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## Magnetic resonance imaging in the diagnosis of Fournier's gangrene

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**Abstract** Magnetic resonance imaging and ultrasound are the imaging modalities recommended in the early diagnosis of Fournier's gangrene. Because of the high mortality of this inflammatory disease early diagnosis is essential to initiate adequate surgical and medical treatment. In the clinical literature only a handful of cases, in which diagnosis of Fournier's gangrene is based on MRI findings, have been reported; therefore, we report another case which shows the ability of MRI especially to determine the point of origin and extension of disease.

**Key words** Fournier's gangrene · MR imaging · Ultrasound

### Introduction

Fournier's gangrene is a rapidly spreading, acute fulminant fasciitis involving the penis, perineoscrotal region, and abdominal wall. Since its mortality is high, it is important to recognize Fournier's gangrene early so that surgical and medical treatment can be instituted [1, 2, 3].

Ultrasound and MR imaging are the imaging modalities which are recommended in the assessment of inflammatory disease of the scrotum and perineum. The role of MRI in the early diagnosis of Fournier's gangrene in the literature is incompletely documented [4, 5, 6, 7]. We therefore report another case in which MRI findings led to the diagnosis.

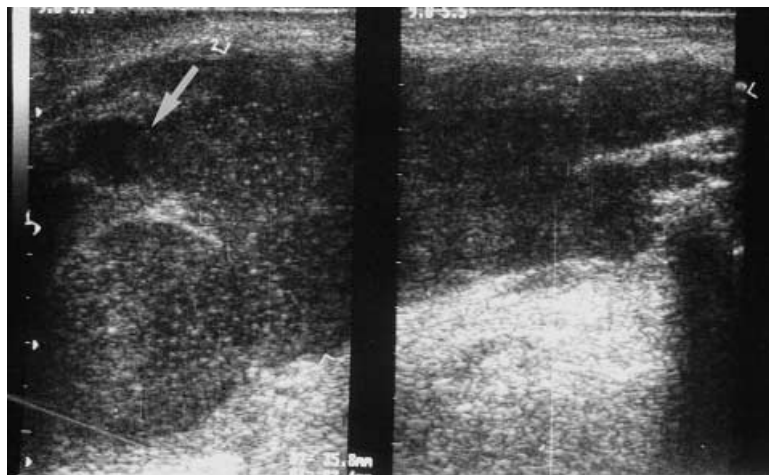
### Case report

We report a 42-year-old man who presented with fevers, penile pain and swelling 2 days after he had dislodged a blocked indwelling urethral catheter. Physical examination revealed massive penile swelling and erythema, but the scrotum seemed to be normal. A suprapubic cystostomy was performed. The patient had insulin-dependent diabetes mellitus and chronic alcoholic liver disease.

Haematological findings were as follows: haemoglobin was 8.5 g/dl; red blood corpuscles 2.53/pl; haematocrit 24.6%; mean corpuscular haemoglobin 33.6 pg; and mean corpuscular volume 97.2 fl. Further investigations showed an alkaline phosphatase of 198 U/l, a lactate dehydrogenase of 277 U/l and a  $\gamma$ -glutamyltransferasepeptidase of 72 U/l, glucose 164 mg/dl, calcium 1.96 mmol/l, and potassium 5.4 mmol/l. C-reactive-protein was 22.4 mg/dl and erythrocyte sedimentation rate was 110 mm/h.

The patient was referred for a US examination with the presumptive diagnosis of a bulbar lesion with peripenile haematoma. Ultrasound revealed marked thickening of the penile skin and

**Fig. 1** Longitudinal US scan over perineum and bulb of the penis demonstrates perineal fluid accumulation (*arrow*), producing low-amplitude echoes without posterior shadowing, and penile skin thickening



perineal fluid extending from the bulb of the penis; thus, the initial differential diagnoses included a penile abscess or a phlegmon (Fig. 1). The scrotum, testes and epididymis were normal.

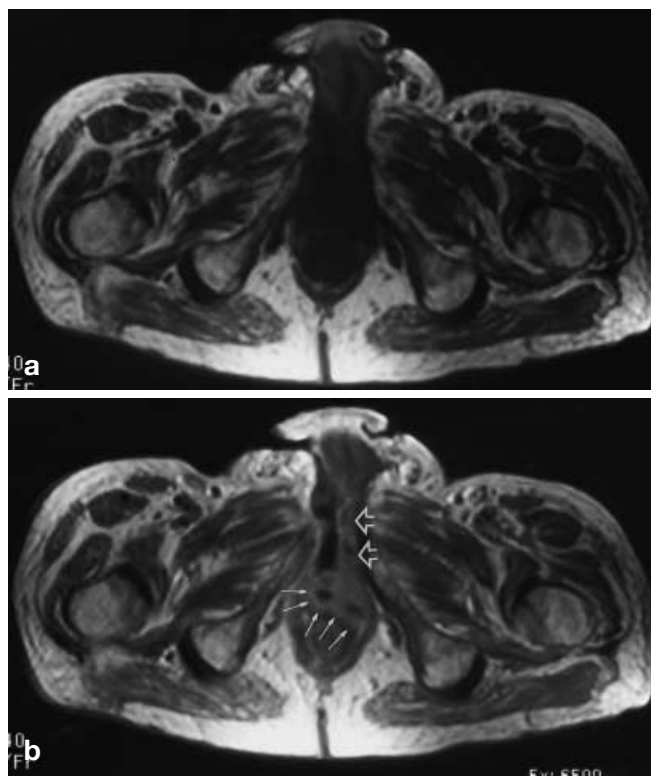
Eight days later, MRI was performed with a 1.5-T machine and a torso phased-array coil (Signa, Echo Speed, General Electric Medical Systems, Milwaukee, Wis.) to confirm the impression seen at US. Axial T2-weighted fast spin-echo images (TR 5320 ms, TE 104 ms, 6-mm slice thickness, 2.5-mm gap) were obtained together with frequency-selected axial T1-weighted spin-echo images (TR 540 ms, TE 8 ms, 6-mm slice thickness, 2.5-mm gap) before and after injection of 12 ml gadopentetate dimeglumine. Coronal fast spin-echo inversion recovery images (TR 6000 ms, TI 140 ms, 7-mm slice thickness, 2.0-mm gap), sagittal T2-weighted fast spin-echo images (TR 4500 ms, TE 98 ms, 5-mm slice thickness, 1.5-mm gap) and coronal T1-weighted spin-echo images (TR 340 ms, TE 8 ms, 7-mm slice thickness, 2.0-mm gap after contrast injection) were also acquired. Magnetic resonance imaging revealed a fluid collection adjacent to the urethra extending from the bulb of the penis to involve the right crus of the corpus cavernosum and much of the perineum. The fluid collection was low signal intensity on T1-weighted SE (Fig. 2a) and high signal intensity on T2-weighted FSE sequences. After contrast injection, marked rim enhancement developed on T1-weighted SE images (Fig. 2b), compatible with the diagnosis of an abscess. T1-weighted, contrast-enhanced SE (Fig. 3) images and T2-weighted FSE showed high signal intensity at the deep and superficial fascia of the penis consistent with necrotizing fasciitis. T1-weighted images after intravenous gadolinium administration exhibited enhancement of the superficial subcutaneous tissue of the penis being characteristic of cellulitis. The penile skin was visible as a thickened rim of high signal intensity on T2-weighted images, reflecting massive edema. Both epididymis and testicles had normally high signal intensity on T2-weighted images. No areas of abnormal signal intensity were observed in the peripheral or central zones of the prostate on T2-weighted sequences. A preoperative diagnosis of Fournier's gangrene was made.

Aspiration of the perineal fluid yielded pus; culture of it grew *Streptococcus viridans*.

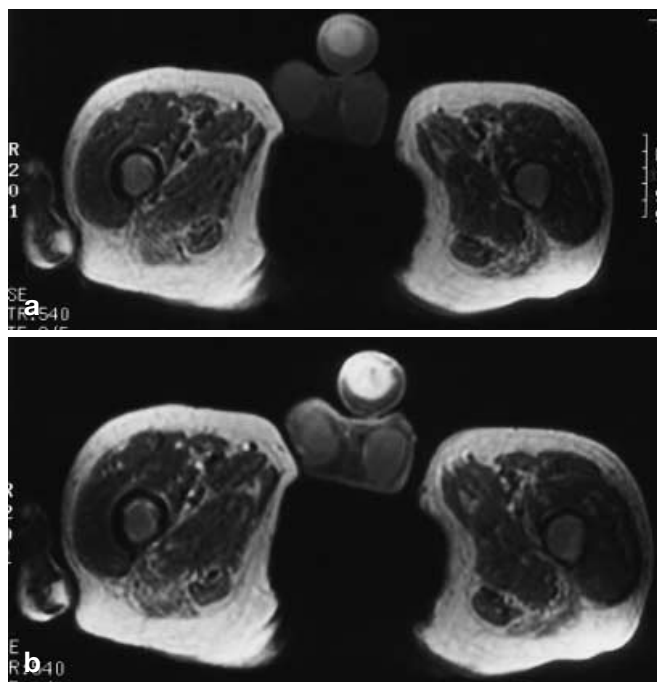
After successful correction of blood glucose, the patient was taken to surgery, confirming the impression at MRI of beginning Fournier's gangrene. A radical perineal, bilateral inguinoscrotal and bilateral penile incision revealed a perineal and bulbar abscess as well as focal necrosis in the subcutaneous tissue. The bulb of the penis, including the fascial planes of the corpus spongiosum and

the right corpus cavernosum, showed isolated necrotic lesions. The scrotal compartments were intact, and the bulbar urethra was not involved.

Aggressive debridement was performed and repeated 6 days later. Antiseptic irrigations followed, and supportive antibiotics were administered. Two weeks later, excision of the penile skin and



**Fig. 2a, b** Perineal abscess extending from the bulb of the penis. **a** Axial T1-weighted spin-echo (SE; TR/TE: 540/8 ms) and **b** axial, gadolinium-enhanced T1-weighted SE (TR/TE: 540/8 ms) images exhibit marked rim enhancement of the perineum (*small arrows*) extending from the bulb of the penis (*open arrows*)



**Fig. 3** **a** Axial T1-weighted SE (TR/TE: 540/8 ms) and **b** axial, contrast-enhanced T1-weighted SE (TR/TE: 540/8 ms) images reveal gadolinium enhancement of the deep and superficial fascia of the penis, consisting of necrotizing fasciitis. The superficial subcutaneous tissue of the penis exhibits areas with gadolinium enhancement, indicating cellulitis

grafting of the penis with scrotal skin were performed. At 6 weeks after surgery, the patient completely recovered and was well when discharged.

## Discussion

Fournier's gangrene or spontaneous fulminating gangrene was originally described in 1883 as an infectious necrotizing penile and/or perineoscrotal cellulitis of unknown origin which is rapidly progressive, devastating and life threatening [3, 4, 5]. In general, both healthy young males and elderly men may be affected by this fulminant infection [4]. Although treated with proper antibiotic therapy, this mixed aerobic and anaerobic disease may have a 33–55% mortality rate [1].

Recent studies have shown that the soft tissue infection usually begins as an area of cellulitis adjacent to the portal of entry of the causative organism. Then the primary deep fascial planes of the anterior and posterior abdominal walls are involved and the infection extends beyond the entry point. As soon as fasciitis has developed, the overlying skin is affected [1, 4, 5, 8].

In most cases, the first clinical signs are scrotal and/or penile swelling as well as erythema [1, 5]. Chills, fever

and pain are the commonly observed clinical symptoms associated with Fournier's gangrene. Nausea, vomiting and prostration are also described in the literature [1, 3, 9]. Acute scrotal pain and swelling may be confused with epididymitis, orchitis or scrotal cellulitis [4, 5]. Acute penile pain and swelling must be differentiated from bulbitis, cavernositis, penile cellulitis and local abscess [1, 3, 9].

Serious and debilitating underlying diseases, such as diabetes mellitus, arteriosclerosis, immunosuppression, advanced liver or kidney disease or other underlying urinary tract diseases, may predispose to its onset [4, 5]. A causative factor for the development of Fournier's gangrene may be a minute and unrecognizable periurethral or perianal infection, and sometimes its origin remains unknown. Nevertheless, it may also occur as a consequence of perineal or scrotal skin disruption resulting from trauma, surgery or injection of drugs into femoral or scrotal vessels [2, 4, 5, 7, 9, 10, 11, 12].

Treatment of Fournier's gangrene is based on early diagnosis, radical surgery of the affected area, debridement at the least sign of recurrence and antibiotic therapy [3, 4, 5]. In some cases of advanced gangrenous infection penectomy, bilateral orchiectomy and extensive skin debridement is necessary [8, 9]. Occasional administration of hyperbaric oxygen has been also described by some authors [13, 14]. Because the mortality increases with delayed therapy, early surgical and antibiotic treatment is extremely important. Additionally, treatment of underlying debilitating diseases is mandatory [4, 5, 10, 11].

Ultrasound and MRI are the fundamental imaging techniques for the early diagnosis of Fournier's gangrene [4, 5, 6, 7]. Both US and MRI have the ability to show air in the subcutaneous tissues, marked thickening of the scrotal skin and fluid accumulation [4, 5]. An important advantage of MRI is that it allows a wider field of view; consequently, MRI can also reveal the extension of infection to the perineum, abdominal wall, fascial planes and buttocks more accurately than ultrasound can [4, 6]. Occasionally, MRI may define the starting point of the disease [6], and it is said to be advantageous in patients who have advanced skin lesions [4].

In conclusion, we present a case of early Fournier's gangrene which was preoperatively diagnosed with MR imaging. Both US and MRI were highly accurate for the diagnosis of penile cellulitis, penile edema and perineal abscess extending from the bulb of the penis. In comparison with US, MRI seems to have a wider field of view and reproducibility; therefore, it should be used as a complementary imaging technique in the early exact diagnosis of Fournier's gangrene as knowledge of the extent of the necrosis is necessary before surgical intervention.

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