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Local Fasciocutaneous Gluteal Flap (Dufourmentel) in Reconstruction of Parapelvic Pressure Sores

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ABSTRACT

This study was performed in the Plastic, Reconstructive and Burn Unit, Mansoura University Hospitals during the period from January 2000 to January 2003. The study included 40 patients (31 males and 9 females). Their ages ranged from 3 to 80 years (mean: 36.8 years). Ten patients presented with sacral pressure sores, 22 patients presented with ischial pressure sores (19 unilateral and 3 bilateral) and 4 patients presented with bilateral trochanteric pressure sores. Four patients presented with combined pressure sores (sacral and unilateral ischial in 2 patients and sacral and unilateral trochanteric in another 2 patients). Ten patients were ambulating and 30 patients were paraplegic due to post-traumatic spinal cord injury. All pressure ulcers were stage IV. Follow-up ranged from 6 months to 2 years. The defects were reconstructed by a local gluteal transposition fasciocutaneous flap (Dufourmentel). There were no seroma, hematoma, wound infection or flap necrosis. Wound dehiscence occurred in five (3 ischial and 2 sacral) patients that healed by local wound care and secondary sutures. Recurrence was observed in seven (4 ischial, 2 sacral and one-trochanteric) patients related to various patient factors not to flap design. The advantages of the dufourmentel flap in pressure ulcers reconstruction are: 1- Adequate blood supply, 2- Durable coverage, 3- Minimal potential for a functional deformity, 4- Better reconstruction of the normal anatomic arrangement over bony prominences, 5- Primary closure of the donor site, 6- It does not preclude the use of other flaps for recurrent ulcer reconstruction, 7- Simple technique, 8- Versatility of design, 9- Reduction in hospital stay and 10- Use of local tissue with the needed thickness to obliterate the wound defect. Because it can fill rhomboid like defects that are not necessarily 60 and 120 degrees and with diagonals or sides that may be unequal, we prefer Dufourmentel design rather than the rhombic or Limberg designs. So, we prefer the use of this flap in reconstruction of small-and medium-sized pressure ulcer defects (sacral, ischial and trochanteric).

INTRODUCTION

Pressure sores are a medical and surgical problem, which occur in a variety of patients and place an enormous strain on the expanding costs of the health care system. Prevention remains the cornerstone of management. Education should emphasize prevention protocols, early identification of patients at risk, strategies for management of existing ulceration and rehabilitation after operative therapy. Coexisting medical problems must be addressed promptly to avoid additional general debilitation and to decrease the incidence of pressure-induced tissue ischemia [1].

Pressure sores (decubiti, or decubitus ulcers) almost invariably occur over bony prominences. Direct pressure and shearing forces are cardinal factors in their formation. Malnutrition, anemia and chronic illness can also contribute to their formation by the impairment of blood supply and delayed wound healing. Resultant necrosis at the skin level is usually small compared with that of the necrotic area over bone, which resembles an inverted cone. Sacral pressure sores are more common in supine patients; ischial pressure sores are more common in sitting patients; trochanteric pressure sores are more common in patients who lay in the lateral decubitus position for too long. Decubiti are generally a recurrent problem, especially for patients with spinal cord injuries and frequently, patients require multiple surgeries during their life span. Therefore, the main goal in the treatment of pressure sores must be to provide the least invasive and most durable coverage at the first operation, while preserving future sites for flap coverage for recurrent disease [2].

Even in the era of muscle and musculocutaneous flap reconstructions, the Limberg flap, because of its versatility of design and simplicity of surgical execution, continues to be a viable option for treatment of small pressure ul-

cers [3]. A modification of the Limberg flap was described by Dufourmentel in 1962 [4]. This flap is used to fill rhomboid like defects with angles that are not necessarily 60 and 120 degrees and with diagonals or sides that may be unequal [5-9].

Based on this modification, the aim of this study was to evaluate the use of a local gluteal transposition fasciocutaneous flap (Dufourmentel) in the reconstruction of sacral, ischial and trochanteric pressure sores.

PATIENTS AND METHODS

This study was performed in the Plastic, Reconstructive and Burns Unit, Mansoura University Hospitals during the period from January 2000 to January 2003. The study was done prospectively on 40 patients. There were 31 males and 9 females. Their ages ranged from 3 to 80 years (mean: 36.8 years). Ten patients presented with sacral pressure sores, 22 patients with ischial pressure sores (19 unilateral and 3 bilateral) and 4 patients with bilateral trochanteric pressure sores. Four patients had combined pressure sores (sacral and unilateral ischial in 2 patients and sacral and unilateral trochanteric in another 2 patients). Ten patients were ambulating and 30 patients were paraplegic due to post-traumatic cord injury. All pressure ulcers were stage IV.

Assessment of the defect:

The defect is assessed first by evaluation of the general condition of the patient. Restoration of positive nitrogen balance is mandatory preoperatively. The hemoglobin, hematocrit and plasma protein levels are important and every effort should be taken to normalize them. Any concomitant urinary infection should be treated before surgery. Patients should be evaluated for osteomyelitis. If bony infection is suspected, biopsy is required. Bony infection involving the hip joint necessitates treatment of the infected bone, as well as wound closure. All pressure sores should be considered colonized; the granulation tissue is an immunologic reaction against these microorganisms. Thus, wound cultures have little efficacy; culture biopsies predict potential infection best. If the organism count is greater than $1x10^5$ consideration should be given to topical or systemic antibiotic for treatment and to deferring wound closure until the bacterial counts can be diminished.

Laboratory studies include a complete blood cell count, assays for total protein and albumin, coagulation profiles, urine analysis, cultures and radiographs of the bones. Pressure sores must be examined manually to assess size and depth, bursa, underlying bony prominences and the relationship with the rectum. Patients should be placed on a high-protein, low-residue diet. Care must be taken to evaluate the patient for previous surgical scars and flap surgery. Frequently, previous surgery may preclude the use of a flap because of compromised vascular supply. Spasticity must also be assessed. The placement of a flap in a spastic patient is doomed to failure because of the constant battle of muscle contracture on suture line closure. Today, spasticity can usually be controlled pharmacologically. Every attempt should be made to treat significant hip and knee contracture before surgery.

Surgical technique:

Debridement:

Pressure sore margins are covered by a pale shiny, unhealthy granulation tissue. In many patients, a variable degree of undermining may be present around the periphery of the ulcer. By applying slight upward pressure to a clamp placed within the wound, the depth of the decubitus can be determined. Overlying skin and the formal bursa must be excised. Placement of methylene blue within the ulcer cavity to dye granulation tissue can assist with bursa excision; the surgeon removes all blue-stained tissue. Excision of exposed bone and infected bone is necessary to close the wound. Radical ostectomy however, should be avoided. If the wound is considered to be infected, the surgical procedure should be divided into stages. The first stage would entail debridement. Several weeks later, the defect is closed with the flap.

Surgical procedure:

Excision of the defect is planned in a rhombic fashion and the flap is then oriented so that the donor-site scar will fall in the line of maximum extensibility. Flap design is marked on the skin and followed throughout the operation. A line is drawn as a continuation of the short diagonal and another line is drawn as a continuation of one of the sides, typically at the obtuse angle. These two lines form an angle that, when bisected, is the edge of the flap. the length of the edge should equal the length of the side and

an incision parallel to the long axis allows the flap to be raised (Fig. 1). After the ulcer had been removed, the elasticity of the surrounding skin will produce an enlargement of the defect. The temptation to enlarge the flap size must be resisted. As wound closure is achieved, normal skin tension is restored. The inherent geometric design defines a length-width ratio of 1:1. This ratio relates to the adequacy of circulation in random flaps and establishes the safety factor of the flap. Meticulous hemostasis and tension-free closure ensures success in wound healing. The flap is elevated in the same plane as the excision and is transferred to the defect. The thickness of the flap is varied according to the depth of the defect. Flaps with thickness up to or 6 cm were taken in some cases. Two-layer repair is usually needed. Suction drains are inserted.

Postoperative care:

Patients are routinely hospitalized for 2 to 4 weeks to observe wound healing. Direct pressure on the flap must be avoided and the general nutritional condition of the patient must be improved. This can be achieved by having the patient remain prone; the more preferable procedure is placement of the patient in an air-fluidized bed. Drains generally kept in place for several weeks to avoid the potential for recurrent dead space. Pharmacologic agents may be required to prevent contamination of the wound by feces and provide protection from hip spasticity. Culture-specific intravenous antibiotic coverage is continued postoperatively. Stitches are removed at the end of the second or third week postoperatively. By the end of the second or third postoperative week, mobilization and physical therapy were begun. Education for prevention of recurrence continues after discharge.

RESULTS

In three years, 51 Dufourmentel flaps were performed on 40 patients for reconstruction of small- and medium-sized sacral, ischial and trochanteric pressure ulcer defects. There were no cases of seroma, hematoma, wound infection or complete or even partial loss of the flap. Wound dehiscence was noticed in five patients (3 ischial and 2 sacral) that healed by local wound care and secondary sutures. Six months-to-2-year-follow ups revealed that there were recurrence in seven patients (4 ischial, 2 sacral and one trochanteric). They were reconstructed by transferring a contralateral Dufourmentel flap. I do not think that ulcer recurrence was related to flap design. Rather, various patient factors (spasticity, motivation and/or job requirements contribute to the recidivism rate. Representative clinical cases are shown in Figs. (2-5).

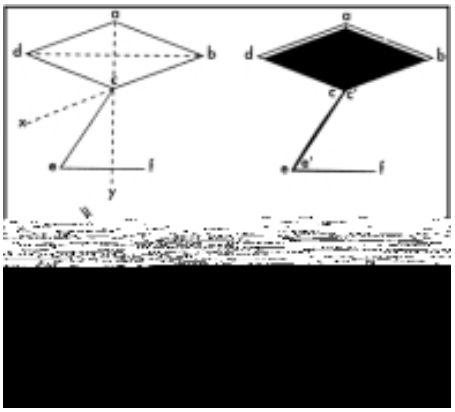

Fig. (1): Dufourmentel flap. The short diagonal ac and side bc are extended to y and x. The angle xcy is bisected with line ce (ce length equals bc length). A line (ef) is then drawn parallel to long diagonal db. The flap. bcef is then transposed. Mobilization of dce may facilitate closure at donor site.

Fig. (2,A): Fifty-years old paraplegic female with medium-sized sacral pressure sore with flap design shown.

Fig. (2,B): Twenty days postoperative.

Fig. (3,A): Four-years old paraplegic female with ischial pressure sore. The flap is designed superiorly-based.

Fig. (3,B): Two weeks postoperative.

Fig. (4,A): Forty-years old female with ischial pressure sore. The flap is designed laterally-based.

Fig. (4,B): One month postoperative with drainage maintained up to sound healing. Buttock contour is preserved.

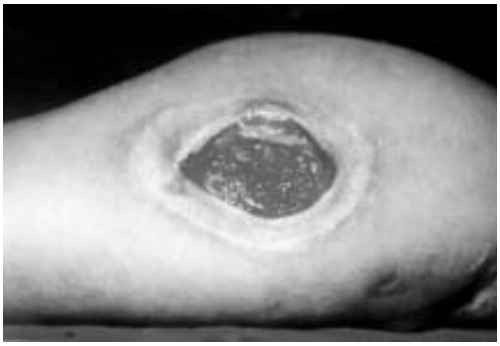

Fig. (5,A): Eighteen-years old paraplegic male with trochanteric pressure sore.

Fig. (5,B): Nine-months postoperatively with stable coverage.

DISCUSSION

The gradual evolution in the surgical treatment of pressure sores had led to the presently accepted surgical objectives: (1) excision of the ulcerated area, including the underlying bursa and the usually infected scar tissue and/or undermined skin that encircles the defect; (2) resection of any existing bony prominence; (3) resurfacing of the defect with healthy skin, including adequate subcutaneous padding; (4) designing the flaps as large as possible and (5) obtaining additional padding by the use of muscle flaps if subcutaneous tissue is not adequate **[10]**. Elective reconstructive surgery should not be contemplated unless the general condition of the patient had stabilized and the ulcer shows the following signs of improvement: (1) clear-

ance of all necrotic tissue, (2) appearance of healthy granulation tissue and a tendency for the ulcer to decrease in size by diminution of the extent of the undermining and/or evidence of advancing epithelial margins **[10]**.

The operative procedure chosen should be customized to the patient as well as the ulcer. When planning a surgical strategy, the surgeon should consider subsequent surgical procedures as well as the present surgery. The choice of the skin flaps versus musculocutaneous flaps depend on not only the location, size and depth of the ulcer, but also the previous surgeries. Primary closure may be appealing, but the surgeon should remember that these ulcers represent an absence of tissue and that primary closure almost always leaves a subcutaneous "dead space". In addition, adjacent tissues are usually less compliant than would be necessary for a tensionless primary closure. Skin grafting of the pressures sores may be possible with superficial ulceration, but this tends to provide unstable coverage and the success rate is only 30%. Therefore, wound closures usually require rotation of the local skin, fasciocutaneous, or musculocutaneous flaps **[11]**.

The theoretic superiority of musculocutaneous flaps over skin flaps in the closure of infected wounds had been demonstrated in animal and clinical studies **[12-14]**. The advantages of musculocutaneous flaps for coverage of pressure sores include the following: 1- excellent blood supply. 2- provision of bulky padding, 3- ability to readvance or rerotate flaps to treat recurrence and 4- proven effectiveness in treating infected wounds. The disadvantages are also significant in that muscle: 1- is the tissue more sensitive to external pressures, 2- may be atrophic in elderly patients and in those with spinal cord injuries and 3- may lead to functional deformity in ambulatory patient **[11]**.

The advantages of fasciocutaneous flaps are as follows: 1- adequate blood supply, 2- durable coverage, 3- minimal potential for a functional deformity and 4- better reconstruction of the normal anatomic arrangement over bony prominences. The disadvantages include the limited bulk for the treatment of large ulcers **[15]**.

The buttock may be considered as the region falling within the following boundaries: medially, the midline; laterally, a line between the anterior superior iliac spine and the greater trochanter; superiorly, the iliac crest and inferiorly, the buttock fold extended laterally and upwards to the greater trochanter. The general scheme is simple with most of the skin being supplied by perforators from the superior and inferior gluteal arteries. In addition, there is a small area around the anal canal supplied by the internal pudendal artery, an area medial to the posterior superior iliac spine supplied by iliolumbar and sacral branches and an area over the inferolateral part of the gluteus maximus supplied by the first perforator arising from the profunda femoris. The region is therefore mainly supplied by multiple small musculocutaneous perforators, which measure approximately 0.5 mm internal diameter and supply areas of 15-20 cm^2 **[16]**. These perforators were reported to be 20-25 in number and were arranged in three rows; medial, intermediate and lateral. The length of these perforators ranged from 4-8 cm **[17]**. There was free intramuscular anastomosis between the various pedicles **[18]**.

The ideal covering of pressure sores in to replace the lost tissues i.e. skin and subcutaneous tissues. Since the most common areas of pressure ulceration (the sacrum, the ischia and the greater trochanter) do not normally have a layer of muscle interposed between the bone and the skin **[13]**, in addition to the fact that the skin and subcutaneous tissue are less sensitive to ischemia than muscle **[19]**, so we prefer the use of Dufourmentel flap in closure of small-and moderate-sized sacral, ischial and trochanteric pressure sores. Because it can fill rhomboid like defects that are not necessarily 60 and 120 degrees and with diagonals or sides that may be unequal, we prefer Dufourmentel design rather than the rhombic or Limberg designs.

The advantages of the Dufourmentel flap in pressure ulcers reconstruction are: 1- adequate blood supply, 2- durable coverage, 3- minimal potential for a functional deformity, 4- better reconstruction of the normal anatomic arrangement over bony prominences, 5- primary closure of the donor site, 6- it does not preclude the use of other flaps for recurrent ulcer reconstruction, 7- simple technique, 8- versatility of design, 9- reduction in hospital stay and 10- use of local tissue with the needed thickness to obliterate the wound defect.

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