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Egg in the Bladder" Sign – A Novel CT Sign for Vesical Calculus

Medical Science

KEYWORDS : egg in bladder; vesical calculus, calcium stones, CT scan.

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ABSTRACT

Urinary bladder calculi are one of the important sites of calcification in the body. The existence of calcium and other minerals in the excretory contents makes it prone to calcifications in the conditions of stasis of these contents, in a conducive biochemical environment. It is very important to diagnose these as they have no specific symptoms and delay in treatment may result in complications. The imaging findings depend on the composition of stones, most common of which are calcium containing stones. These stones show unique imaging findings at Computed tomography scans appearing as dense radio opacities. The bladder stones appear as high density oval or rounded structures giving an appearance identical to "egg in the bladder", hence the name.

INTRODUCTION

Urinary Bladder calculi constitute 5% of all urinary tract calculi. Most of the bladder calculi are composed of calcium and hence appear radio opaque on imaging. The existence of calcium and other minerals in the excretory contents makes it prone to calcifications.

The use of familiar objects to describe visual findings enables resident and consultant radiologists both to arrive at a correct diagnosis and to effectively convey such diagnostic findings to clinicians. We describe a unique sign for describing calcium containing bladder calculi which appear hyperdense or opaque on CT images and hence give oval white shaped appearance of an egg, hence the name "Egg in the bladder sign".

Fig 1. Axial CT scan of the pelvis of a 30 year young male at the level of urinary bladder shows an oval shaped uniformly radio opaque calculus (marked by arrow) of 500-600 HU in the lumen of bladder surrounded by urine giving the appearance of "egg in the bladder"

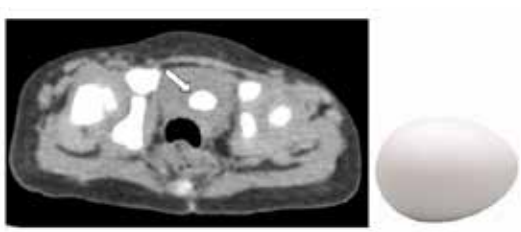

Fig 2. Axial CT scan of the pelvis of a girl child of 2 years age at the level of urinary bladder shows an oval shaped uniformly radio opaque calculus of 500-600 HU in the lumen of bladder giving the appearance of "egg in the bladder"

DISCUSSION:

The urinary tract is one of the most important systems in the human body with excretory function. It consists of the kidneys, ureters, bladder and the urethra. The human urinary tract acts as a perfect host to many calcification processes, the determinants of which are multi-factorial and hence are its health impacts. The most common form of a urinary tract calcification is a calculus. The existence of calcium and other minerals in the excretory contents makes it prone to calcifications, particularly in conditions of stasis of these contents, in a conducive biochemical environment [1].

Urinary tract calculi are formed when the urine is supersaturated with salt and minerals such as calcium oxalate, struvite (ammonium magnesium phosphate), uric acid and cystine[2].

Bladder calculi account for 5% of all urinary system calculi[3].In the United States, bladder calculi are most commonly seen in association with bladder outlet obstruction. Like renal calculi, bladder calculi usually consist of a mixture of calcium oxalate and calcium phosphate[4]. Radio opacity of bladder calculi reflects their composition [5]. Depending upon its calcium content, it could be radio-opaque when it is made of calcium oxalate or it may be slightly radiolucent if it is composed of cystine. These calculi are located within the lumen of the excretory system [1].

Sr No	Primary Composition	Occurrence
1	Calcium	70 - 80
1A	Calcium Oxalate-Phosphate	30 – 40
1B	Calcium Oxalate	20 – 30
1C	Calcium Phosphate	5 – 10
2	Struvite	15 – 20
3	Uric acid	5 – 10
4	Cystine	1 – 3

Table 1: Chemical composition and percentage wise occurrence of calculi in urinary system [6]

Epidemiologically speaking, men are more commonly affected than women, with a male to female ratio of 3:1. The difference between the sexes is gradually being eroded. This is thought to be due to lifestyle-associated factors such as obesity and a western diet. The peak age for developing stones is between 30 and 50 years and a recurrence is common[1]. Recurrent urinary tract infection, hematuria and urinary retention are common disorders in these patients [7].

Children remain at high risk for bladder stone develop-

ment in endemic areas [8].Even in children in whom a major anatomic abnormality does not coexist, bladder calculi can occur in endemic areas, the primary influential factors being dietary intake and socio-economic factors leading to the formation of bladder calculi [9].

Primary vesical calculosis is quite commonplace in Asia, with calculi consisting of ammonium urate and calcium oxalate. Because of malnutrition in the very early years of life, vesical calculosis is now common in Turkey, Iran, India, China, and Indonesia; however, there is a decrease in the incidence as social conditions gradually improve [10].

Bladder calculi occur either from migrated renal calculi or urinary stasis. Bladder calculi are usually observed secondary to bladder outlet obstruction. Vesical diverticulae predispose to formation of stone in the bladder.

The clinical findings usually depend on the site and the size of the urinary tract calcification. The patients may be asymptomatic or they may have pain, dysuria, frequency, hesitation and gross haematuria, or even a sudden cessation of voiding, which is accompanied by pain in the perineum[1].

The preferred method for diagnosis is cystoscopy, but an X-ray, an ultrasound[7,8] or CT scan are very useful for optimal evaluation, determination of composition, size, shape and number of calculi and any associated complications.

Calculi may be single or multiple and often large. Calculi can be laminated, faceted, spiculated, or seedlike in appearance[5]. Jackstone calculus is the name assigned to the appearances of a sub-set of urinary tract calculi which have a jagged irregular edge, that resemble the appearance of traditional toy jacks. Massive or giant bladder calculus is a rare entity in the recent urological practice. Bladder stones may cause unilateral or bilateral hydronephrosis[11].

Sonographically they are mobile, echogenic, and shadow distally. They may be associated with bladder wall thickening due to inflammation. On CT scan, calcium containing calculi are densely radio opaque. On CT almost all calcium stones are opaque, but vary considerably in density which can be determined by identifying the Hounsfield units.

Sr No	Primary Composition	CT values(HU)
1	calcium oxalate +/- calcium phosphate	400-600
2	struvite (triple phosphate)	usually opaque but variable
3	pure calcium phosphate	400-600
4	uric acid	100-200
5	cystine	opaque
6	Indinavir stones	radiolucent and usually undetectable on CT
7	pure matrix stones	radiolucent

Table 2. CT values of various types of vesical calculi

The enlarged, calcified prostate gland may protrude into the bladder and give a false appearance of a vesical calculus. The foreign bodies which are within the bladder or elsewhere within the urinary tract may calcify in response to a urine exposure and they have characteristic appearances as per their original shapes [1].

The walls of the bladder show calcifications in patients with transitional cell carcinoma, urachal carcinoma, schistosomiasis, alkaline incrusted cystitis, cytotoxic cystitis, radiation therapy, and tuberculosis [5]. The use of CT scan easily identifies the location of calculus and differentiates intraluminal calculi from bladder wall calcification.

There are a number of techniques and modalities available to remove bladder stones. Relieving the obstruction, eliminating the infection, meticulous surgical technique, and accurate diagnosis are essential in their treatment[8,12].

CONCLUSION:

The recognition of radiologic signs that resemble familiar real-world objects can be helpful in diagnosis. Recognition of these familiar signs helps in easy identification of the pathology and also assists in narrowing the diagnostic possibilities.

Hence this novel radiologic sign “egg in the bladder” may aid easily in recognizing and remembering Calcium containing Vesical calculi.

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