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Island Gluteal Thigh Flap for Coverage of Ischial Bed Sores

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ABSTRACT

Background: Many flaps have been described for reconstruction of ischial pressure sores; each of them has its merits and drawbacks. Gluteal thigh flap have been reported for coverage of ischial defects. Several variations of the gluteal thigh flap have been used, including a transposition flap, an advancement flap and an island flap. This study aimed at evaluation of the reliability of the island gluteal thigh flap in primary ischial pressure sores reconstruction.

Patients and Methods: A prospective study was performed on 13 patients (10 males and 3 females), admitted to the Dep. of Plastic Surgery between June 2016 and June 2019, suffering from ischial pressure ulcers. Of them, eight were grade III and five were grade IV who underwent island gluteal thigh flap for coverage. The mean age of patients was 31.3 years. The mean ulcer size was 4.9x7.1cm. 13 island gluteal thigh flaps were used.The mean flap dimensions were 8.1cm in length and 5.9cm in width. The donor sites were closed primarily in all patients.

Results: 13 island gluteal thigh flaps were used.The mean flap dimensions were 8.1cm in length and 5.9cm in width. The donor sites were closed primarily in all patients. Twelve flaps survived completely. There was no complete flap loss in our study. However, we had an overall rate of complications about 23%; venous congestion in 2 cases, partial superficial flap necrosis in 1 case and hematoma in 1 case. After an average follow-up period of 12 months, one ulcer (7.7%) recurred.

Conclusion: Island gluteal thigh flap is reliable in primary ischial pressure sores reconstruction provided that the primary source vessel is included. This flap is highly efficient and easy to raise. It spares adjacent cutaneous territories for recurrent cases and preserves gluteus maximus muscle for patients who will be ambulant with minimal donor site morbidity.

Key Words: *Ischial bed sore – Reconstruction – Island gluteal thigh flap.*

INTRODUCTION

Pressure ulcers constitute an important problem in bed-ridden patients' e.g. paraplegics and geriatric patients. The ischial pressure ulcers remain the most challenging ones to treat due to high rate of wound complications and tendency for recurrence **[1]**. So, we should select a treatment option that provides the least invasive and durable coverage, while preserving the maximum skin capital for the recurrent cases **[2]**. Various flaps have been used for ischial pressure ulcers reconstruction including Gracilis **[3]**, Gluteus maximus **[4]** and Tensor fascia lata myocutaneous flaps **[5]**, V-Y hamstring advancement flap **[2]**, profunda femoris artery perforator based V-Y advancement flap **[6]**, gluteal thigh flap **[7]** and inferior gluteal artery perforator flap **[8]**. Nevertheless, plastic surgeons were unable to reach a consensus about the ideal type of myocutaneous or fasciocutaneous flap that should be used for closure of ischial sores **[9]**.

Hurwitz was the first to describe the gluteal thigh flap in 1980 **[10]**. It is a sensate fasciocutaneous flap that is dominated by the descending branch of the inferior gluteal artery (IGA) and the posterior femoral cutaneous nerve **[1]**. Several variations of the gluteal thigh flap have been reported, including a transposition flap, an advancement flap and an island flap for coverage of sacral, ischial, perineal and trochantric defects and even as a free flap for distant defects **[11]**. Gluteal thigh flap has been considered the flap of choice for ischial pressure sores reconstruction by the Swiss Paraplegic Center at Nottwil **[12]**. Recently, the introduction of the Handheld Doppler to identify flap-feeding vessels, particularly perforating arteries and better understanding of the vascular anatomy of posterior thigh skin have led to a renewed interest in the island gluteal thigh flap. In the present study, we aimed to evaluate the reliability and efficiency of the island gluteal thigh flap in primary ischial pressure sores reconstruction.

Anatomical basis of gluteal thigh flap:

The inferior gluteal artery (IGA) leaves the pelvis via the infrapiriform aperture and courses beneath the gluteus maximus muscle supplying its lower two thirds and the overlying skin via multiple musculocutaneous perforators **[10]**. The artery continues in the posterior aspect of the thigh as the descending branch of IGA. It enters the posterior thigh at a point midway between the ischial tuberosity and the greater trochanter at the lower border of the gluteus maximus muscle (Fig. 1), where it gives off a cutaneous branch that runs around the inferior border of the muscle perforating the fascia lata. Then, it makes an anastomosis with the perforators of the obturator and medial circumflex femoral arteries within the subcutaneous tissue [13]. The descending branch of IGA continues in the posterior thigh with the posterior femoral cutaneous nerve medial to it at the subfascial level in the groove between the biceps femoris and semitendinosus muscles [14]. A poorly developed artery may be not enough as the main blood supply for an island flap [15]. Walton et al. [16] assumed a dual blood supply of the skin territory of the posterior thigh with a fascial plexus lying above the deep fascia that is nourished by the perforators of the obturator, femoral and inferior gluteal arteries and a subfascial plexus that is fed by the descending branch of IGA.

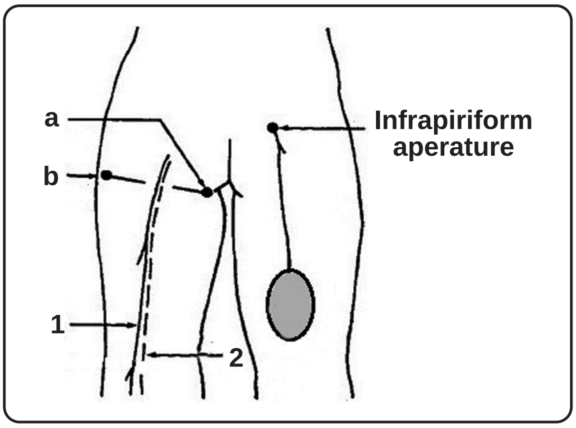

Fig. (1): Design of the island gluteal thigh flap along the course of descending branch of inferior gluteal artey. (1) Descending branch of IGA entering posterior thigh at a point midway between (a) the ischial tuberosity and (b) the greater trochanter. (2) Posterior femoral cutaneous nerve medial to the artery.

The venous drainage of the gluteal thigh flap is provided by the venae comitantes that accompany the descending branch of IGA and the profunda femoris perforators. In addition, there is a superficial subcutaneous venous system that may drain medially into the great saphenous vein, accordingly peninsular flap in this region rarely develops venous congestion that may happen in island flap when the descending branch of IGA is hypoplastic or not included within the flap [12].

PATIENTS AND METHODS

A prospective study was performed between June 2016 and June 2019 in Plastic Surgery Department, Tanta University Hospital, on 13 patients (10 male and 3 female), aged from 20 to 45 years (mean: 31.3±1.82 years), admitted with ischial pressure ulcers (8 were grade III and 5 were grade IV). The ulcers were localized in the left side in 9 patients and in the right side in 4 patients. Eleven cases had paraplegia (10 traumatic spinal cord injuries and one spina bifida) and two had quadriplegia (traumatic spinal cord injury). The ulcers ranged in size from 4x5 to 6x9cm (mean: 4.9x 7.1cm). Patients with recurrent ulcers, or with osteomyelitis, as well as those with absent descending branch of IGA were excluded from the study. All ischial pressure sores were covered by the island gluteal thigh flap.

After approval from the University Ethical Committee and upon completion of the written informed consent by the patients or their relatives, all subjects were evaluated for surgical interference and associated medical conditions were dealt with. Thorough education of the patients and their relatives about the postoperative general care and pressure relief to adjust the patients' daily living activities after the operation. All cases underwent standard bowel preparation preoperatively.

Preoperative marking:

With the patient in prone position, the ischial tuberosity and the greater trochanter were marked as fixed anatomical landmarks, and then the axis of the flap was outlined on the posterior thigh as a line from midpoint between the ischial tuberosity and the greater trochanter to midpoint of the popliteal fossa. Handheld Doppler was used to detect the perforator at the midway between the ischial tuberosity and the greater trochanter along the gluteal crease representing the superficial vascular system of the flap. Two cm distal to this point was marked as the end point of dissection to preserve the dual blood supply of the flap. A mark is made 10 cm above the popliteal crease representing the distal limit of the flap. The skin island was designed to include the pedicle and to be 1cm larger than the defect in all dimensions. The length of the pedicle was marked to allow safe rotation of the flap whereas the width of the adipofascial pedicle was kept at 4cm to preserve the venous outflow of the flap. A lazy S incision was planned between the skin island and the end point of dissection for adipofascial pedicle elevation (Fig. 2).

Surgical technique:

All procedures were done in prone position, with hips slightly flexed, under general anesthesia. The ulcerated area, the bursa and any devitalized soft tissues were excised down to the healthy tissue with care to avoid injury of the nearby structures (Fig. 3). Any bony prominences were excised to preserve a smooth non-prominent ischial surface.

An incision was created at the distal edge of the flap through skin, subcutaneous tissue and fascia lata exposing the descending branch of IGA and posterior femoral cutaneous nerve (Fig. 4). The axis of the flap was readjusted according to the position of the artery (if no vessel could be found, the island flap should be converted to peninsular flap). Creating the lazy S incision over the adipofascial pedicle with elevation of the skin flaps on both sides to expose the adipofascial pedicle. Superficial veins were included within the 4cm width of the pedicle. Afterwards, incisions around the flap were completed. The flap was elevated from distal to proximal at a subfascial plane to preserve the neurovascular pedicle (Figs. 5,6). The endpoint of dissection was kept at 2cm distal to the midpoint between the ischial tuberosity and the greater trochanter. The flap was rotated to the defect passing through a created wide tunnel and fixed with loose sutures. All donor sites were closed primarily (up to 8cm can be closed primarily) (Fig. 7). Two suction drains were used; one was placed under the flap for 7-10 days and the other in the donor site for 2 days.

Post-operative care:

Patients were maintained in prone position for a period of 3 to 4 weeks. In addition, a low residue fiber diet was instituted for 2 weeks and careful hygiene of the perineum was carried out. Patients were kept for another month on air mattress and entirely non weight bearing on the site of the flap, with periodic change of the position. Subsequently, a sitting protocol that entails increase in pressure on the flap site gradually which was delayed in presence of wound complications.

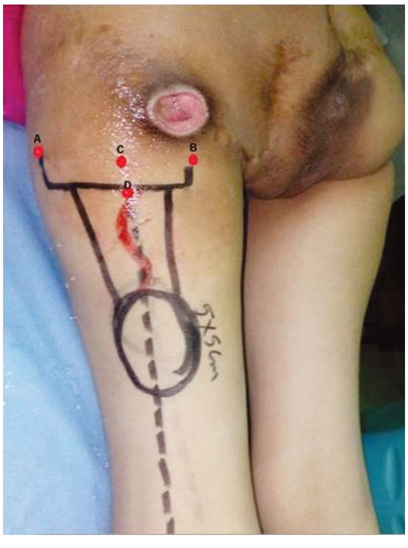

Fig. (2): A 30-year-old female paraplegic with left grade IV ischial sore. (Pre-operative marking) (A) The greater trochanter. (B) The ischial tuberosity. (C) Point midway between the ischial tuberosity and the greater trochanter. (D) The end point of dissection to preserve the dual blood supply of the flap 2cm distal to point C.

Post-operative monitoring:

The flap perfusion was monitored for early detection of venous congestion. Occurrence of other complications as hematoma, infection, flap necrosis, wound dehiscence and donor site morbidity were carefully recorded. Flap survival and durability of coverage were assessed for all patients, whilst, recurrence was considered in patients in which the lesion reappeared after one month of complete wound healing.

RESULTS

(Example cases are illustrated in Figs. 9-15):

Over a 3-year period, we used 13 island gluteal thigh flaps ranging in size from 5x6 to 7x10cm (mean: 5.9x8.1cm) for primary ischial pressure sores reconstruction. The summarized data about the patients and the outcomes are shown in Table (1). Major complications such as total flap loss were not recorded in our series. Twelve flaps survived completely. The procedures had a complication rate of 23% (3 out of 13). Two cases of venous congestion required medical leeches therapy; one resolved completely without any loss and one developed partial superficial necrosis that healed secondarily. One case had hematoma at the donor site that necessitated surgical drainage.

After an average follow-up period of 12 months (range from 7 to 18 months), twelve flaps provided satisfactory healing and stable coverage. One ulcer (7.7%) had local recurrence of the pressure sore after 5 months due to prolonged weight bearing with lack of proper nursing care and was managed by inferior gluteus maximus myocutaneous flap.

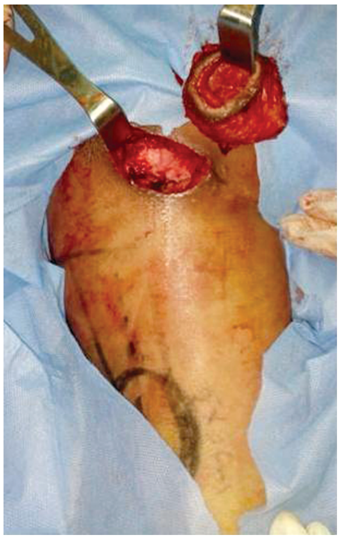

Fig. (3): The ulcerated area and the underlying bursa were excised down to the healthy tissue (en bloc).

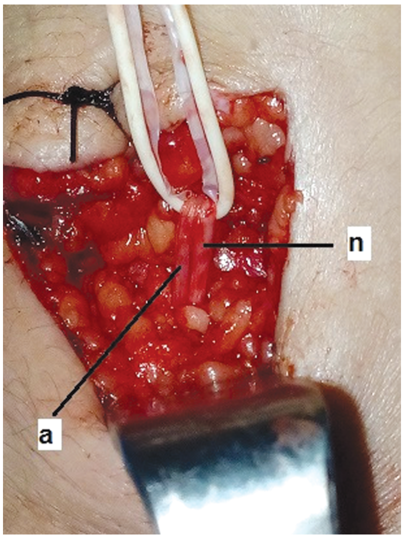

Fig. (4): An incision was created at the distal edge of the flap exposing the descending branch of IGA (a) and posterior femoral cutaneous nerve (n).

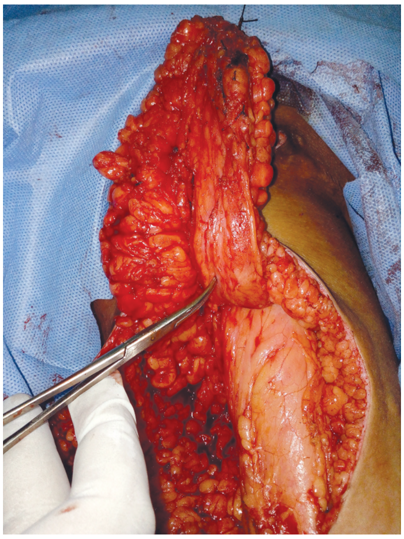

Fig. (5): Undersurface of the flap. Tip of the haemostat pointing at the neurovascular pedicle.

Fig. (6): The flap completely harvested with a 4cm wide adipofacial-pedicle, wide tunnel created and ready for insetting.

Fig. (7): Immediate postoperative result. Flap inset filling the defect and donor site closed primarily.

Fig. (8): Late postoperative results after 5 months showing sound healing.

Fig. (9): A 25-year-old male paraplegic with left grade III ischial sore. (Preoperative flap design).

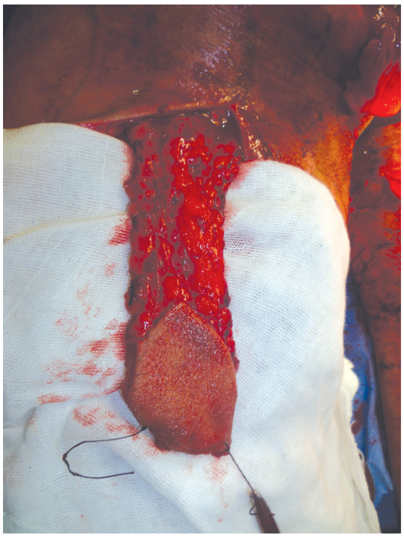

Fig. (10): The width of the adipofascial pedicle was kept at 4cm to preserve the venous outflow of the flap.

Fig. (11): Immediate postoperative results.

Fig. (12): Late postoperative results after 7 months showing sound healing.

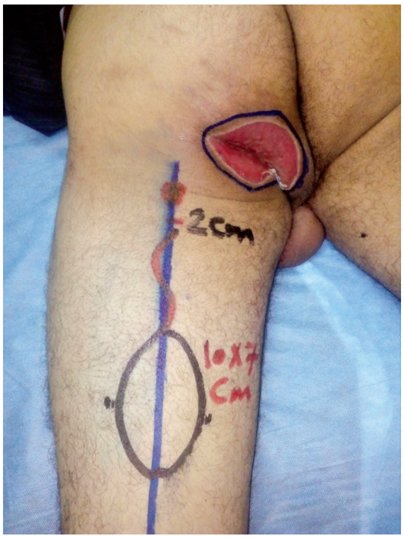

Fig. (13): A 32-year-old male paraplegic with left grade III ischial sore. (Preoperative flap design).

Fig. (14): Immediate postoperative results.

Fig. (15): Late postoperative results after 3 months showing sound healing.

Table (1): Summary of patients ' data.

No.	Age (yr)/Sex	Status	Defect size (cm)	Flap size (cm)	Complications	Flap survival	Follow-up (mo)
1	25/M	Paraplegia witht Lt ischial PU grade III	4x7	5x8	–	Complete	9
2	30/F	Paraplegia witht Lt ischial PU grade IV	4x5	5x6	–	Complete	12
3	21/F	Paraplegia with Rt ischial PU grade III	6x8	7x9	Venous congestion	Complete	7
4	40/M	Paraplegia witht Lt ischial PU grade IV	5x6	6x7	Hematoma	Complete	15
5	30/M	Paraplegia witht Lt ischial PU grade III	4x5	5x6	–	Complete	10
6	32/M	Paraplegia witht Lt ischial PU grade III	6x9	7x10	–	Complete	10
7	42/M	Quadriplegia witht Lt ischial PU grade IV	6x7	7x8	Venous congestion	Incomplete (partial superficial necrosis)	18
8	44/M	Paraplegia with Rt ischial PU grade IV	6x8	7x9	Recurrence	Complete	18
9	23/F	Quadriplegia witht Lt ischial PU grade IV	4x8	5x9	–	Complete	9
10	45/M	Paraplegia with Rt ischial PU grade III	4x7	5x8	–	Complete	12
11	20/M	Paraplegia witht Lt ischial PU grade III	5x7	6x8	–	Complete	11
12	25/M	Paraplegia witht Lt ischial PU grade III	6x9	7x10	–	Complete	13
13	30/M	Paraplegia with Rt ischial PU grade III	4x6	5x7	–	Complete	12

M: Male. F: Female. PU: Pressure ulcer. Lt: Left. Rt: Right.

DISCUSSION

In the literature, ischial pressure sores remain a frequent complication in wheel-chair bound patients. Despite successful surgery, the incidence of recurrence and complications remains challenging. This situation is caused by mechanical stress as shear in the sitting position, and the close proximity to the perineum, which induces local maceration **[2]**. Overall, the goal of the surgical intervention is to obtain a stable coverage in time, to take into consideration the event of ulcer recurrence and the need for future reconstruction and to avert having scars in areas of support **[12]**.

Musculocutaneous flaps have been considered to be the gold standard in ischial pressure sores reconstruction due to improved blood supply, increased resistance to infection and cavity filling abilities of these flaps **[17]**. However, recent studies demonstrated comparable, if not superior results of fasciocutaneous flaps than myocutaneous ones in the coverage of ischial pressure ulcers due to their reliable axial blood supply, provision of enough tissue to cover dead space, adequate closure with minimal donor site morbidity and better functional and esthetic outcomes **[18]**. We aimed in this study to evaluate the reliability and efficiency of island gluteal thigh fasciocutaneous flap in primary ischial pressure sores reconstruction.

The gluteal thigh flap was first demonstrated by Hurwitz as a sensate compound myocutaneous and direct cutaneous flap based on the gluteus maximus muscle and the inferior gluteal artery respectively for ischiatic and perineal reconstruction **[10]**. Later on, Walton **[19]** described a gluteal thigh flap "a pure, arterialized cutaneous flap" based on the descending branch of IGA and can be designed as either an island flap or a pedicled flap.

The descending branch of IGA has been reported to be inconsistent. In our study, we constantly found the descending branch of IGA in all our patients. In agreement with us, the descending branch of IGA was consistently found by many authors **[20,21]**. However, Walton et al. **[16]** noticed absence of the descending branch of IGA in 25% of cases and concluded that pedicled flap would have adequate blood supply from the fascial plexus lying above the deep fascia, while island flaps should be precluded in these cases. In a cadaveric study, Windhofer et al. **[15]** documented the presence of the descending branch of IGA in 91.5% of specimens. They reported that the descending branch of IGA is present more frequently than formerly assumed.

In our series, we could harvest island gluteal thigh flap as large as 7x10cm (70cm^2) and all donor sites were closed primarily. Unlike our results, Wanjala and Martin 22 designed two island posterior thigh flaps (16x24cm and 14x20cm) for coverage of deep sacral wounds and the donor sites were skin grafted. In another study, Montag et al. **[1]** used 25 gluteal thigh flaps for reconstruction of ischial and perineal defects. The maximum size of flap harvested was 160cm^2. They adopted deepithelialization and folding of the flap distal portion in deep ischial wounds. All donor sites were closed primarily. They noted that gluteal thigh flap could be considered a workhorse for ischial pressure sores reconstruction.

In this study, we had no total flap loss and the overall rate of complications was 23%; 2 cases of venous congestion, 1 case of partial superficial necrosis and 1 case of hematoma. All but one patient had stable wound coverage with no recurrence. Similarly, Rubin et al. **[13]** reported no cases of flap failure, a relatively low incidence of postoperative complications (21%) and one case of ulcer recurrence. In agreement with us, Lin et al. **[9]** demonstrated no cases of total or partial flap loss among 12 cases with ischial pressure ulcers covered with 12 posterior thigh flaps. Two patients developed minor wound dehiscence and were managed conservatively. Two recurrent sores after 24 and 27 months were reported and closed by advancement of the same flap. They concluded that posterior thigh flap should be considered a valuable alternative for grade III and IV ischial pressure sores reconstruction. However, when the defect is too deep, the space left between the flap and the bottom of the defect may cause fluid collection and recurrence. Therefore, myocutaneous flap is preferred in such case.

In another series, Rosen et al. **[23]** used 19 island gluteal thigh flap for ischial, sacral and trochantric pressure sores reconstruction and observed 2 cases of partial flap loss, 1 case of total flap loss in which the descending branch of IGA was not found and the flap was not converted to peninsular gluteal thigh flap, 3 cases of venous congestion and 1 case with minor separation at the flap base. They noted that island gluteal thigh flap is an excellent choice for reconstruction of the pelvic area. It provides sensibility and has wide arc of rotation. However, in patients with recurrent ulcers, prior rotation of the gluteus maximus muscle may interrupt the blood supply to the posterior thigh; it is not possible to use the island gluteal thigh flap. Contrary to us, Friedman et al. **[24]** reported a relatively high rate of complications (53%), in spite of the merits of the posterior thigh flap, 10 cases had delayed wound healing and 1 case had total flap loss. Also, Saito et al. **[11]** observed 6 postoperative complications among 9 cases (66.6%). Among these complications, 1 patient had total flap loss, 2 patients had partial flap loss and 3 patients had wound infections. They suggested that prior radiotherapy at the recipient site may be considered a relative contraindication to the use of posterior thigh flap in oncology patients.

Foster et al., **[25]** in their large series of ischial pressure ulcers reconstruction, compared the efficacy of different flaps. They concluded that the inferior gluteus maximus myocutaneous flap had the highest success rate 94% followed by the gluteal thigh flap 93%, the hamstring V-Y myocutaneous flap 58% and the tensor fascia lata myocutaneous flap 50%. Larger studies with longer follow-up periods are advocated for better evaluation of the short and long term outcomes of the island gluteal thigh flap.

Conclusion:

We have found the island gluteal thigh flap to be reliable in primary ischial pressure sores reconstruction provided that the primary source vessel is included. This flap is highly efficient and easy to raise. It spares adjacent cutaneous territories for recurrent cases and preserves gluteus maximus muscle for patients who will be ambulant with minimal donor site morbidity.

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