Emphysematous cystitis, radiological diagnosis

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ABSTRACT

Emphysematous cystitis has been reported though it is not very common. This is characterized by presence of gas in the urinary bladder wall and/or in the lumen. The infection is caused by gas forming organisms commonly seen in patients with a background of diabetes mellitus. Presentation varies in different patients but with increasing use of different imaging modalities more cases are diagnosed in asymptomatic patients. We describe an incidentally detected case of emphysematous cystitis in the control radiograph of an adult male diabetic patient who was referred to us for barium enema and also present a review of the literature.

Key words: Diabetes mellitus; emphysematous cystitis; plain abdominal radiograph; KUB

Introduction

The presence of gas in the parenchyma of solid organs or the walls of hollow viscera may be due to a variety of pathologic and benign conditions. Besides infection with gas-forming bacteria, other possible sources include bland tissue infarction with necrosis, enteric fistula formation, and reflux from an adjacent hollow viscus. Other causes include poor glycolysis at the tissue level in diabetic patients which results in increased glucose concentration within the interstitial fluid. Other clinical factors that contribute to the increased production or slower removal of gas include a depressed cell-mediated immune response, local tissue necrosis, and the presence of arteriosclerosis.[1,2]

Emphysematous cystitis is a rare disorder that is usually associated with immuno-suppression, poorly controlled diabetes mellitus (DM), and other risk factors like previous urinary tract infection (UTI) and/or recent instrumentation of the urinary tract.[3]

DM is the most common pre-disposing factor identified in all reviews.[4-6] Emphysematous cystitis was first described by Keyes in 1882.[7] Diagnosis of this condition is usually radiographic and incidental as in this case.

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We present a case of emphysematous cystitis diagnosed in the control radiograph of a patient referred to us for barium enema. This case is important because it is an index case in our environment where there is paucity of literature and increase in cases of poorly controlled DM.

Case Report

UM, a 44-year-old Nigerian male technician with history of pain on passing stool as well as persistent pain in the lower abdomen, was referred to us for double-contrast barium enema to rule out colonic pathology.

The control radiograph prior to the enema procedure revealed extensive gaseous distention of the urinary bladder [Figure 1]. On direct questioning, it was discovered the patient had a history of DM diagnosed 4 years before presenting the complaint. He admitted that control of his blood sugar had been difficult due to poor compliance to medications. The last blood sugar level which was done 3 days before being referred for barium enema was 8.4 mmol/L. The Barium enema procedure was consequently cancelled and the patient sent back to the referring physician for blood sugar control and stabilization.

Discussion

The true incidence of emphysematous cystitis is unknown but an apparently increased incidence of emphysematous cystitis may be related to increasing use of medical imaging

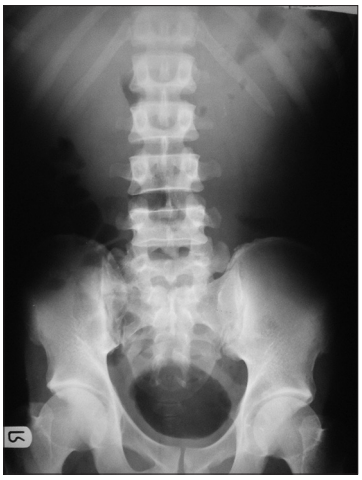

Figure 1: Plain abdominal radiograph demonstrates extensive gaseous distension of the urinary bladder

and several cases are diagnosed as incidental findings[6] as demonstrated in the index case.

Emphysematous cystitis is usually seen in diabetic elderly women often in the age of 60-80 years. This contrasts with our index case who was a 40-year-old male. DM is the most common pre-disposing factor.[5,6] Our patient had DM. Other pre-disposing factors are factors that are related to impaired bladder emptying, i.e., bladder neck obstruction and neurogenic bladder, indwelling catheters, instrumentation, urinary calculi, and immunosuppresion. Our patient did not have any of these other pre-disposing factors.

The true pathogenesis of emphysematous cystitis is not understood but a combination of infection by gas-producing organisms, high glucose concentration (glycosuria), lowered immunity, decreased tissue perfusion, and impaired catabolism have been suggested.[5,6]

The gas-forming organisms produce carbon dioxide at lowered pH by fermenting local glucose, but this does not explain why emphysematous cystitis is seen in non-diabetic patients and where non-gas forming organisms are isolated.[5,6] The commonest isolated gas-forming organisms are *Escherichia coli* and *Klebsiella* but non-gas forming organisms like Enterobacter and fungal species like Candida have been identified.[6]

A plausible theory is that urinary albumin, lactose, and tissue protein act as substrates for gas-forming organisms.[6] Rapid catabolism leading to production of gas with impaired absorption resulting in the accumulation of gas causing local infarction has been suggested to explain the pathogenesis.[4-6] Case reports have also been described where air is seen in the hepatic veins and inferior vena cava in association with emphysematous cystitis but the pathogenesis is not clear.[6]

Clinical presentation of emphysematous cystitis may vary from the asymptomatic patient to patients with established sepsis and peritonitis due to bladder necrosis.[4,5] The index patient was completely asymptomatic and the reason for this is in explicable. Emphysematous cystitis is usually diagnosed by radiological imaging, but may also be diagnosed by cystoscopy, laparotomy or autopsy.[4] Plain radiography was sufficient for accurate diagnosis in our patient. Plain abdominal X-ray (KUB) is sensitive, but it has the disadvantage of reduced specificity even though it is the commonest initial imaging modality.[4,6] Emphysematous cystitis usually shows on X-ray as intra-vesical cobblestone or beaded necklace appearance due to pockets of gases contained in the infarcted tissues of the bladder. Sometimes air-fluid levels may be seen. In some cases, air and soft tissue doughnut sign due to a mix of gas, infarcted, and normal tissues in the pelvis is seen.[8,9] In some cases plain radiography may demonstrate irregular, streaky lucencies in the bladder wall. Radiolucencies representing gas may be seen in the bladder wall tracking proximally into the ureters. Early in the disease process, gas may appear as localized clusters of rounded lucencies. In this case, it may be difficult to distinguish this appearance from gas in the bowel or gas within an abscess. On contrast, in studies like cystograms, these gas-filled vesicles may resemble sub-mucosal filling defects that can be produced by inflammatory or neoplastic processes. However, in these cases, the mucosa will be thickened, irregular, and nodular.[10] With the progression of the disease, a ring of gas lucencies surrounding the bladder and separated from the bladder may be obvious. At intravenous urography, gas in the bladder may be demonstrated as a horizontal air-fluid level on images obtained from erect projection.[10] We did not investigate this patient further using contrast-enhanced imaging technique not only because the plain film findings were classical but also because the patient needed to be stabilized by the referring physician before contrast administration would be considered.

Ultrasound has a low sensitivity, but may demonstrate indirect sign like diffuse bladder, wall thickening, and increased echogenicity. Serial ultrasonography may be useful in evaluating patients who show clinical improvement and also in patients who cannot have computed tomography (CT) done on them for any reason.[4,9]

CT will clearly demonstrate the gas in the bladder wall and can delineate the extension and location of the gas collection.[6] CT will also diagnose other related abnormalities such as diverticular or scrotal abscess, neoplasms, vesico-colic fistula, and ascending infections.[6] Our patient work up did not progress eventually with the use of CT primarily because we are confident of the X-ray diagnosis and also due to patient's inability to bear the cost of examination.

Management of emphysematous cystitis involves adequate drainage of urine and the use of serial radiological imaging and antibiotics that are sensitive to the offending organisms.

In conclusion, emphysematous cystitis is an uncommon condition that can present clinically in various ways and may be asymptomatic. It is associated with DMs among other pre-disposing conditions. Radiological imaging is the primary mode of diagnosing this condition.

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