Evaluation of the Anteromedial Thigh Fasciocutaneous Flap for Scrotal Reconstruction

MOHAMMED ABD EL-MAGEED, M.D.
The Department of Surgery, Faculty of Medicine, Cairo University.

ABSTRACT

Major scrotal skin losses represent a significant challenge to the reconstructive surgeon. Although many therapeutic methods have been established for the treatment of such defects, each technique has its own advantages and disadvantages in specific situations. The aim of this prospective study was to evaluate the use of an anteromedial thigh fasciocutaneous flap for scrotal reconstruction. Eight patients with major scrotal defects were subjected to reconstruction by this flap between August 2002 and February 2005. The mean patient age was 42 years (range 26 to 62 years). The aetiology of scrotal loss was Fournier gangrene in 4 cases, trauma in 3 cases, and excision of malignant scrotal lesion in one case. Four cases had bilateral and four cases had unilateral flap reconstruction. The anteromedial thigh fasciocutaneous flap is based on the longitudinal axiality of the anteromedial thigh suprafascial plexus. All the twelve flaps survived completely. Scarring at the donor site was limited and acceptable. The study concluded that anteromedial thigh fasciocutaneous flap is very reliable in coverage of major scrotal defects. This flap allows sensate cover and takes well in contaminated areas. Primary donor site closure obviates the need for skin grafts. The flap had excellent esthetic appearance except in two fatty patients where it was bulky.

INTRODUCTION

Although most scrotal defects occur as a result of trauma, they may also occur as a result of Fournier’s gangrene or as iatrogenic sequelae. Scrotal defects secondary to trauma are difficult to treat because they are usually associated with a crushing injury of the perineum, groin, thigh, or lower abdomen and because the scrotum is in the fold region between both areas of the groin. Thus the therapeutic method chosen must be individualized and must depend not only on the severity of injury but also upon the local anatomic conditions (e.g., the extent of tissue defect, associated injuries, and viability of adjacent skin) [1].

Fournier gangrene is a synergistic necrotizing fasciitis that spreads along deep fascial planes of the penis, scrotum (or vagina), perineum, inner thighs, and lower abdomen. It is associated with significant soft tissue losses and may even be lethal. Since the testes have an independent vascular supply, they usually survive and remain exposed [2]. Fournier gangrene can lead to a broad range of integumentary loss involving the scrotum, penis, thighs, and lower abdomen. After debridement and control of infection, skin coverage of the denuded areas becomes the next problem [3].

Major scrotal defects with exposed testes have been treated in a myriad of ways. Prior methods for testicular salvage have evolved from the simplest solution with skin grafting [4], burying them underneath the medial thigh skin [5], tissue expansion of adjacent tissues [6,7], and use of local fasciocutaneous [3,8-11] or musculocutaneous flaps [12]. However, the vast majority of reconstructive options include the use of flaps, either fasciocutaneous or musculocutaneous [13].

Reconstruction of the scrotum is important for functional, cosmetic, and psychological reasons [14]. Scrotal coverage with early single-staged sensate flap that provides complete and adequate protection of the exposed testicles is the ideal choice [10].

Local pedicled fasciocutaneous flaps from the medial thigh and the groin area [8,9,10] offer the advantages of avoiding skin-graft problems, preserving adequate sensation, and covering a large defect [1].

In the anteromedial region of the thigh, there is a well-developed fascial plexus with marked axiality aligned with sartorius [15].

The aim of the present study was to evaluate a reconstructive procedure for major scrotal defects by the use of an anteromedial thigh pedicled fasciocutaneous flap.
PATIENTS AND METHODS

Between August 2002 and February 2005, eight patients with major scrotal defects were reconstructed by the anteromedial thigh fasciocutaneous flap at the department of surgery, Cairo University Hospitals.

Patient selection:

Patients with large scrotal defects occupying one half or more of the scrotum were included in this prospective study, provided none of the following exclusive criteria was present.

1- Uncontrolled diabetes.
2- Severely debilitated patients.
3- Very old patients.
4- Post traumatic cases with crushing injury of the groin and or medial thigh.
5- Fournier gangrene cases with synergistic gangrene of the groin and/or medial thigh.

Preoperative preparation:

The infection in cases of Fournier gangrene and crushing scrotal injuries was controlled with wound debridement and intravenous antibiotics. After complete debridement, local wound care was performed with moist gauze dressings (i.e., saline or Betadine) changed two or three times per day until healthy granulation tissue was established.

Surgical technique:

Under general anesthesia while the patient in the supine position, with thighs abducted and slightly externally rotated, a proximally based longitudinally oriented rectangular thigh flap was designed, to include the skin and fascia over the anteromedial region of the thigh (Fig. 1A & 2A). The base of the flap was drawn on the anteromedial thigh at the level of the neck of the scrotum. The width of the flap corresponded to the distance between the anterior and posterior boundary of the defect. The length of the flap was that enough to cover the ipsilateral scrotal defect. Bilateral flaps were done for defects exposing both testicles.

The skin was incised along the anterior, posterior and lower edges along the subcutaneous tissues to the deep fascia. Flap elevation was started from the distal end and extended up to the base in the subfascial plane, deep to the epimysium of the adductors. It was advisable that the skin be temporarily sutured to the underlying fascia to avoid disruption of fasciocutaneous perforators. No pedicle had to be identified at the base of the flap. The vascular supply to this flap is the rich suprafascial plexus of vessels present at the anteromedial thigh.

The flap was then transposed to cover the scrotal defect by suturing its edges to the edges of the defect. The donor site was then closed after undermining the flaps on both sides in the subcutaneous tissue plane. Edges were closed in two layers with drainage.

Postoperative care:

The patients were nursed in the supine position with the ipsilateral thigh positioned in such a way not to compress the flap and not to apply tension on it, for at least 5 days. Postoperative antibiotics were given. Drains were removed after 48 hours. Interrupted skin sutures were removed after 10 days. All the patients were followed-up for 6 months.

RESULTS

Fourteen anteromedial thigh fasciocutaneous flaps were performed for coverage of large scrotal defects in 8 patients (Table 1). The average patient age was 45.3 years (range, 26 to 62 years).

The aetiology of scrotal loss was Fournier gangrene in 4 cases, crushing injury in 2 cases, avulsion injury in one case, and excision of malignant scrotal lesion in one case. All the 4 patients of Fournier gangrene and the 2 cases of crushing injury of the scrotum received delayed surgical reconstruction after the appearance of healthy granulation tissue at the base of the wound. The mean time between the last debridement performed and the reconstructive procedure was 23.7 days (range, 12 to 42 days). The case due to avulsion injury and that due to excision of malignant lesion had immediate reconstruction, since the wounds were clean.

The average flap length was 16.7cm, varying between 14 and 20cm. The average flap width was 9cm, ranging between 7 and 12cm. Flap survival was excellent, the donor site scar area healed nicely, and all patients experienced sensation at the site of flap surgery. The aesthetic results were very satisfactory to both the patient and the surgeon except in two patients with overweight where the flaps were bulky and esthetically undesirable. Figs. (1,2) show pre, intra and postoperative views of two cases done in this series.

Complications included 3 cases of low-grade wound infections and 3 cases of partial wound separations. However, all wounds eventually healed satisfactorily.
Fig. (1-A,B): A case of crushing injury of scrotum. Preoperative view and flap design.

Fig. (1-C,D): Early postoperative views.

Fig. (1-E,F): Late postoperative views.
Fig. (2-A,B): A case of Fournier gangrene. Preoperative view and flap design.

Fig. (2-C,D): Intraoperative views of the elevated flaps.

Fig. (2-E): Early postoperative views.

Fig. (2-F): Late postoperative views.
Table (1): Patients’ data.

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Age (Year)</th>
<th>Aetiology</th>
<th>Affected side</th>
<th>Time of Reconstr.</th>
<th>Flap dimensions (cm)</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54</td>
<td>Fournier’s gangrene</td>
<td>Bilateral</td>
<td>23 days</td>
<td>8x14, 8x16</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>Fournier’s gangrene</td>
<td>Bilateral</td>
<td>25 days</td>
<td>9x17, 9x18</td>
<td>Dehiscence</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>Crushing injury</td>
<td>Bilateral</td>
<td>19 days</td>
<td>10x18, 11x20</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>51</td>
<td>Post excision of carcinoma</td>
<td>Left</td>
<td>Immediate</td>
<td>9x15</td>
<td>Wound infection</td>
</tr>
<tr>
<td>5</td>
<td>62</td>
<td>Fournier’s gangrene</td>
<td>Bilateral</td>
<td>12 days</td>
<td>11x19, 12x20</td>
<td>Dehiscence</td>
</tr>
<tr>
<td>6</td>
<td>42</td>
<td>Avulsion injury</td>
<td>Left</td>
<td>Immediate</td>
<td>9x17</td>
<td>Wound infection</td>
</tr>
<tr>
<td>7</td>
<td>59</td>
<td>Fournier’s gangrene</td>
<td>Bilateral</td>
<td>42 days</td>
<td>7x14, 8x14</td>
<td>Wound infection</td>
</tr>
<tr>
<td>8</td>
<td>33</td>
<td>Crushing injury</td>
<td>Bilateral</td>
<td>21 days</td>
<td>7x16, 8x17</td>
<td>Dehiscence</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Many therapeutic modalities have been used to resurface scrotal defects [1]. Split skin grafts have been used in the past but graft take is not satisfactory, and when it is, it commonly undergoes contraction. A free skin graft will also not take if the testes have been stripped of the tunica vaginalis [9].

Implantation of the testes in the thigh followed later by local skin mobilization along with the testes was used to reconstruct the scrotum [16]. The drawbacks to this technique, however, are constant pain caused by mechanical trauma and the testicular atrophy [3]. Permanent placement in the thigh has been reported, but concerns over temperature regulation and reports of pain and adverse psychological effects generally support relocating the testicles anatomically at some point in the reconstruction [14].

The scrotal musculocutaneous flap can be used for small to medium size defects and provides durable and good-quality skin. It has a rich blood supply and elasticity conferred by the dartos muscle [17]. Because of the scrotum’s expansile nature, as little as a third of residual scrotum can be expanded to resurface the entire scrotum [7].

Numerous myocutaneous flaps have also been used, including the rectus abdominis myocutaneous flap [18] the gracilis myocutaneous flap [19], the adductor minimus myocutaneous flap [20] and composite gastric seromuscular and omental pedicle flaps [21]. Although such procedures produce acceptable cosmetic results, and the flaps take readily in the contaminated environment, they can be technically challenging, especially to those not versed in reconstructive surgery [3].

Perforator-based cutaneous flaps have been also described for scrotal reconstruction, including the island anteromedial thigh flap [22], paraumbilical perforator-based cutaneous island flap [1], medial circumflex femoral artery perforator flap [2], pedicled deep inferior epigastric perforator flap [23]. Although they are thin flaps which is aesthetically and functionally optimum for scrotum replacement, these flaps are technically difficult and sophisticated and their blood supply is less predictable.

Numerous thigh fasciocutaneous flaps have been used and represent an excellent tool for scrotal reconstruction [24]. They offer excellent cosmetic results while being technically simple to perform with minimal disruption of the donor site [3]. These include the medial thigh fasciocutaneous flap [10], superomedial thigh flap [25]; a superiorly and laterally based thigh pedicle flap [26]; anterolateral island thigh fasciocutaneous flap [14], inner thigh lift flap [13], Singapore flap [3] and V-Y fasciocutaneous pudendal thigh flap [11].

The medial thigh fasciocutaneous flap was adopted as a single-staged sensate flap option for creation of a neoscrotum [10]. No specific vascular pedicle had to identified at the base of this longitudinally oriented flap, as it is nourished by the suprafascial plexus of the medial thigh that included septocutaneous branches from the superficial femoral artery and musculocutaneous branches through the adductor muscles [2].

The studies conducted by Pontén [27] Haertsch [28], Har-Shai et al. [29] and Cormack and Lamberty [30] pointed out the crucial role played by the fascial plexus in the cutaneous vascularization of the medial thigh. This plexus arises from the convergence of three longitudinal rows of vessels, anterior, medial, and posterior, that contribute to the creation of a vascular network, as described by Wang et al. [31].

Another unique feature of the fascial system of the thigh is the observation made by Cormack...
and Lamberty [15] “The most striking feature about the vascular plexus in the three regions of the thigh is the variation in axiality. In the anteromedial region, there is a well-developed fascial plexus with marked axiality aligned with sartorius”.

Based on these anatomic considerations, a superiorly based vertically oriented skin pedicled anteromedial thigh fasciocutaneous flap is described in this study. The flap is based on the longitudinal axiality of the anteromedial thigh suprafascial plexus described by Cormak & Lamberty [15,30] and confirmed by Hallock [2,10]. No vascular pedicle has to be identified at the base of the flap. Flaps up to 12cm wide and 20cm long could be used in this study.

This flap is similar in principle and technique of elevation to the medial thigh fasciocutaneous flap of Hallock [10] described for scrotal reconstruction, but differs from it in being designed on the anteromedial thigh and thus it has more accessible dissection, less twisting at the pedicle and easier insetting over the defect.

The anteromedial thigh fasciocutaneous flap described in this article differs from the anteromedial thigh flap of Koshima et al. [22] and from the superomedial thigh fasciocutaneous flap of Hirshowitz & Pertez [8]. The anteromedial thigh flap of Koshima et al., is an island cutaneous flap based on the septocutaneous perforator originating from the medial descending branch of lateral circumflex femoral vessels. Although this flap is thin, it requires tedious dissection of its vascular pedicle which is also liable to hazards of kinking, overstretching and compression. The superomedial thigh flap is a horizontally oriented anteriorly based fasciocutaneous flap. One limit of this flap is its transverse dimension [24].

Eight cases with large scrotal defects were reconstructed by the anteromedial thigh fasciocutaneous flap. Four cases were due to Fournier gangrene, 3 cases secondary to trauma and one case after surgical excision of a squamous cell carcinoma of the scrotum. Complete debridement and stabilization of the patient preceded any attempt at scrotal reconstruction.

The anteromedial thigh fasciocutaneous flap was found an easy technique regarding its elevation, transposition and insetting into the defect. No compromise to the circulation was encountered. The donor site could be closed primarily in all cases leaving a nicely healed scar. Aesthetic results were excellent except in two overweight patients where the flaps were bulky.

Complications in the studied cases were all minor wound complications and all of them could be managed conservatively and only lead to delay in wound healing.

Hallock [2,10] mentioned that one medial thigh fasciocutaneous flap from one thigh can serve to make the whole neoscrotum for bilateral cases. Although the technique of anteromedial thigh flap mentioned here is very similar to the technique of medial thigh flap of Hallock [10], I prefer to use one flap for each scrotal half to preserve the shape of two scrotal compartments rather than one single bag.

Conclusion: The flap described in this article has the same advantages as medial thigh fasciocutaneous flap for scrotal reconstruction: 1) It constitutes a simple, safe, and single-stage procedure, 2) It provides a sensate coverage, ideal for scrotal defects, 3) It achieves a reasonable aesthetic result, preserving male identity, and 4) Primary closure of the donor site.

Moreover, anteromedial thigh fasciocutaneous flap has the following advantages over the medial thigh fasciocutaneous flap: 1) Flap dissection is easier, being more accessible, 2) Arc of rotation is less acute with less kink at the pedicle, 3) Dog-ear deformity in the upper thigh is smaller, and 4) Scar of donor site closure is away from friction areas in the medial thighs.

One disadvantage of the described anteromedial thigh flap in fatty patients is its bulk which makes its rotation difficult and makes the neoscrotal bag very bulky. Also, it may affect spermatogenesis.

REFERENCES


