient who had partial wound dehiscence (Table 2).

Lymphedema developed in 12 (20.6%) patients after 3 months, 5 (8.6%) patients after 6 months, and one (1.7%) patient after a year. There was not any chronic lymphedema formation at the 18-month follow-up of our patients. During the follow-up period, none of the patients had any local or regional recurrences. Only three patients developed distant metastases 6 months after surgery and they were lost during the follow-up period (Table 3).

Discussion

The upper segment of the saphenous vein that empties into the femoral vein is ligated and resected in a traditional inguinal lymphadenectomy.

Postoperative complications following classical inguinal lymph-node dissection being the rule rather

Table 1 Patients demographic characteristics

Age (years)	62.15±10.71 (range, 59–68)
Sex	
Female	32
Male	21
Total number	53
Diagnosis	
Melanoma	13
Vulva cancer	24
Squamous-cell carcinoma lower-limb	15
Penis cancer	1
Site	
Unilateral inguinal lymphadenectomy	45
Bilateral inguinal lymphadenectomy	8
Total number	61
Inguinal lymphadenectomy with	
Saphenous vein preservation	58
Saphenous vein ligation	3
Follow-up duration	
3 months	46
6 months	37
12 months	25
18 months	9
Lost to follow-up	3

Table 2 Short-term postoperative complications

	n (%)
Cellulitis	7 (12)
Seroma	2 (3.4)
Hematoma	2 (3.4)
Phlebitis	3 (5.1)
Deep-vein thrombosis	1 (1.7)
Pulmonary embolism	0
Partial wound dehiscence	1 (1.7)

Table 3 Long-term complication outcome

	3 months	6 months	12 months	18 months
Lymphedema	12(20.6)	5 (8.6)	1(1.7)	0
Local recurrence	0	0	0	0
Distant metastases	0	3	0	0

than exception [10]. Several surgical techniques have been developed to lessen the complications [5].

The preservation of nonlymphatic structures during inguinal lymph-node dissection, such as saphenous vein, was proposed with the aim to reduce both the short-term (wound complications) and long-term (lymphedema) complications.

Wound infections, seroma, hematoma, DVT, thrombophlebitis, and wound dehiscence are the most common wound consequences after inguinal lymphadenectomy [11]. Serpell *et al.* [1] reported a 71% wound-complication rate after inguinal lymphadenectomy for melanoma, with 25% infection rate, 46% seroma rate, and 25% wound-dehiscence rate.

In this study, the overall wound-complication incidence was 22.4%, with cellulitis accounting for 12%, phlebitis for 5.1%, seroma for 3.4%, and hematoma for 3.4%. In a prospective research, Chang *et al.* [11] discovered a 77% wound-complication rate after inguinal lymphadenectomy for melanoma, with a 55% infection rate. Seroma is in 28% of cases, while wound disintegration is seen in 53% of cases. According to this study, where saphenous

vein sparing was the only intervention, wound complications were significantly lower than in earlier trials.

In this study, the incidence of cellulitis was 22.4%, but there is no evident wound infection. Because cellulitis can cause delayed wound healing and early wound disintegration, cellulitis and wound dehiscence are linked together. Prophylactic antibiotics, excellent intraoperative hemostasis, early removal of the wound drain, and excision of the vascular compromised skin edges during the procedure may all aid to reduce wound-cellulitis rates.

In this study, seroma formation was observed in two (3.4%) patients and hematoma in two (3.4%) patients. Seroma was managed by repeated needle aspiration and no surgical management was needed, but hematoma was drained surgically under local anesthesia. Previous studies showed that the incidence of hematoma and seroma problems ranges from 2 to 42% [12,13].

In this study, there was only one patient with partial wound dehiscence and he was managed conservatively with daily dressing and topical treatment without surgical interference. The 'saphenous vein preservation technique' is beneficial to wound dehiscence rather than other short-term skin complications. This may be due to improvement of the venous drainage from the compromised skin flap and the low rate of wound infection.

Lymphedema is the most distressing long-term consequence of inguinal lymph-node dissection. Lymphedema is a chronic medical condition in which a protein-rich fluid accumulates in the body,

causing inflammation, adipose tissue hypertrophy, as well as fibrosis. Lymphedema patients experience physicosocial morbidity, impaired-extremity function, cellulitis, epidermal lymph leak (lymphorrhea), and lymphangiosarcoma development. The patients' quality of life is further lowered as a result of these problems [14]. Lymphedema is a well-known long-term consequence of inguinal lymph-node dissection, involving 14–48% of women after vulvar cancer surgery [15], and 9–64% of patients receiving melanoma surgery [16]. The exact mechanism of preservation of nonlymphatic system, the saphenous vein, and the low incidence of the lymphedema is not clear, it is suggested that high venous reflux and decreased pressure in the venous end and lymphatic–venous connections within the saphenous vein territory may play a role.

The incidence of lymphedema in this study was 20.6% in the first 3 months, 8.6% after 6 months, and just one (1.7%) patient after a year who totally recovered after 18 months. We noted that lower-limb lymphedema was worse in the first 6 months, and then steadily improved, till it fully disappeared after 18 months.

Secondary lymphedema after cancer surgery is caused by a malfunction of the lymphatic drainage system. Its pathophysiology can be explained in two ways. First, lymphedema is the result of a complicated interaction between lymphatic angiogenesis and inflammation at the cellular level, lipid metabolism, and fibrosis. Second, a complex pathophysiology has been recognized within the saphenous vein area, highlighting the involvement of increased venous reflux and concomitant lower pressure in the venous end and lymphaticovenous connections [17]. The disruption of the lymphatic system caused by inguinal lymph-node dissection has been linked to an increase in both subcutaneous and intramuscular-compartment pressures in the lower limb [18]. As a result, maintenance of the saphenous vein main trunk and its tributaries enhances local blood circulation and maintains endothelial cell homeostasis, which reduces the incidence of lymphedema associated with venous injury and facilitates wound healing. The traditional lymph-node dissection procedure, radical neck dissection, has been enhanced by sparing nonlymphatic structures in order to reduce long-term postoperative problems [19]. The removal of the internal jugular veins in radical neck dissections frequently causes maxillofacial edema due to face venous-reflux disturbance or intracranial hypertension, resulting in headache and disorientation [19]. The internal jugular vein, sternocleidomastoid muscle, and accessory nerve are all preserved with a modified radical neck dissection attaining safe oncological excision of localized tumor while reducing morbidity of radical neck dissection [20,21].

The preservation of the saphenous vein was linked to a lower risk of postoperative morbidity without influencing the radical resection of localized metastases in this study.

In this study, the patients had no local or regional recurrence of the primary tumor after a follow-up time spanning from 3 to 18 months, except for three (5.1%) patients who developed systemic metastasis and five patients were lost during the follow-up. Saphenous vein-preservation technique seems to be a safe procedure for metastatic inguinal cancer patients as regards the safe oncological point of view.

Conclusion
Saphenous vein-preservation technique during inguinal lymph-node dissection reduces both short-term wound complication (wound dehiscence) and long-term lymphedema morbidity with high oncological safe procedure (no local or regional recurrence).

Conflicts of interest
There are no conflicts of interest.

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