Case Series

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Multimodal management of Fournier's gangrene with subsequent wound closure techniques

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ABSTRACT

Fournier's gangrene (FG) is a fulminant and lethal condition usually occurring in the immunocompromised, first described in 1883 by the French dermatologist Jean Alfred Fournier. It is a form of necrotizing fasciitis of the perineal, genitourinary and perianal regions mostly in males with a mortality of nearly 20-50%. It is a surgical emergency and requires early diagnosis aided by scores such as laboratory risk indicator for necrotising fasciitis (LRINEC) and FG severity index (FGSI), extensive debridement combined with supportive procedures to manage associated complications and broad-spectrum antibiotics. Management of FG thus required a multimodal approach and emphasis on reconstruction after recovery in patients who survive was crucial to improving the quality of life in these patients. Here we were presenting 7 cases of FG successfully managed at our institution, grouped under the four methods by which wound closure was achieved: fecal diversion and split skin grafting of scrotum, urinary diversion and penoscrotal split skin grafting, delayed primary closure (with and without orchidectomy) and wound healing by secondary intention.

Keywords: Fournier's gangrene, Reconstruction, Diversion, split skin grafting, Delayed primary closure

INTRODUCTION

FG is a fulminant necrotizing fasciitis of the perineal, genitourinary and perianal regions mostly in males, caused by synergistic activity of both aerobic and anaerobic bacteria that can rapidly lead to multiple organ dysfunction and death. Decreased incidence among females may be explained by better drainage of perineal secretions. It usually occurs in patients with immunocompromise and a local nidus of infection. The mixed infection by aerobic and anaerobic bacteria causes an acute inflammation of the subcutaneous tissues that results in an obliterative endarteritis of the arterioles to the skin of the scrotum/perineum leading to gangrene. The impaired defences in host allow the infection to

proceed unchecked at alarming rates to the fascia and skin of the penis, perianal region and abdominal wall leading to extensive loss of tissue.⁶ The patient usually also has pronounced systemic features.

The patient has a stormy presentation to the emergency department and usually needs early, emergency, extensive (sometimes multiple) surgical debridements and associated supportive fecal/urinary diversion procedures. If the patient survives the turbulent perioperative period, he is left with a substantial raw area that can impair the quality of life. Thus, reconstruction and wound cover are important aspects of management that are essential in rehabilitation of the patient.

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The reconstructive procedures can be performed in the same admission or after resolution of the acute infectious process, either way after achieving stable, well granulated wounds.⁴

In cases with large wounds surrounding the natural excretory orifices, fecal/urinary diversion may be needed to allow control of sepsis and wound healing.⁷⁻⁹ The diversions are usually reversed after wound coverage is complete.

This article focused on the methods by which wound closure was achieved in 7 such cases managed successfully at our institution.

CASE SERIES

Case 1

A 37 year old diabetic male presented to the emergency department with a history of blackish discoloration of the scrotum, perineum and perianal region for the past one week. Local examination showed extensive necrosis and loss of tissue with slough and active pus discharge over scrotum, perineum and perianal regions. He was febrile with a WBC count of 28,900 per cumm and blood glucose levels of 349 mg/dl. Patient was resuscitated with IV fluids, broad spectrum antibiotics, insulin and taken up for emergency radical debridement and transverse loop colostomy for fecal diversion. Post-surgery patient recovered well and after a month underwent split skin grafting of the scrotum and perineum which provided full cover of the raw area thus enabling reversal of anastomosis (after ensuring continence) and complete recovery of the patient (Figure 1). The treatment spanned over a course of 4 months.

Case 2

A 45 year old diabetic male presented to the emergency department with complaints of swelling discolouration of scrotum and penis for the past 4 days. Patient also gave a history of difficulty in micturition and passing a poor stream of urine for the past one year which had been left undiagnosed and untreated. Local examination revealed necrosis of penile and scrotal skin. He was febrile on admission with elevated WBC count of 26,800 per cumm, blood glucose levels of 346 mg/dl and elevated renal parameters, urea-103 mg/dl and creatinine-3.2 mg/dl. Patient was resuscitated with IV fluids, antibiotics and insulin. Urinary diversion with suprapubic catheterisation was done in view of urethral stricture and penile skin loss and the patient was taken up for emergency surgical debridement. One month after discharge the patient underwent split skin grafting over the penis and scrotum thus achieving wound closure (Figure 2). An unmeshed split skin graft was used over the penis and a meshed SSG over the scrotum.

Case 3

A 47 year old diabetic male presented to the emergency department with complaints of pain over the scrotum with blackish discoloration over the right hemiscrotum for the past 4 days. Patient had a patchy necrosis of the right hemiscrotum, elevated WBC count of 20,400 per cumm and blood glucose values of 254 mg/dl. Patient was resuscitated and taken up for emergency debridement. Since the skin loss was less than 50% of the scrotal surface, delayed primary closure was done 2 weeks after surgery and the patient recovered well (Figure 3).

Case 4

A 45 year old diabetic male presented to the emergency department with complaints of pain and blackish discolouration of scrotum for the past 1 week. Patient was in shock on admission with BP of 80/60 mmHg, elevated WBC count of 41300 per cumm blood glucose levels of 255 mg/dl, blood urea-190 mg/dl and serum creatinine of 4.2 mg/dl. Local examination revealed extensive necrosis of the scrotal skin. Patient was resuscitated and taken up for emergency wound debridement. Post-surgery patient was diagnosed with CKD in view of elevated renal parameters and decreased urine output and underwent peritoneal dialysis and recovered over the course of one month in the ICU during which the wound improved but the left testis lost viability. Thus, left orchiectomy was done which also enabled delayed primary closure of the wound (Figure 4).

Case 5

A 40 year old diabetic male came with a history of trauma to scrotum one week ago following which he developed scrotal swelling, redness, pain and fever. Local examination revealed swollen erythematous scrotum and anterior abdominal wall in bilateral iliac regions. Patient was febrile, with elevated WBC counts (24,200 per cumm) and hyperglycemia (322 mg/dl). Patient was taken up for surgery and scrotum was found to be filled with pus and slough that was extending to the anterior abdominal wall. Patient underwent staged debridement of devitalised tissue and progress to healthy raw area took 2 months after which patient underwent delayed primary closure of abdominal and scrotal wounds (Figure 5, 6).

Case 6

A 47 year old diabetic male came with a history of blackish discolouration of scrotal, penile skin and lower anterior abdominal wall redness, swelling and pain. Local examination confirmed the diagnosis of FG with penile involvement and evolving Meleny's gangrene. Patient had elevated WBC count (32300 per cumm) and elevated blood glucose values. After resuscitation the patient was taken up for emergency extensive surgical debridement. Patient recovered well and post-surgical raw areas healed by secondary intention under cover of broad-spectrum

antibiotics and diabetic control without any loss of function (Figure 7).

Case 7

A 50 year diabetic old male presented with localised patchy necrosis of scrotal wall for the past 3 days. Patient

underwent emergency surgical debridement in view of elevated WBC count, fever and hyperglycemia. Post-surgery patient recovered well and wound healed by secondary intention under cover of appropriate antibiotics (Figure 8).



Figure 1: The wound at the time of presentation, after debridement and after SSG.



Figure 2: Penoscrotal SSG (done after wound debridement).



Figure 3: Post-surgical raw area of <50% of scrotal surface area and after delayed primary closure.



Figure 4: Orchidectomy and delayed primary closure.

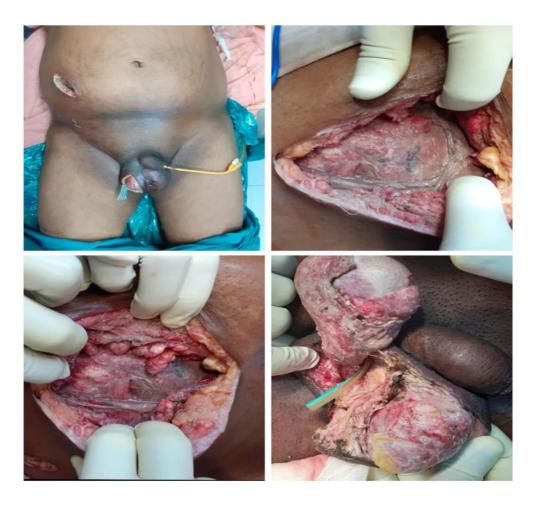


Figure 5: Wound at presentation.



Figure 6: After achieving a stable raw area and delayed primary closure.





Figure 7: Healing by secondary intention.



Figure 8: Post-surgical raw area.

DISCUSSION

FG, even though a rare disease, can be a common occurrence in the emergency department of a tertiary hospital and thus knowledge of the disease per se and its associated conditions and complications was essential to

map out the plan of management. Reconstruction was the final step in the patient's path to recovery and thus played a major role in improving quality of life. There was no best method for reconstruction and the choice of reconstruction depended on the characteristics of the raw area and surgeon experience.^{3,4,10}

Methods of wound closure included skin grafting, flap reconstruction, testicular transposition, healing by secondary intention, delayed primary closure and adjuvant therapies like negative pressure therapy (NPT), hyperbaric oxygen and vacuum assisted closure (VAC).

A study in 2015 came up with an algorithm for the choice of wound cover (Figure 9).¹¹

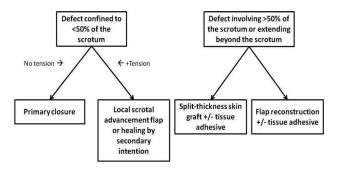


Figure 9: Algorithm for choice of wound cover after debridement.

Defects confined to <50% of scrotum can be closed using primary closure techniques, local scrotal advancement flaps or simply be left to heal by secondary intention.

Defects involving >50% of scrotum or extending beyond the scrotum can be closed using either split skin grafts or flaps.

Using this algorithm devised by Karian et al in their study in 2005 we used split thickness skin grafts for defects involving >50% of the scrotum and those extending beyond the scrotum and allowed defects of <50% of scrotum to heal by secondary intention or by delayed primary closure. This algorithm was simple, yet highly effective in planning the reconstruction of the post-surgical raw area and yielded good results in all our patients.

All the split skin grafts used for the above patients were taken from the thigh and meshed adequately to allow wound cover and prevent seroma/hematoma. Split skin grafting done over the penis in case 2 was not meshed for cosmetic purposes and post-operatively after healing there was no impairment of penile functions. 12-14

Duration of hospital stay

It should be noted that the time taken to achieve wound closure varied for each and every case depending on the severity of contamination, comorbid immunosuppressive illness, extent of raw area, time taken for the raw area to contract and graft/flap survival. The amount of time elapsed since debridement was not a factor to be taken into consideration while planning for wound closure, the achievement of a stable wound, however long it took, was the absolute pre requisite for reconstruction. The patient may stay in the hospital throughout or may be discharged in between treatments.

All the cases were operated during the COVID-19 pandemic over the course of 2020-2021 and the duration of treatment for each of the cases (including time spent in hospital for both primary debridement and reconstruction and the time taken for raw areas to close) was depicted below in the form of a bar graph in Figure 10.

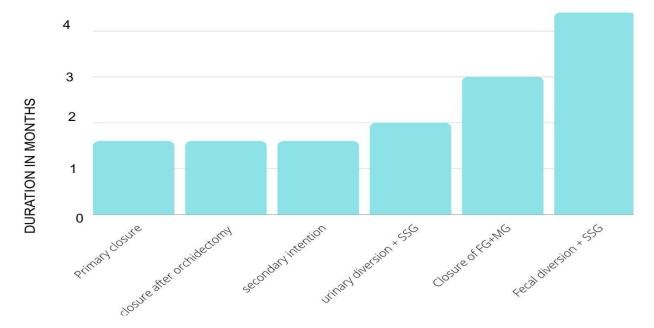


Figure 10: Time taken to achieve wound closure by each of the methods discussed above.

All the cases were followed up post-operatively and complete wound closure was achieved in all the cases and no complications were observed.

All of the patients were able to resume normal societal activities with minimal to no loss of function.

Therefore, although cosmesis was desirable, a functional wound cover with protection of testicular function was the aim and usually ensured patient satisfaction.

CONCLUSION

FG is a forbidding necrotising soft tissue infection that leaves large morbid wounds in the wake of extensive surgical debridements causing prolonged hospital stay and patient suffering. Once the patient has recovered from sepsis and a stable wound has been achieved, proper thought must be put into planning wound closure so as to improve the patient's quality of life. There is no perfect or superior technique and what works for one patient might not work for the other. Each patient's surgical history is different and the wound closure is to be tailored to fit the individual to meet his functional and cosmetic needs. The ultimate aim is to pull the patient back from

the claws of sepsis, heal his wounds and give him a new lease on life by enabling him to return back to society in full possession of his functions. Wound coverage goes a long way in patient satisfaction because in the end, adding life to years is as equally important as adding years to life.

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