Case Report

# Battle on two fronts: Fournier's gangrene as a devastating complication of targeted radiotherapy for advanced adenocarcinoma rectum

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## ABSTRACT

Fournier's gangrene (FG), as a complication of rectal carcinoma, is exceptionally rare and life-threatening. This case reports an unusual presentation of radiotherapy-induced FG in a 75-year-old male patient with advanced rectal adenocarcinoma. Multiple surgical debridements provided temporary stabilization, supported by targeted antibiotics and airway management. However, progressive polymicrobial sepsis necessitated a multidisciplinary approach, which was unsuccessful due to underlying poor prognostic factors. This case underscores the need for standardized clinical guidelines and management protocols to improve patient outcomes and reduce mortality in similar cases.

**Key words:** Adenocarcinoma rectum, Adverse effects of radiotherapy, Fournier's gangrene, Necrotizing fasciitis, Pelvic radiotherapy, Radiotherapy complications

Fournier's gangrene (FG) was initially considered an idiopathic condition, but it is now recognized as having multiple etiologies. FG results from polymicrobial aerobic and anaerobic synergistic infection of the fascia and subcutaneous soft tissue [1]. FG, secondary to pelvic brachytherapy, is a markedly rare complication, often associated with a highly complex and challenging prognosis. Though rare, FG linked to rectal adenocarcinoma highlights the need for early malignancy detection [2-4]. Managing such patients is challenging because of the unpredictable disease course. Delayed presentation can necessitate rapid surgical debridement, sometimes requiring complete scrotal excision. The optimal surgical approach, whether multiple debridement or a single extensive procedure, remains a topic of debate, and its impact on patient prognosis is unclear.

Rectal adenocarcinoma is often treated with neoadjuvant chemoradiotherapy followed by surgical resection. The presented case is not indicated for surgical resection as rectal carcinoma had extensive organ and metastatic spread. FG as a sequelae of radiotherapy remains poorly documented. This case highlights the rare but life-threatening association between pelvic radiotherapy and FG, detailing the importance of early recognition and intervention. FG is a rare but serious complication of radiotherapy, often linked to poor outcomes. A high FG severity index (FGSI) score reflects an increased risk of death. Early diagnosis and prompt, coordinated treatment are important to improve survival.

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## CASE PRESENTATION

A 75-year-old male patient presented to the emergency department with fever, loose stools, and scrotal swelling for 4 days. He also reported low back pain and altered bowel habits persisting for 4–5 months. His surgical history included a hemorrhoidectomy (2018) and a right T5 amputation (2013). He denied any relevant family history.

On arrival, he was in grade III coma (Grady coma scale), had an unrecordable blood pressure, and was hypoxic, indicating septic shock. His medical history included hypertension, type 2 diabetes mellitus, and a biopsy-confirmed diagnosis of rectal adenocarcinoma in 2021 at a tertiary hospital. Although the diagnosis, prognosis, and treatment options had been explained to him, he opted for native treatment. On examination, the abdomen was soft, with no palpable mass, and the flanks were free. The scrotum was swollen, exhibited blackish discoloration, and had a foul-smelling discharge. A perineal abscess was noted, extending from the left gluteal region into the scrotum.

Pelvic magnetic resonance imaging (MRI) (Fig. 1a) revealed a semi-annular mass measuring 5.2 cm × 1.4 cm in the lower rectum and upper half of the anal canal. Two enlarged metastatic lymph nodes were identified, the largest measuring 10 × 8 mm

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(Fig. 1b). Extensive collections with air pockets were present in the left scrotal wall, extending to the perineum, perianal region, and superficial layers of the ischiocavernosus muscle, as well as within the bulbospongiosus and corpora spongiosa. The infection further tracked into the pubic region, bilateral inguinal regions, and penile shaft, with substantial scrotal edema. An enormous collection with air pockets, measuring 7.2 × 6.4 × 1.5 cm, was noted posterior to the urinary bladder wall (Fig. 2a). A focal defect in the posterior bladder wall communicated with this collection. Bilateral external iliac lymph nodes were also enlarged, with the largest measuring 1.3 cm in short-axis diameter (Fig. 2b).

Emergency wound debridement for FG and incision and drainage of the perineal abscess were performed. The patient was further stabilized in the intensive care unit and started on broad-spectrum antibiotics and supportive medications. Wound culture from the gangrenous tissue grew *Escherichia coli*, whereas, blood culture revealed *Candida somata*, prompting the initiation of antifungal therapy. Two days later, a transverse loop colostomy was performed and placed in the right flank region. Because of deranged liver and renal function, the patient was closely monitored in intensive care.

On day 10, a tracheostomy was performed. Over the next 10 days, the patient showed improvement and was weaned off

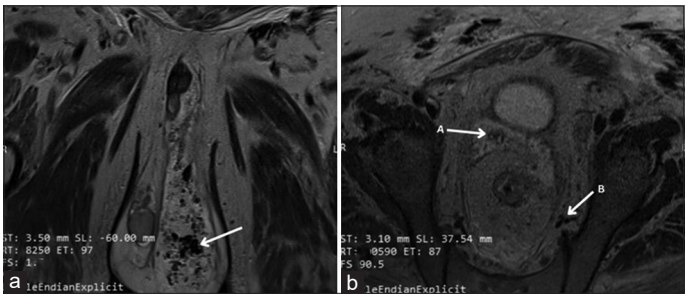


**Figure 1: (a) Large collections with air pockets in left scrotal wall tracking into penile shaft and significant scrotal edema; (b) Semi-annular mass in low rectum and anal canal, with collection of air pockets posterior to urinary bladder wall measuring 7.2 × 6.4 × 1.5 cm. Image shows axial oblique T2-weighted magnetic resonance imaging of the male Pelvic region with A and B specifying: (a) Semi-annular mass in low rectum and anal canal. (b) Collection of air pockets posterior to urinary bladder wall**

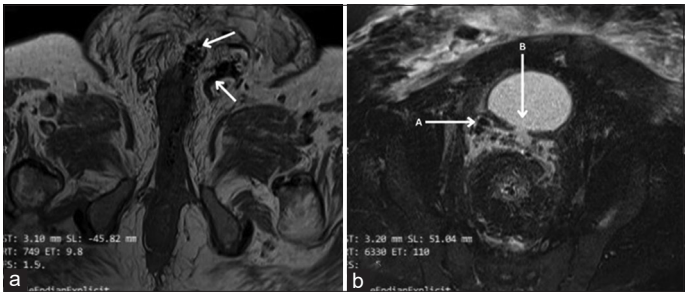


**Figure 2: (a) Air pockets in ischiocavernosus muscle, within bulbospongiosus in the pubic; (b) An enormous collection with air pockets noted posterior to urinary bladder. A focal bladder defect was noted in the posterior wall communicating within the collection. Image shows axial oblique T2- magnetic resonance imaging of the male pelvis with A and B specifically indicating: (a) Large collection with air pockets noted posterior to urinary bladder. (b) Focal bladder defect in the posterior wall communicating within the collection**

mechanical ventilation. However, on postoperative day (POD) 10, fever spikes were noted, and repeated blood cultures grew *Candida* species. On POD 12, the patient suffered a sudden cardiac arrest but achieved the return of spontaneous circulation after six resuscitation cycles. A repeat wound culture from the FG site grew *Acinetobacter baumannii* and *Pseudomonas aeruginosa*, leading to a change in antibiotic therapy based on sensitivity reports. The patient was placed back on mechanical ventilation, and further debridement was planned once he stabilized. He subsequently developed anasarca, which was attributed to hypoalbuminemia, and was managed with nutritional supplementation. A second debridement was performed on POD 23. However, the patient again became hemodynamically unstable and required continued inotropic support and mechanical ventilation. No further clinical improvement was observed, and he died on POD 25.

## DISCUSSION

FG is an extremely rare condition, with an even lower incidence when caused by spontaneous perforation or scrotal invasion of rectal carcinoma. Bruketa *et al*. estimated the incidence of FG at 1.6/100,000 males. Furthermore, the incidence of rectal cancer-induced FG among all FG cases ranged from 1.47% to 16.6% [1,2]. FG is a rare condition that is characterized by necrotizing fasciitis of fascia and subcutaneous urogenital soft tissue.

Though FG has multiple identifiable causes, the pathophysiology behind pelvic brachytherapy-induced FG is still not fully elucidated due to its rarity [3]. Given the high mortality rate, more than 67% according to FGSI necessitates prompt surgical interventions [3]. Kobayashi *et al*. demonstrated 35 cases of FG caused penetration of rectal carcinoma in the world [4]. We have reported a case of FG due to a rare complication of pelvic brachytherapy in a diagnosed rectal adenocarcinoma patient. According to Saleem *et al*. commonly identified side effects of pelvic radiation therapy include colorectal-genitourinary tract fistulae, which can be dangerous. However, severe complications such as FG are not well characterized. As a result, FG is often overlooked and needs further investigation [5]. It is documented that bevacizumab can induce spontaneous perforation of rectal carcinoma with various adjoint consequences [6]. In contrast to this documentation, the reported case was only on pelvic brachytherapy had been completed his bevacizumab course around 2 months ago.

Risk factors including anorectal causes, widespread disease conditions, advanced age, septic shock, deranged liver functions, and renal failure accounted for a high mortality rate of 85%. FG is not a radiological diagnostic disease, though MRI of the pelvis of this case was carried out to find unseen complications of FG, pelvic brachytherapy, and rectal adenocarcinoma. Imaging also helps in identifying the spread of FG and the origin of the primary cause as reported by Ash *et al*. [7]. Hence, the imaging that revealed a posterior wall defect of the urinary bladder helped us in surgical navigation, the extent of excision, and debridement.

Chawla *et al* exhibited that there was a negative impact on survivability following repeated debridement as the patients had

poor baseline health, suggesting extensive disease and progressive systemic disease despite early surgical intervention [8]. Arguing with the documented intervention, we observed hemodynamical stability after each surgical intervention (one widespread excision and debridement and two wound debridements). The mainstay gold standard treatment remains wide local excision and debridement. Hyperbaric oxygen therapy is a new treatment modality in such extensive FG cases. Yoshino *et al*. have documented several cases of FG treated with hyperbaric oxygen therapy, which inhibited the growth of anaerobic bacteria, halting necrosis, as well as reducing systemic toxicity [9]. Hou *et al*. have reported a case of FG due to rectal carcinoma, which was treated with vacuum-assisted closure therapy, radicular resection, and wound closure; the case had a good outcome following 22 months [10]. This provides an alternative indication for using voltage source converter therapy. Concluding, the case of FG with rectal cancer can also have a causative factor from unknown native treatments which required extensive excision, debridement with other supportive aids, had extremely poor prognostic factors, and so this co-existence of FG from rectal cancer needs more extensive studies to provide better care and increased survivability.

FG should be considered a potential complication of pelvic radiotherapy in rectal patients, as the common side-effects of pelvic brachytherapy include fistulae, radiation proctitis. Early diagnosis, broad-spectrum antibiotics, and aggressive surgical debridement remain the mainstays of management. Awareness of this is rare, but life-threatening conditions can facilitate early intervention and improve patient survival.

## CONCLUSION

Managing such rare and complex cases requires both aggressive surgical intervention and intensive medical management. Although certain guidelines exist for predicting patient outcomes, clear recommendations for optimal surgical intervention remain lacking. Although large-scale studies are needed to establish effective treatment strategies for these complex cases, conducting such research is difficult due to the rarity of this condition.

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