

# Total thigh flaps as a salvage procedure in paraplegics with massive ulcers

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**FOG Fraulin, GW Lobay, GL Moysa. Total thigh flaps as a salvage procedure in paraplegics with massive ulcers. Can J Plast Surg 1995;3(3):119-125.** A small percentage of spinal cord injured (SCI) patients with frequent recurrent pressure sores will eventually develop massive ulcers of the buttocks that are no longer amenable to local tissue coverage. The amputation of one leg and the creation of a total thigh musculocutaneous flap (TTF) may then be appropriate. The purpose of this paper is to evaluate the indications for and the efficacy of this procedure in nine SCI patients who underwent 10 TTF between February 1989 and November 1994. These patients had numerous previous hospitalizations (mean 12.1 admissions) and operations (mean 13.1 operations) for pressure sores. Past psychiatric evaluation found seven of eight males to have a similar history of social, financial and behavioral problems. The typical presentation was a septic, malnourished patient with massive ulceration of his buttocks. Only after wound and patient stabilization was the TTF chosen as a salvage procedure. The operation was long and associated with excessive blood loss. The most common complications were wound dehiscence or partial necrosis (five of 10), sepsis (five of 10), hemodynamic instability (five of 10), and chronic drainage (four of 10). The reoperation rate for complications was six of 10 cases. Long term follow-up (mean 3.5 years) on seven of eight surviving patients showed that these patients had resumed independent living but they had all developed new pressure sores as early as three months post TTF. The underlying risk factors for pressure sores had not changed. The total thigh flap operation remains a last resort procedure in a very small percentage of spinal cord injured patients because of its high morbidity, high reoperative rate for complications, and inability to prevent recurrence of pressure sores.

**Key Words:** *Complications, Paraplegia, Recurrent pressure sores, Salvage procedures, Total thigh flap*

## **Lambeaux de cuisse complets comme intervention chez les paraplégiques atteints d'ulcères massifs**

**RÉSUMÉ:** Un faible pourcentage de patients paraplégiques qui présentent des escarres de pression récidivants développeront, éventuellement, des ulcères massifs au siège qui ne répondent plus au traitement local. L'amputation d'une jambe et la création d'un lambeau musculo-cutané complet de la cuisse peut alors être approprié. Le but de cet article est d'évaluer les indications et l'efficacité de cette intervention chez neuf de ces

patients qui ont subi dix interventions entre février 1989 et novembre 1994. Ces patients avaient été hospitalisés fréquemment précédemment (en moyenne 12,1 hospitalisations) et avaient subi des chirurgies (en moyenne 13,1 interventions) pour escarres de pression. L'évaluation psychiatrique passée a permis de découvrir que sept sujets de sexe masculin sur huit avaient les mêmes antécédents de difficultés sociales, financières et comportementales. Le tableau typique est celui d'un patient infecté, dénutri, porteur d'un ulcère massif au siège. Ce n'est qu'après stabilisation de la plaie et du patient que l'intervention peut être décidée. L'opération est longue et associée à une perte considérable de sang. Les complications les plus fréquentes sont la déhiscence ou la nécrose partielle (cinq sur dix), une infection (cinq sur dix), une instabilité hémodynamique (cinq sur dix) et un suintement chronique (quatre sur dix). Le taux de réintervention pour complication a été de six sur dix. Un suivi à long terme (en moyenne 3,5 ans) chez sept patients survivants sur huit, a révélé que ces patients avaient repris une vie autonome et qu'ils avaient tous développé de nouveaux escarres de pression, certains dans les trois mois suivant l'intervention. Les facteurs de risque sous-jacents à l'égard des escarres de pression n'ont pas changé. La chirurgie pour lambeau complet de la cuisse demeure une intervention de dernier ressort chez un très faible pourcentage de patients paraplégiques à cause des forts taux de morbidité et de réintervention pour complications qui l'accompagnent, et de l'incapacité à prévenir les récurrences d'escarres de pression.

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The prevalence of pressure sores in spinal cord injured patients is approximately 20 to 30% (1,2). In those patients that undergo surgical repair of their pressure sores, the recurrence rate can be as low as 11% (3) or as high as 48 to 69% (4,5). A closer look at these results, however, shows that for most patients the recurrence rate after surgical repair of these ulcers is less than 10%. There is a small subset of paraplegics in whom the recurrence rate approaches 100% and these patients account for the majority of operations for recurrent ulcers. Of these patients with frequent recurrences, a small percentage will eventually develop massive or multiple ulcers of their buttocks, despite the efforts of all people involved in their care (Figure 1A). These patients and their ulcers are some of the most difficult problems that present to the plastic surgeon.

These patients reach a point where their ulcers are no longer amenable to local tissue coverage. The amputation of one limb and the creation of a total thigh musculocutaneous flap to cover the defect may then be appropriate. This procedure was first described in 1956 for the treatment of large, recurrent trochanteric ulcers accompanied by osteomyelitis of the femur and pyarthrosis of the hip (6). Several reviews of the use of this procedure have been published (7, 8). Other authors have described modifications of this technique including the use of bilateral high thigh amputations (9), or the use of soft tissue from below the knee to gain additional flap length for the coverage of sacral defects (10-12) or the elevation of the flap as an island (13). Recently, a split total thigh flap has been described (14).

Between February 1989 and November 1994 in Edmonton, this operation was performed on 10 occasions in nine paraplegics with massive ulcers. The purpose of this paper is to review the indications for, and the efficacy of, this procedure in these patients.

## METHOD

This paper will look at three main areas: the past history of these paraplegics, the technique of the total thigh flap procedure and postoperative results; and a follow-up of these patients.

The past history and records of all patients were available from four city hospitals: University of Alberta WC McKenzie Centre, Royal Alexandra Hospital, Misericordia Hospital, and the Grey Nuns Hospital. These charts were reviewed for patient demographics and past medical, surgical, psychiatric and social history.

Information recorded from the total thigh flap procedure included their status at presentation, operative indications, perioperative details, and postoperative complications.

All surviving patients greater than one year postoperative were then evaluated in follow-up. This follow-up included questions regarding satisfaction with the operation and current medical, psychological and social status. A physical examination was performed when possible.

## RESULTS

### Patient demographics and past history

Of the nine patients involved, eight were males and one was female; the mean age was 47.8 years (range 28 to 78 years) at the time of the total thigh flap procedure. Five patients were Caucasian and four were Native Indian. All patients were long-standing paraplegics (n=8; T4-T12 para) or quadriplegics (n=1; C4 quad) with a mean time of 12.8 years (range 5.5 to 21 years) since their injury. Etiology of their paralysis included motor vehicle accident (n=6), gunshot wound (n=1), mountaineering accident (n=1), and transverse myelitis (n=1).

The time from initial injury to first buttocks pressure sore ranged from eight to 78 months (mean 31.6 months). These patients had numerous previous hospitalizations for pressure sores (mean: 12.1 admissions/patient; range five to 20) and numerous previous operations for buttocks sores including skin grafts, local skin flaps and local muscle flaps (mean 13.1 operations/patient; range four to 20).

Only one patient, an elderly female with transverse myelitis, had other medical problems besides paralysis; these problems included diabetes, osteoarthritis, advanced age (78 years), obesity, hypertension, and previous transient ischemic attack. Psychiatric examination found her to be patient, cooperative and fairly compliant; she developed a severe pressure ulcer due to her associated medical conditions.

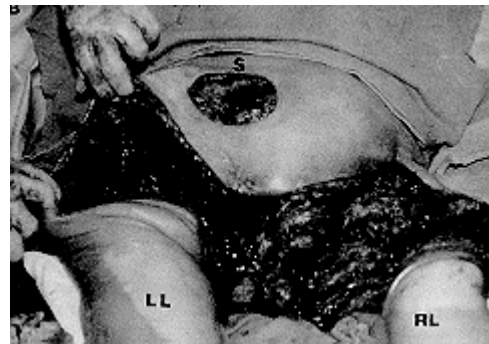
On the other hand, seven of the eight male patients had a remarkably similar past social history of ongoing behavioural, financial and social problems since their initial injury. Review of previous evaluations by social workers and psychiatrists identified that these patients all suffered from disruption in their family life; five patients had divorced since their injury, and two others were single but not communicating with their family. Most of these males had suffered problems with excessive alcohol intake and depression. They were found to be noncompliant and lacking insight into their condition. They were also weakly motivated, unemployed and surviving on social assistance. They disregarded medical advice, would sit for long periods of time and neglected care of their open wounds. Several of the patients would only present to the emergency room after they became septic from their pressure ulcers.

### Total thigh flap -- presentation

The typical presentation that led to a total thigh flap was a septic, malnourished patient with massive ulceration of the buttocks. Often multiple anatomic areas on one buttock or both buttocks and hips were necrotic and draining pus (Figure 1A). All patients required at least one, and often two or three, operative debridements, with their associated massive blood loss, before the total thigh flap procedure. All patients were seen by infectious disease specialists. Osteomyelitis was often difficult to diagnose by x-ray or bone scan because of the recent surgical procedures and the large soft tissue component. When possible, bone biopsies were performed and were found to be the most useful monitor of osteomyelitis (15). Antibiotics were changed multiple times because of the development of resistant organisms.



**Figure 1A)** *Thirty-five-year-old male paraplegic presents with complete erosion down to both ischial tuberosities, both greater trochanters, and the sacrum. He has been a T5 paraplegic since a motor vehicle collision 18 years earlier. He has had 14 previous admissions and 20 operations for recurrent pressure sores (I Ischium; S Sacrum; T Greater trochanter)*



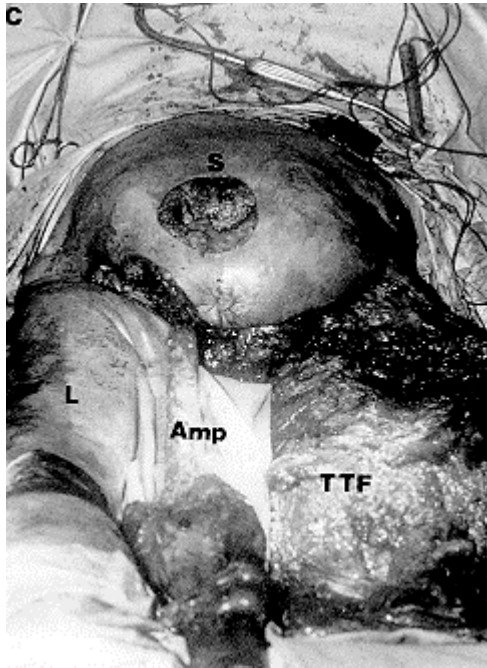
**Figure 1B)** *Patient undergoing debridement of entire ulcerated area. The massive ulcerated area to be covered is shown. A girdlestone arthroplasty (resection of proximal femoral head and neck) has been performed previously on the right side. He had biopsy proven osteomyelitis of his pelvis. He also had problems with heterotopic ossification in both hip regions (LL Left leg; RL Right leg; S Sacrum)*

Adjunctive procedures included colostomy (n=3), suprapubic catheter insertion (n=2), and broviac catheter insertion (n=2). In five of 10 cases, a girdlestone arthroplasty (resection of femoral head and neck) was performed by an orthopedic surgeon during the debridement procedure, as an initial attempt to allow local collapse of the tissues and to allow easier closure of the wound (Figure 1B) (16). Unfortunately, the defects were still too large for closure with local muscle flaps. Another problem was heterotopic ossification found at the time of the initial debridement or with subsequent debridements. Heterotopic ossification is a well-recognized complication of spinal cord injury and resection is recommended if the bone is infected, if it prevents closure of the wound, or if it limits joint range of motion (17-19).

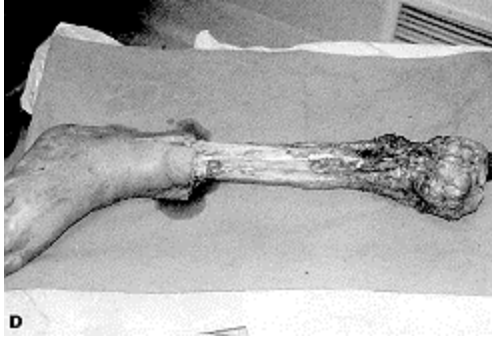
After debridement(s), adjunctive procedures, frequent dressing changes, and improvement of nutritional status (ie, tube feeds) and overall condition, a massive open wound remained with no local tissue as an option for coverage. The idea of indefinite dressing changes and institutionalized care was not appealing to either the patient or the physicians involved because of the young age of most of the patients. It was, therefore, only after lengthy discussion with the patient, and exhaustion of other techniques, that the decision to perform a total thigh flap was made. Patients were evaluated by a social worker or a psychiatrist preoperatively. Losing a limb, even if it is a functionless limb, can be very disconcerting for the patient and he or she must be prepared mentally.

#### Total thigh flap -- technique

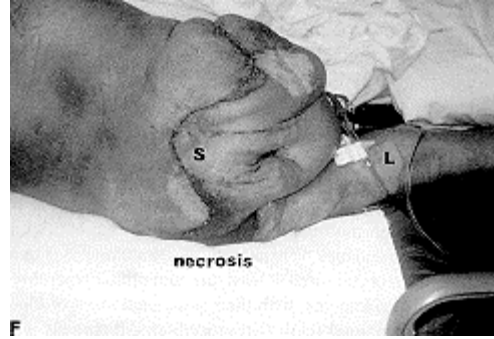
The operation performed was similar to previously described techniques with certain modifications (7, 20). Patients were placed in the prone position. Debridement of the entire ulcerated area was again performed (Figure 1B). The incision was marked on the midlateral aspect of the leg extending from the greater trochanter of the femur to the level of the knee or the lateral malleolus as required. The dissection was carried along the lateral intermuscular septum, between the lateral border of the long head of the biceps femoris muscle, and the vastus lateralis, down to the femur. The dissection extended subperiosteally, completely freeing the femur from the muscle mass of the thigh. By staying close to the femur, the superficial femoral artery and femoral vein, which were the essential blood supply to the thigh flap, were preserved. Often the muscles were atrophic from long term nonuse.



**Figure 1C)** *The right leg is filleted from the anterior and posterior compartment muscles developing a total thigh musculocutaneous flap (AMP Amputated right leg; LL Left leg; S Sacrum; TTF Total thigh flap)*



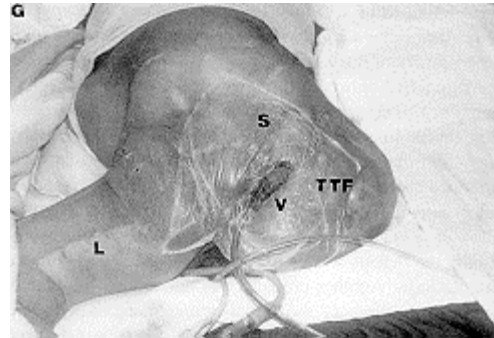
**Figure 1D)** *The amputated right leg*



**Figure 1F)** *Within several days postoperatively, partial flap necrosis at the most distal end is evident. The patient was taken back to the operating room one week later*



**Figure 1E)** *Closure of the right total thigh flap. An opening in the flap has been created for the anus. The operation was 8.5 h long. Patient was monitored and ventilated in the intensive care unit postoperatively (A Anus; I Ischium; LL Left leg; S Sacrum; T Greater trochanter; TTF Total thigh flap)*



**Figure 1G)** *The patient later developed a chronic lymphatic and serous fistula. A vacuum assisted closure device is in place. This patient also developed sepsis and candidemia, air embolism, line sepsis and depression postoperatively (LL Left leg; S Sacrum; TTF Total thigh flap; V Vacuum assisted device)*

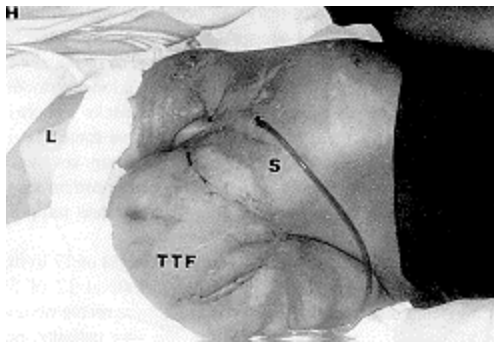
If the thigh provided enough tissue, the popliteal vessels were ligated and a circumferential incision was made at the knee. If more tissue was required, the popliteal vessels were preserved and the incision was carried down to the lateral malleolus. The dissection below the knee was often more difficult because of the presence of the tibia and fibula. Once the length of the tissue desired was achieved the vessels were ligated distally (Figures 1C,D). If hip disarticulation was necessary, we obtained the assistance of an orthopedic surgeon. The external rotator muscles of the hip were divided at their insertion and reflected medially to expose the capsule of the hip joint. The joint capsule was incised superiorly and the ligamentum teres was ligated and transected. The femoral head was then removed, which allowed for the entire femur, tibia and fibula to be removed and discarded. The distal flap was then turned over into the wound and the size and shape tailored to fit the defect. The flap was sutured in multiple layers over several

suction drains to eliminate the dead space. It was important not to make the flap too large as the excess weight could pull at the suture line (Figure 1E).

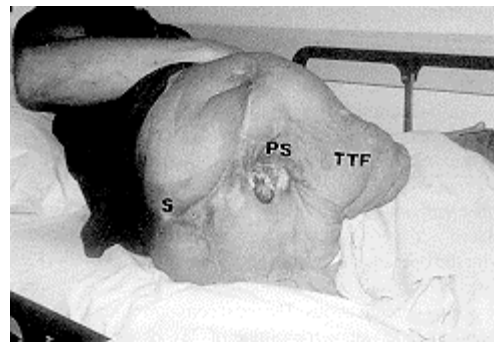
### Operative results

The procedure was long (mean 6.2 h; range 3.5 to 8.5 h) and associated with a great deal of blood loss, estimated at 3000 to 5000 mL/case. The mean amount of blood transfused throughout the hospital stay (including earlier debridements, total thigh flap, and postoperative wound leakage) was 32.4 units of packed red blood cells (RBCs) and fresh frozen plasma/admission; range 4 to 70 units. In five of the 10 procedures, patients also required postoperative monitoring and ventilation in the intensive care unit due to hemodynamic instability.

Postoperative recovery was slow and often turbulent. The most common complications included: wound dehiscence or necrosis (five of 10) (Figure 1F), sepsis (five of 10), hemodynamic instability (five of 10) and chronic drainage (four of 10) (Figure 1G). Less common complications included: marked depression (three of 10), metabolic abnormalities (two of 10), line sepsis (two of 10), *Clostridium difficile* pseudomembranous colitis (two of 10), development of ulcers on opposite side (two of 10), and fracture of the other leg in bed (one of 10). Six of the 10 patients required reoperation for complications (five for necrosis; one for fractured femur). Hospital stay was long (mean: 89.2 days; range 38 to 236 days). The elderly female patient was transferred to a peripheral hospital two months postoperatively in a stable condition but died soon after from an arrhythmia. Included in the above results is one patient who underwent a total thigh flap procedure of the opposite leg 3.5 years after the initial procedure.



**Figure 1H)** *The flap is now healed at 2.5 months post total thigh flap. The patient required a total of 70 units of packed red blood cells and fresh frozen plasma during his 276 day hospital stay (LL Left leg; SSacrum; TTF Total thigh flap)*



**Figure 1J)** *The patient has developed a recurrent pressure sore in his thigh flap eight months after his total thigh flap (PS Recurrent pressure sore; S Sacrum; TTF Total thigh flap)*

### Follow-up

Of the eight surviving patients, seven survived longer than one year postoperatively and were available for follow-up (mean 3.5 years postoperatively, range 1.3 to 6 years). All seven patients left the hospital with healed flaps and returned to independent living (Figure 1H). Six patients have not had any trouble with balancing,

sitting or mobilizing. The one patient who had both legs amputated has had trouble with balancing and wheeling in his chair. All seven patients were satisfied with their outcome, believed they were better off after the operation, and would undergo the procedure again if necessary.

When questioned about change in independence, discomfort level or amount of spasm, patients were relatively split in their responses. Four patients felt there was no change in their independence, while three believed the operation increased their independence. Four patients felt they have had a decrease in discomfort level since the operation; two patients felt there had been no change; one patient felt the discomfort was worse. Four patients have had a decrease in the amount of spasms while three patients have had no change. When questioned about their present appearance, it bothered only two of the seven patients (it did not bother the double amputee).

Despite all seven patients being relatively satisfied with the outcome of this major operation, all seven patients developed new pressure sores, as early as three months postoperatively (Figure 1J). Three patients developed sores on the side opposite the amputation, two patients on the same side and two patients on both sides. Five of the seven patients required further operations for pressure sores. One patient has required another 11 operations since his total thigh flap, including debridements, resection of the femoral head and neck, and advancements of the thigh flap tissue.

Questioning on social aspects, financial status, support and outside activities identified that "nothing had changed" from before the operation despite the severity of their condition and despite the counselling and help offered to them. In their desire to remain independent, they have often been difficult to help. Six of seven were unemployed and remained on social assistance at the time of follow-up; five of seven lived alone without a caregiver; five of seven had no outside activities or groups; six of seven admitted to continuing problems with bouts of depression or excessive alcohol intake.

## DISCUSSION

The management of multiple, or massive, pressure sores in spinal cord injured patients can be a very difficult problem. Fortunately, the number of patients that actually get to this point is quite small. Royer et al (7) reported their experience with 41 flaps in 28 patients over 16 years; they estimated that 28/617 (4.5%) paraplegics admitted to their hospital over that 16 years underwent a total thigh flap. Even this figure is probably high because it does not take into account paraplegics that were never admitted to the hospital.

The patient's desire for independence (9) entices us to search for a method of obtaining wound closure so that he may leave the hospital as soon as possible. Once local tissue has been depleted, there are few options for coverage. Leaving these wounds open and performing frequent dressing changes is a poor option in a young individual because of the economic constraints, the effects on the patient's lifestyle, and the risks associated with chronic open wounds: communication with bowel or bladder, amyloidosis (21-23), or marjolin's ulcer (24,25). Nevertheless, in the nonsurgical candidate, there may be no other option.

The Girdlestone arthroplasty (proximal femoral neck resection) in association with soft tissue reconstruction is one alternative for large trochanteric and ischial ulcers that communicate with the hip joint (26-29). In comparison to the total thigh flap, the



Girdlestone operation is much less traumatic in terms of surgical morbidity and of body image. Blood loss is less and both lower limbs are preserved; therefore, it is more acceptable to patients (29). This procedure was attempted initially in five of the 10 cases presented, but was found to be insufficient to allow for coverage of the massive defect. The option of a large free muscle flap from the upper trunk can be considered but it is not recommended because it will affect the paraplegic's upper body function (30, 31). Also, patients that have reached this stage have frequently already had urinary diversion procedures and/or a colostomy which precludes a transverse rectus abdominis myocutaneous flap.

Our indication to use the total thigh flap was as a salvage procedure to obtain coverage of massive or multiple ulcers of the buttocks no longer amenable to local or regional tissue coverage. This indication agrees with the indications listed by other authors (6-9,11,12,20). The total thigh flap is often placed as the last option because of the morbidity associated with the operation. Royer et al (7) found that 23 of 28 (82%) patients required some additional surgery for recurrent ulcers or wound complications. The most common complications he found included sinus tract (nine of 28), hemorrhage (six of 28), infection (six of 28), acute pyelonephritis (six of 28), and dehiscence (three of 28). We found similar results in our review: six of 10 (60%) patients required additional surgery for complications; the most common complications were wound dehiscence or necrosis (five of 10), sepsis (five of 10), hemodynamic instability (five of 10) and chronic drainage (four of 10). The eldest patient in our series went on to die two months after surgery from an arrhythmia.

Although the procedure has a high perioperative morbidity, there are some positive results. If used in the proper patient, it can return him to independent living. It will not affect balancing, sitting or mobilizing if only one leg is removed. Some patients found that it increased their independence (easier to mobilize and transfer), decreased their discomfort, and decreased their spasms. All patients were satisfied with the outcome of the procedure.

For the physician, however, the long term results are less satisfactory. Perhaps the most disappointing result from this review is that despite the severity of their illness, and despite all of the time and counselling given to these patients, they made no change in their lifestyle or behaviour and continued to develop recurrent pressure sores postoperatively. We echo the words of Spira (12) who stated "the road to physical and social rehabilitation for this type of patient is long, arduous, and fraught with discouraging pitfalls and setbacks". There is often an underlying anger and self-destructive force that is difficult to change in these patients. In this group, seven out of seven patients at follow-up had developed recurrent sores since their total thigh flap and five of seven had required further surgery for these recurrent sores.

Royer et al (7) stated that, at follow-up, eight of 17 living patients and nine of 11 deceased patients (total 17 of 28 [61%]) had recurrent pressure sores. In a more recent review of efficacy of operative cure in pressure sore patients, not specific to total thigh flaps, Disa et al (5) found that despite an 80% healed rate at the time of discharge, 61% of sores and 69% of patients had recurrent ulcerations within a mean of 9.3 months. They go on to suggest that surgical reconstruction of pressure sores does not appear to be efficacious for young post traumatic paraplegics or cerebrally compromised elderly patients (5). Unfortunately, the problem of recurrent sores in this population persists

worldwide. It would be ideal if we could use a sensate flap to fill the defect, but these defects are too large for this option (32-36).

In conclusion, the total thigh flap is necessary as a salvage procedure in a small set of spinal cord injured patients who have developed massive or multiple ulcers no longer amenable to local tissue coverage. It will allow a patient to return to independent living but it is associated with high perioperative morbidity and does not prevent recurrence of pressure sores postoperatively. The decision of whether to use this flap or to leave the wound open must be individualized to each patient's particular situation. Ethics and economics will undoubtedly play a role in this decision process.

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