The operative treatment of pressure wounds: a 10-year experience in flap selection

Romy Ahluwalia, Daniel Martin, James L Mahoney

ABSTRACT
This study sought to both assist in the selection of flaps for ischial pressure wound re-construction and to evaluate the overall complication rates associated with re-construction. A retrospective medical record review was conducted for 78 patients following the surgical re-construction of an ischial pressure sore. Records were reviewed for demographics, location of sores, methods of re-construction and flap selection, as well as any complications and recurrences. Seventy-two wounds were re-constructed with an average of 1.4 flaps used per wound. An ischial flap complication rate of 16% was observed in flap follow up, with a recurrence rate of 7% recorded. The vast majority of complications went on to heal with 15% of patients requiring a second re-construction. Our relatively large sample of ischial flaps allowed for a close comparison with previously published work. Both flap selection and site of reconstruction significantly affected the success rates for pressure sore coverage. The overall complication rates by flap and re-constructive site in this review are lower than previously published reports. Our experience with ischial re-construction was extensive enough to suggest a posterior medial thigh fasciocutaneous flap combined with a biceps femoris muscle flap as a first choice in ischial pressure wound re-construction.

Key words: Flap selection • Pressure ulcers • Wound reconstruction outcomes

INTRODUCTION
The treatment of pressure sores represents a significant challenge to healthcare professionals. Pressure ulcers are costly, recurrent and are often compounded by significant medical illness. Although pressure wound management demands a multi-disciplinary approach, soft tissue defects requiring re-construction are often considered for surgical management. To garner a successful outcome one must ensure proper surgical technique, patient adherence and thorough pre- and postoperative care (1).

In 1938, Davis documented the successful use of a skin flap in the closure of a decubitus ulcer (2). Conway and Griffith’s report in 1956 detailed the principles of modern wound re-construction including careful debridement of bone and tissue followed by soft tissue coverage with a large flap and suture lines relegated to lower pressure areas (3). Flap survival rates saw a significant improvement with the advent of musculocutaneous flaps in the 1970s. With flap survival rates improving, the literature saw a substantial increase in the variety of flap types and compositions being used (4). Although modern surgical
Key Points
- To evaluate patient outcomes following reconstruction, a retrospective medical record review was conducted for 78 patients from a consecutive cohort following the surgical reconstruction of a stage III or IV pressure wound.
- All reconstructed patients underwent a similar care regimen with routine preoperative assessments, optimized nutrition and pressure relief, wound cultures and pelvic x-rays being conducted.
- With consideration of the alternatives, ischial wounds were preferentially reconstructed by this surgeon using a combination of two different flaps per ischial wound.

Approaches generally include local and sensate flap reconstruction combined with a thorough debridement prior to reconstruction; the modern plastic surgeon is faced with a bevy of flap types and variations applied to a variety of different wounds of varying size and extent of bone involvement.

With the goal of evaluating the validity of wound reconstruction, surgical complication rates in pressure sore reconstruction have been documented for years (5–7). Disa et al. reported complication rates of 31% following pressure ulcer reconstruction with mixed flap compositions (2). Mandrekas and Mastorakos reported complication rates as low as 7% in the use of myocutaneous flaps for pressure sore reconstruction, while others such as Tavakoli et al. reported complication rates as high as 62% following reconstruction with myocutaneous flaps (8,9). Although many studies have sought to evaluate the complication rates of wound reconstruction, few have examined flap selection critically by wound site. In addition to providing insight into the efficacy of wound reconstruction, such a study would underscore the important principles of flap selection and provide grounding to the future algorithmic selection of flaps for specific wound site reconstruction.

METHODS
To evaluate patient outcomes following reconstruction, a retrospective medical record review was conducted for 78 patients from a consecutive cohort following the surgical reconstruction of a stage III or IV pressure wound. These 78 patients had a combined total of 93 wounds of which 72 were over the ischial site. These wounds were reconstructed under the direction of a single surgeon between 1997 and 2007. Records were reviewed for patient demographics, level of mobility, location of sores, methods of reconstruction and flap selection, flap composition, as well as any complications, recurrences and secondary procedures that may have been necessary. This study was approved by the St Michael’s Hospital Research Ethics board.

Complications and recurrence rates were examined by sore location and reconstruction method to directly compare surgical outcomes. Complications as determined by chart review were defined as any wound that failed to heal immediately postoperatively, including very minor dehiscence, infection and flap necrosis. As a result, most complications went on to heal fully. A pressure ulcer recurrence is the development of a pressure sore over a previously healed reconstructed site.

All reconstructed patients underwent a similar care regimen with routine preoperative assessments, optimized nutrition and pressure relief, wound cultures and pelvic x-rays being conducted. Operatively, methylene blue was used to visually trace the extent of sinus tract formation, followed by a bursal excision and limited sequestrectomy to the healthy bone. All reconstructions included the placement of drains and the administration of appropriate anti-microbial therapy guided by preoperative wound cultures. Postoperative care regimens included 4–5 days in hospital, 5 weeks of bed rest followed by the gradual introduction of short intervals of weight bearing and a high protein, high calorie diet as tolerated.

RESULTS
From 1997 to 2007 78 patients received surgery from a single surgeon for 72 ischial wounds utilizing 104 flaps. The mean age of the reconstructed patients was 43 years (15–71) and the vast majority of patients [94% (73/78)] had suffered spinal cord injuries. Seventy-three percent of patients were males (57/78). The 72 wounds were re-constructed using 63 fasciocutaneous flaps and 41 muscle/musculocutaneous flaps with an average of 1.4 flaps used per wound. Reconstructed wound sizes varied based on the extent of the necessary debridement and nature of the sore. An overall complication rate of 16% (17/104) was observed in flap follow up. These included all minor complications, many of which went on to heal postoperatively. Conversely, a re-operation was representative of an operative reconstruction that did not succeed and warranted a new reconstruction.

Following the excision of the ischial bursa a variably sized cavity was present. In many cases following spinal cord injury and numerous surgeries the gluteal and thigh musculature and circulation is variable in its anatomical integrity. With consideration of the alternatives, ischial wounds were preferentially reconstructed by this surgeon using a combination of two different flaps per ischial wound; these flaps were the biceps femoris muscle flap

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combined with a posterior medial thigh fasciocutaneous flap. Ischial flaps were found to have an overall complication rate of 16% (Table 1). Of those flaps with which we had significant experience (n > 5), when the gluteus myocutaneous flap could be used, it had the lowest complication rate [12%, (1/8)], followed by the biceps femoris myocutaneous flap, which was always combined with the posterior medial thigh fasciocutaneous flap [14%, (4/29)]. A recurrence rate of 7% was recorded for the 72 wound sites reconstructed.

DISCUSSION

Our experience with ischial reconstruction flaps (n = 104) is extensive enough to facilitate a meaningful comparison with other reported reconstructive approaches. In 1997 Foster et al. conducted a review of over 113 ischial flaps with the goal of assisting in flap selection. Our ischial flap reconstruction complication rate of 16% is similar to Foster et al.’s reported complication rate of 17%. Foster et al.’s most common ischial reconstructive flap was the inferior gluteus maximus island flap (n = 34, 30% of cases) which is similar to our gluteus muscle flap. Our most common ischial reconstructive approach, however, involved the use of either a posterior medial fasciocutaneous thigh flap (complication rate 17%) alone, or in combination with a biceps femoris muscle flap (complication rate of 14%). Both these flaps have higher complication rates than Foster et al.'s inferior gluteus maximus island flap (6% complication rate) and our gluteus muscle flap (12% complication rate) but provide an excellent alternative.

The posterior medial thigh flap used in our study derived its blood supply from the medial thigh perforators and was based on the skin of the posterior medial thigh medial to biceps femoris muscle. This flap combined with a biceps femoris muscle flap offers several advantages over Foster et al.’s inferior gluteus maximus island flap and our gluteus muscle flap. Because of the likelihood of recurrent or multiple wounds amongst spinal cord injury patients, the need for skin and muscle saving techniques has been well established (10). The posterior medial thigh and biceps femoris flap combination does not violate any of the other potential flaps that may be needed for future reconstructions. Despite having a slightly lower complication rate, the use of a gluteus myocutaneous flap in ischial reconstruction can be problematic if a patient develops recurrent or multiple wounds. Gluteal myocutaneous flaps also provide ideal tissue coverage for the reconstruction of sacral wounds, which would be limited as a reconstructive option if sacral wound arise. The use of a combination posterior medial thigh fasciocutaneous flap with a biceps femoris muscle flap does not violate other important tissues that are often needed for future reconstruction, moreover, the biceps femoris flap can be reused in recurrent ischial wound cases, whereas a gluteus muscle flap cannot. Given the relatively low complication rate observed with our combination flap reconstruction and the future reconstructive advantages this technique offers over a gluteus muscle flap; the use of a combination posterior medial thigh fasciocutaneous flap with a biceps femoris muscle flap can be recommended as a first choice in ischial pressure wound reconstruction. Undoubtedly, our comparison is confounded by differing surgical techniques and patient variability. A randomized trial examining a single surgeon’s use of both ischial reconstructive approaches would aid further in flap selection at the ischial site.

Our data provides insight into the complication rates associated with different flap types selected for ischial pressure wound reconstruction sites with the goal of assisting in the selection of flaps.

- a randomized trial examining a single surgeon’s use of both ischial reconstructive approaches would aid further in flap selection at the ischial site
- our data provides insight into the complication rates associated with different flap types selected for ischial pressure wound reconstruction sites with the goal of assisting in the selection of flaps
- this study also examined reconstructive complications by wound site, noting a relatively low complication rate as compared with previously published literature

Table 1 Flaps selected for ischial reconstruction and complication rates

<table>
<thead>
<tr>
<th>Flap selected</th>
<th># of flaps</th>
<th>Complications (%)</th>
</tr>
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<tbody>
<tr>
<td>Posterior medial thigh</td>
<td>60</td>
<td>17</td>
</tr>
<tr>
<td>Biceps femoris M (with posterior medial thigh fasciocutaneous)</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>Gluteus M</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Gluteal fasciocutaneous</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Rectus femoris</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Gracilis fasciocutaneous</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TFL</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
<td>16</td>
</tr>
</tbody>
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M, muscle flap

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reconstruction flaps \((n = 104)\), was extensive enough to add validity to the use of the gluteus maximus musculocutaneous flap and suggest that the posterior medial thigh fasciocutaneous flap combined with or without the biceps femoris musculocutaneous flap in the reconstruction of an ischial wound site is a good alternative. A consideration of these two ischial reconstructive techniques allows for the recommendation of the use of a combination posterior medial thigh fasciocutaneous flap with a biceps femoris muscle flap as a first choice in ischial pressure wound reconstruction. This study also examined reconstructive complications by wound site, noting a relatively low complication rate as compared with previously published literature \((1,7–9)\).

REFERENCES


