

Gracilis Myocutaneous Flap for the Coverage of an Extensive Scrotoperineal Defect and Protection of the Ruptured Urethra and Testes

Young Tae Lee and Jin Moo Lee

The use of a gracilis myocutaneous flap to overlay an extensively traumatized scrotoperineal soft tissue defect, through which both testes and the ruptured bulbous urethra were exposed, is discussed. The transplanted gracilis myocutaneous flap, which included vascularized and innervated tissue, was well taken and covered the perineal defect, exposed testes and urethral stricture both cosmetically and functionally.

Key Words: Gracilis myocutaneous flap, multiple injuries of scrotum, perineum, testes and urethra

Commensurate with the development of modern, mechanized civilization, various industrial, military and automobile accidents have occurred, and each part of the body has received its share of complex injuries. Infection and tissue necrosis often accompany such injuries, resulting in the formation of numerous types of tissue defects which necessitate reconstructive surgery.

In the case presented here, an automobile accident resulted in a pelvic fracture, urethral rupture and perineal degloving injury to a 20-year-old man. Infection and necrosis of the overlying soft tissue ensued and the bulbous urethra and both testes were exposed. A gracilis myocutaneous flap procedure was performed on this patient, and the results were satisfactory due to the abundant blood supply and the preservation of the sensory nerves in the flap tissue. The reconstructive surgical technique employed and a review of the literature are presented herein.

CASE

A 20-year-old man was struck by a taxi in January 1987 and received scrotoperineal degloving injuries,

inguinal lacerations, rupture of the bulbous urethra and mesentery, and fractures of the pubic bone. Primary closure of the ileum, mesentery, scrotum and perineum was performed with a suprapubic cystostomy. Six days after the accident, wound infection and necrosis developed and were accompanied by an unpleasant odor and mild fever, but there was no evidence of septicemia. After wide excision of the necrotic tissue, a temporary colostomy was performed and an indwelling urethral Foley catheter remained in the bladder on the 7th day after the injury (Fig. 1-A).

On the 37th day after the injury, scrotal and perineal reconstruction was performed utilizing a gracilis myocutaneous flap. After the surgery a slight wound infection and marginal necrosis of the transplanted flap developed, but this was well managed locally and the epithelial tissue defect was completely covered with the use of a split thickness skin graft (STSG) (Fig. 1-B, C, D, and E).

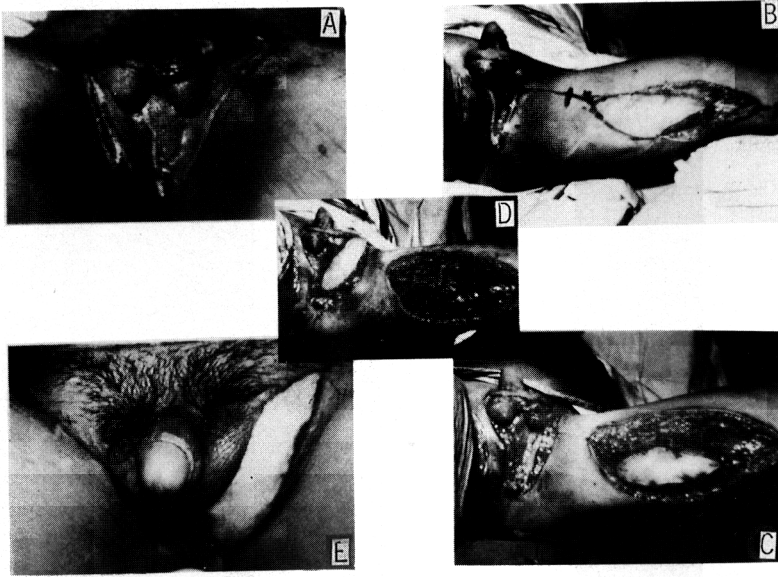
Ten weeks after the reconstructive surgery, spontaneous voiding was attempted with the removal of the silicon urethral catheter. As there was a decrease in urine flow during spontaneous voiding, a voiding cystourethrogram (VCUG) was performed which revealed narrowing of the bulbous urethra. A visual urethrotomy was done (Fig. 2-A and B). Thereafter, although the patient was able to voluntarily control voiding and ejaculation was possible, a marked decrease in the amount of semen and a substantial decrease in the number of sperm were noted. Colostomy takedown was performed 3 months after the

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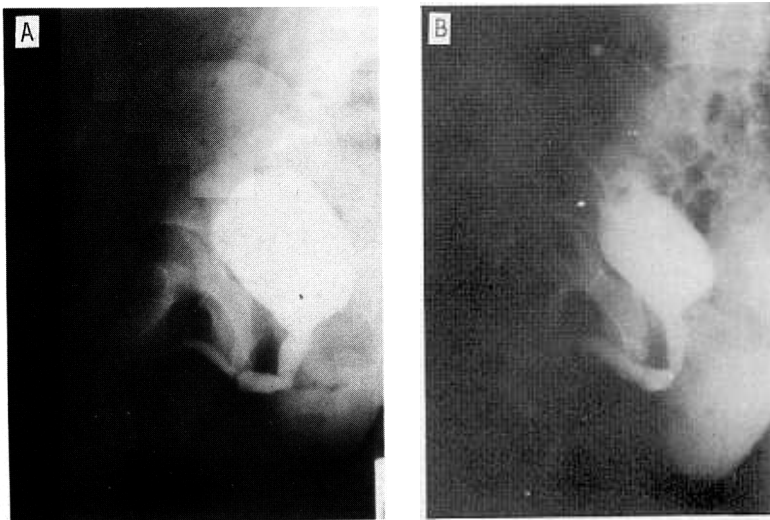
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Department of Urology, Yonsei University College of Medicine, Seoul, Korea

Address reprint requests to Dr. Y T Lee, Department of Urology, Yonsei University College of Medicine, C.P.O. Box 8044, Seoul, Korea, 120-749



- Fig. 1-A.** Fresh and healthy granulation tissue developed 5 weeks after wide excision and treatment of the extensively necrotized and infected wound following a degloving injury to scroto-perineum.
- Fig. 1-B.** A line drawn between the pubic tubercle and medial tibial condyle and a point about 8cm below the pubic tubercle are marked to show a major vascular pedicle. An island gracilis myocutaneous flap is outlined and then mobilization is started.
- Fig. 1-C.** Both scrotoperineal wound debridement and island gracilis myocutaneous flap dissection are started. The skin of the flap is fixed to the muscle by several 3-0 silk sutures.
- Fig. 1-D.** The island gracilis myocutaneous flap is transferred through the subcutaneous tunnel made between the perineum and the medial aspect of the thigh.
- Fig. 1-E.** Completely healed gracilis myocutaneous flap.



- Fig. 2-A.** Voiding cystourethrogram revealed a stricture 3 months after transplant of the gracilis myocutaneous flap and just before a visual urethrotomy.
- Fig. 2-B.** Voiding cystourethrogram 3 weeks after a visual urethrotomy shows no evidence of urethral stricture.

reconstructive surgery, and 5 months after the initial injury. The patient was discharged in satisfactory condition.

SURGICAL TECHNIQUE

In order to perform reconstructive surgery on the perineal and scrotal area using a gracilis myocutaneous flap, systemic antibiotics were administered and the previously fashioned temporary colostomy and bowel were prepared 72 hours preoperatively. The patient was placed in the lithotomy position with the hip joints flexed and abducted 45 degrees, and the calves were placed in the stirrups with the knee joints flexed 45 degrees. The rest of the operative procedure was done in a routine manner. Granulation and fibrotic tissue were debrided from the defect, and the reconstruction area was measured.

A PT line connecting the left pubic tubercle with the left medial tibial condyle was drawn with a surgical marker. A mark was placed about 8cm inferior to the pubic tubercle to indicate the location of the major blood vessels and nerves supplying the gracilis muscle (Mathes *et al.* 1982).

A 5cm×10cm ellipse was drawn on the posteroinferior aspect with the long axis originating 5cm superior to the medial tibial condyle, and the upper end of the short axis was initiated from the PT line. The island of the gracilis myocutaneous flap was designed by extending lines along the axis (Fig. 1-B).

From the inferior aspect of the thigh, the dissection was done superiorly along the design line with careful confirmation of the course of the gracilis muscle to mobilize the gracilis myocutaneous flap. Then the gracilis muscle was divided near the insertion point of the gracilis tendon.

The gracilis myocutaneous flap and gracilis fascia were temporarily sutured with 3-0 silk in several places to diminish the possibility of separation (Fig. 1-C). Approximately 8cm inferior to the pubic tubercle, there is a pedicle consisting of the medial femoral circumflex artery, venae comitantes and the anterior branch of the obturator nerve which supplies and innervates the gracilis muscle and its overlying skin. The pedicle should be carefully checked and preserved. The island gracilis myocutaneous flap was directed to the perineal area through the subcutaneous tunnel formed between the perineum and femoral incision site (Fig. 1-D). After attaching the distal end of the gracilis muscle to the upper margin of the distal inguinal area, the gracilis myocutaneous flap and the previously prepared perineal and scrotal skin were sutured. Two

suction tubes were inserted into the perineum along the direction of the displaced gracilis myocutaneous flap, and a Hemovac was connected to the tubes located in the donor site. The indwelling urethral silicon catheter was removed 10 weeks postoperatively.

DISCUSSION

Debridement of the infected necrotic tissue left a broad tissue defect of the perineum and scrotum, resulting in the complete exposure of both testes and the bulbous urethra which required primary closure and reconstructive surgery.

The problems presented in this case, in terms of efficient therapeutic measures, were as follows:

1) how to best cover the tissue defect that involved about 4/5 of the perineum and scrotum in order to enhance healing of the injured bulbous urethra, 2) how to prevent urethral stricture, and 3) how to protect the wound from additional injury. In other words, with regard to morphology and function, how could these objectives be ideally accomplished? With respect to the above considerations, split thickness skin graft (STSG) simply covers the exposed perineum and urethra. However, it lacks the adequate amount of tissue necessary to protect the urethra from external stimuli. Also, with a STSG, the perineum is easily subject to scar contraction and urethral stricture, and the possibility of urethral injury increases with even trivial impact or stimuli.

If the urethra is damaged, urethroplasty is difficult to perform because there is little supporting tissue to aid in wound healing. However, as a temporary therapeutic procedure, some authors advocate the following: allow the residual scrotal tissue to heal on its own, cover the exposed bilateral testes and the perineal wound, and attempt reconstruction thereafter (Bright *et al.* 1978).

The basic therapeutic plan is to overlay the wound with a pedicled muscle or myocutaneous flap that is abundant in blood supply and has normal healing ability. In such a case, because the pedicled tissue is in effect a biological dressing for the exposed tissue, it is more resistant to infection and enhances healing in a relatively short period of time (Graham 1965; Orticochea 1972). Gracilis muscle began to be utilized clinically following reports of good results in the transfer of the gracilis muscle to the periphery of the anus in patients with fecal incontinence (Pickrell *et al.* 1952). Other reports of similar attempts and success followed (Pickrell *et al.* 1956; Choi *et al.* 1982; Shin

et al. 1984).

Furthermore, this procedure is used in the treatment of chronic perineal fistula (Bartholdson et al. 1975; Baek et al. 1981), bedsores (Wingate et al. 1978), and in the reconstruction of the penis (Persky et al. 1983), scrotum (Westfall et al. 1981), vagina (McCraw et al. 1976), etc. The author also succeeded in the correction of a fistula by interposition of the gracilis muscle flap between the chronic prostatic urethro-rectal fistula (Lee et al. 1985).

After placement of the myocutaneous flap, if there is no infection, healing usually takes about two to three weeks with primary closure (Irvin 1981). However, in chronically infected wounds with a perineal fistula, such as a vaginocolonic or colonic fistula, healing takes three months, a relatively long time (Bartholdson et al. 1975).

In the case presented, because of the partial tension between the perineal wound in the skin suture and the transferred gracilis myocutaneous flap, tissue necrosis and infection developed and complete healing was not achieved for three months until an additional split thickness skin graft (STSG), local treatment and debridement were instituted.

During the next 7 weeks, the patient underwent colostomy repair and a visual urethrotomy to correct a urethral stricture. Although there is controversy in support of and against the use of a temporary colostomy prior to perineal surgery using the gracilis muscle, in this case a transverse colostomy was performed and despite a lengthy recuperation period due to infection, the above procedure proved to be most appropriate (Shin et al. 1984; Frederick. 1980; Landeen et al. 1979; Corman 1983).

SUMMARY

An automobile accident left the patient with a pelvic fracture, urethral rupture, and perineal and scrotal degloving injuries. Infection and tissue necrosis followed, resulting in a wide tissue defect with exposure of the ruptured urethra and both testes. Reconstructive surgery was performed, using a gracilis myocutaneous flap with its blood supply and neurovascular bundle intact. Even though chronic infection and necrosis around the edge of the gracilis myocutaneous flap appeared, wound healing was possible with local wound management.

In addition, the following can be concluded with regard to morphology and function.

1. Urethral healing was enhanced by the use of the thick gracilis myocutaneous flap which has a good

blood supply. The urethral stricture improved with a single visual urethrotomy.

2. Because the soft, thick gracilis flap not only has an excellent blood supply but is also innervated by the anterior branch of the obturator nerve (L2-4), it responds to external stimuli. Furthermore, it offers protection against injury by adequately covering the perineal and scrotal tissue defect and presents a relatively satisfactory cosmetic appearance.

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