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Case Report

Abdominal Implantation of Testicles in the Management of Intractable Testicular Pain in Fournier Gangrene

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Fournier gangrene (FG) is a necrotizing soft tissue infection involving the superficial and fascial planes of the perineum. In many cases of FG, debridement of the scrotum is necessary, leaving definitive management of the exposed testicles a significant surgical challenge. Frequent incidental trauma to the testicles can cause severe pain, especially in laborers. Practical surgical solutions are few and not well detailed. Various options exist, including creating a neoscrotum with adjacent thigh tissue, split-thickness skin grafts (STSGs), or even creating a subcutaneous thigh pocket. We describe a case of abdominal implantation of bilateral testicles for persistent testicular pain in a case where STSGs did not provide adequate protection, adjacent thigh skin was not available for creation of a neoscrotum, and significant cord contracture occurred. We detail the advantages and disadvantages of the commonly described techniques, including this approach, and how in select individuals this may be a suitable alternative.

Key words: Fournier gangrene – Necrotizing fasciitis – Abdominal testicular implantation – Bilateral orchiopexy

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Fournier gangrene (FG), although increasingly diagnosed, remains a rare, life-threatening condition necessitating prompt identification, fluid resuscitation, broad-spectrum antibiotic therapy, and early, aggressive surgical debridement. First described almost 250 years ago by Baurienne in 1764,[1] it wasn't until Jean-Alfred Fournier reported a series of 5 cases in 1883 that the condition was aptly named Fournier's gangrene.[2] Historically, FG was defined as a sudden-onset, rapidly progressing gangrenous infection of the perineum and scrotum in a male, without an identifiable cause. Today, however, the definition more loosely encompasses any necrotizing soft tissue infection of the perineum in either males or females, regardless of etiology.

By definition, the infection involves only superficial layers, sparing the deeper, more vascular structures such as the testis and muscles. If left untreated, the infection can spread rapidly within the fascial planes throughout the body, leading to widespread necrotizing fasciitis and eventual death. Early, wide, surgical excision remains the mainstay of treatment, with scrotal debridement in up to 33% of patients, leaving the surgeon faced with definitive testicular coverage.[3,4]

A variety of methods have been described that focus primarily on skin grafting, local muscle and skin flaps, and even subcutaneous thigh pockets. However, these methods require sufficient skin or adjacent muscle. Given the extensive nature of this patient's disease, these options were not feasible. We employed bilateral testicular abdominal implantation after discussing the need for long-term testicular cancer surveillance.

Case Report

The patient was a 49-year-old alcoholic and cachectic, otherwise healthy, male who was transferred to our institution from an outlying hospital. He had a 1-month history of redness and increasing pain around his perineum and scrotum, with a small, blackened area of necrosis noticed six days prior. He had no past medical history of diverticulitis, colon cancer, or previous trauma to the perineum.

Upon evaluation, he was found to have necrotic areas in the inferior aspect of his scrotum, with surrounding erythema and crepitus extending to his thighs and upwards onto his abdomen, chest, left flank, and left axillary areas (Figs. 1 and 2). His rectal examination was normal. The patient's clinical examination was consistent with a diagnosis of FG.

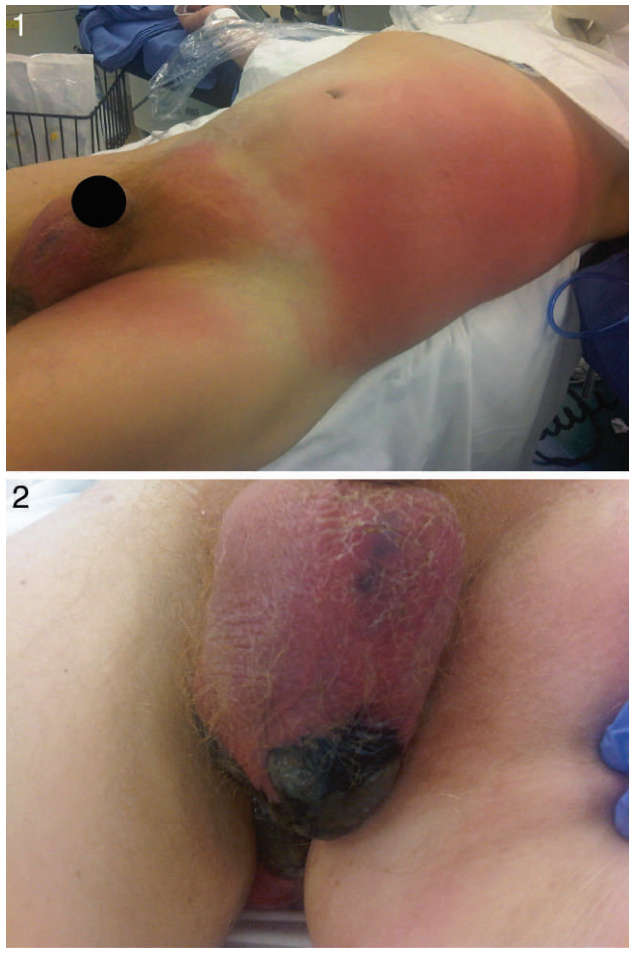
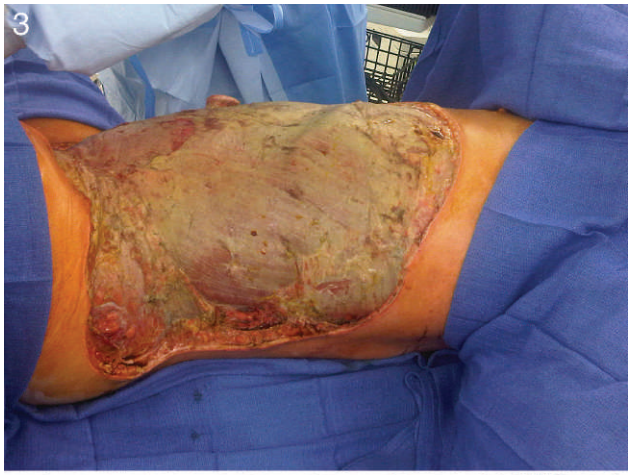


Fig. 1 Initial presentation demonstrating marked erythema and cellulitis. **Fig. 2** Initial presentation showing necrosis of the scrotum.

Vital signs upon presentation did not reveal any signs of sepsis or hemodynamic instability; he appeared mildly uncomfortable.

Laboratory tests drawn from the outlying hospital revealed only the following abnormalities: serum sodium 110 mmol/L, white blood cells 22.6×10^9/L, serum bicarbonate 18 mmol/L, and albumin 2.3 g/dL. His Fournier Gangrene Severity Index was 8 on initial presentation, which corresponded to a survival rate between 78% and 96%.[5]

He was started empirically on piperacillin/tazobactam and metronidazole and taken to the operating room for surgical debridement. The scrotum was entirely debrided, preserving the testicles, which were viable, and negative-pressure wound therapy (NPWT) was instituted. The final results of his wound cultures revealed heavy-growth *Escherischia coli*, *Streptococci*, and *Arcanobac-*



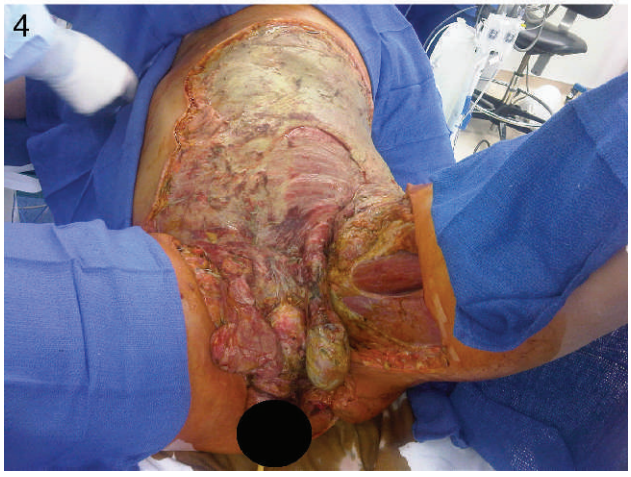
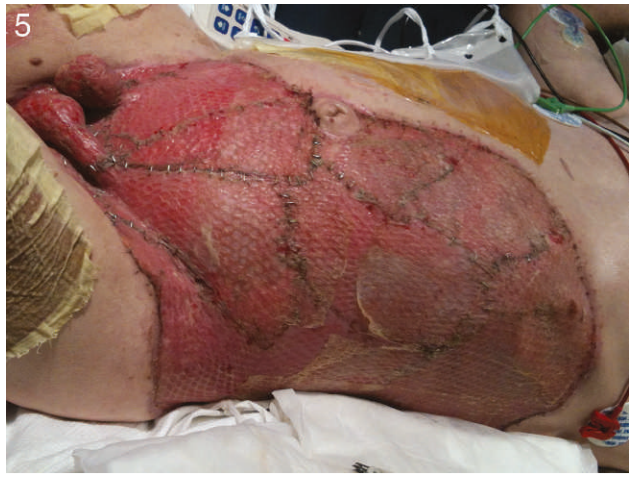


Fig. 3 Torso following third operative debridement. **Fig. 4** Perineal area following third operative debridement.



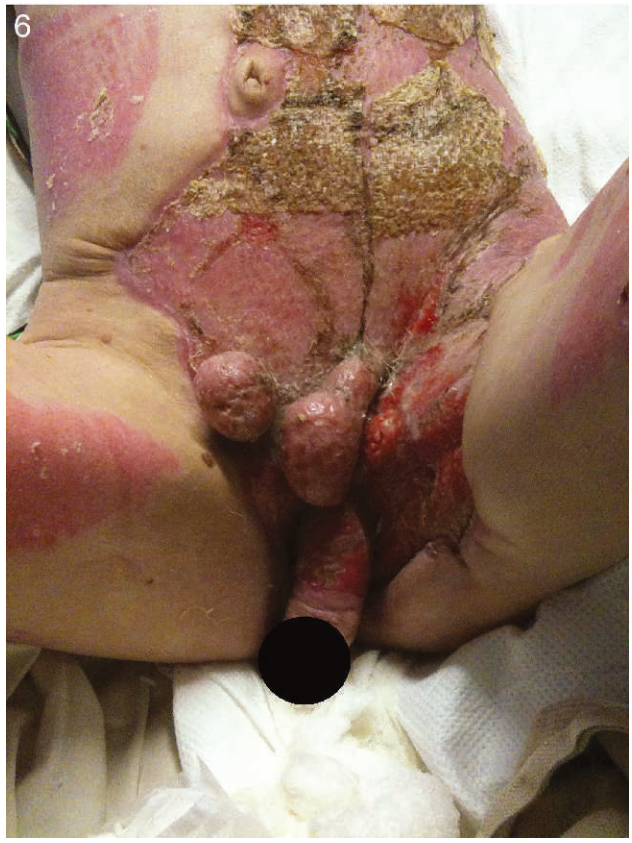


Fig. 5 Torso following 20 operative debridements and split-thickness grafting. **Fig. 6** Two weeks following split-thickness skin grafting.

terium, and antibiotics were accordingly changed to ciprofloxacin and clindamycin.

The patient underwent 14 successive debridements and NPWT over the next 6 weeks until local wound control was obtained and healthy granulation tissue was noted (Figs. 3 and 4). Optimal nutrition was achieved with the patient receiving 3 g/kg of protein per day. Definitive skin coverage was achieved via split-thickness skin grafts (STSGs) harvested from his upper and lower extremities, right chest, and right flank areas, with satisfactory results (Figs. 5 and 6).

However, the patient complained of persistent testicular pain during ambulation and sleeping. Due to lack of adjacent viable muscle and skin and inadequate cord length, a pedicled flap or subcutaneous thigh pockets were not feasible. Furthermore, repeat skin grafting was unlikely to produce desired results. Given these circumstances, we decided to perform abdominal implantation of his testicles (Fig. 7).

Incisions were made through the grafted areas of the inguinal region, followed by dissection through the abdominal wall to the inguinal canal. The previous STSGs were removed, and the testicles

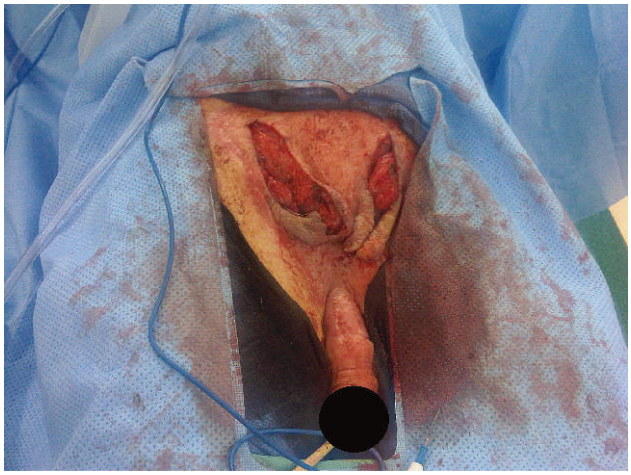


Fig. 7 Bilateral testicular abdominal implantation.

were reimplanted in the inguinal canal. A mesh plug was placed inferiorly in the superficial inguinal canal to bolster the testicles and to prevent cord distortion and kinking. Furthermore, the inguinal floor was reinforced with mesh. Finally, the external oblique fascia was closed over the testicle with absorbable sutures. Once positioned, ultrasonography confirmed satisfactory testicular vascular flow (Fig. 8). The patient did well with resolution of his testicular pain following this final operation and was discharged home shortly thereafter.

Discussion

The term *Fournier gangrene* was first used to describe idiopathic gangrene of the scrotum in the late 19th century.[6] Today, virtually all cases have an identifiable cause. The infection can be secondary to anorectal diseases, trauma, dermatologic pathology, or even occult malignancies.[6]

As the majority of FG patients require scrotal debridement, definitive management of the exposed testicles becomes a surgical challenge. Many methods have been proposed, without a general consensus regarding an optimal approach. The most common and widely published method of coverage is with STSGs.

Although carried out for trauma, one of the earliest reports of scrotal reconstruction using skin grafts was in 1931 by Robertson.[7] Tan *et al* [8] reported on the success, both clinically and aesthetically, of scrotal reconstruction by testicular apposition and wrap-around skin grafting. Chen *et al*[9] reported on the success of several options, devising an algorithm for the most appropriate reconstructive technique, which included scrotal advancement, gracilis myocutaneous and pudendal thigh flaps, and STSGs.

Over the years, modifications of these conventional techniques arose. The short gracilis flap, was first described by Soper *et al*[10] in 1989, transposes a skin island more proximally on the thigh, allowing greater mobility and reduction in bulky zones.[11] Other methods utilize remnant scrotal tissue with placement of subcutaneous tissue expanders and, either as a one-stage or multi-staged operation, recreate scrotal tissue for adequate coverage.[12]

One of the largest studies of scrotal reconstruction was from Bhatnagar *et al*[13] in which they documented the success of a fasciocutaneous rotation thigh flap in 110 patients. Accordingly, this approach demands considerable skill and experience and is associated with a longer hospital stay and relatively more complications, such as infection, hematoma, and flap necrosis, compared with other procedures.

In cases where extensive debridement precludes adjacent flaps and where STSGs fail to yield desired results, alternative methods have been employed. Implantation of the exposed testicle into an adjacent subcutaneous thigh flap has been documented. This strategy affords shorter hospital stay and faster recovery time. Some adopt this technique as a

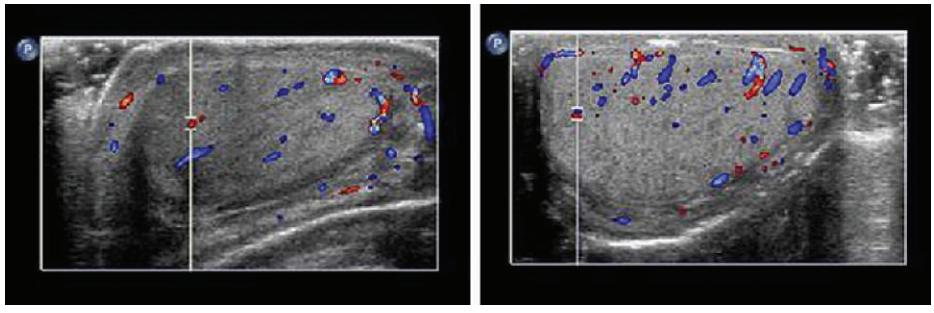


Fig. 8 (Left to right) Left and right testicular ultrasound demonstrating satisfactory blood flow.

bridge to definitive scrotal reconstruction once the patient has recovered and developed more suitable adjacent tissue to facilitate flap coverage.

In patients requiring multiple debridements and prolonged wound care, retraction of the cord may occur. This can be a significant problem, especially in young, ambulatory patients, giving rise to incidental testicular trauma. For those in whom child-bearing is no longer desired, bilateral orchiectomy may be considered as a last resort.

No reports exist of abdominal testicular implantation in the management of FG. A novel approach, particularly in patients with unfavorable results following STSGs, is abdominal implantation, which can alleviate persistent testicular pain and potentially preserve fertility. Mammalian studies demonstrate that Leydig cells' production of testosterone is inhibited at higher ambient temperatures. However, normal adult levels can still be achieved.[14,15] We were, however, able to document satisfactory testicular blood flow following abdominal implantation. This approach does raise concerns as it increases the risk of testicular cancer. But, in select patients desiring fertility and willing to undergo life-long surveillance, it remains a viable, reasonable, and potential alternative.

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