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Urinary lithiasis and urinary tract malformations in children: A retrospective study of 34 cases

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ABSTRACT

Background: Although the association of urinary lithiasis and urinary tract malformation is not rare, their management poses challenges. The aim of this study was to evaluate the relationship between urolithiasis and malformations of the urinary system. There were 34 patients (19 males and 15 females) with a mean age of 4.8 years (range, 2 months to 14 years). All patients had urinary lithiasis with a urinary tract malformation. Abdominal pain was the most frequent clinical symptom (38%). Urinary infection was found in 7 patients (21%) and macroscopic haematuria was present in 10 patients (29%). The most frequent urinary tract malformations were megaureter (8 cases), uretero-pelvic junction obstruction (7 cases) and vesico-ureteric reflux (8 cases), but its malformative origin could not be confirmed. Treatment consisted of lithiasis extraction in 32 cases associated with specific treatment of the uropathy in 27 cases. Postoperative outcome was uneventful in all cases. In fact, urinary lithiasis and urinary tract malformation association is not rare. Indeed, 9-34% of urinary lithiasis are noted to be associated with urinary tract malformation. Positive diagnosis relies specifically on kidney ultrasound, intravenous urography, and urethrocystography. Treatment depends on the type of urinary tract malformation, localisation and size of the urinary lithiasis. **Conclusion:** In conclusion, urinary lithiasis and urinary tract malformation association is a frequent eventuality. Surgical intervention is the usual mode of treatment.

Key words: Children, treatment, urinary lithiasis, urinary tract infection, urinary tract malformation

INTRODUCTION

The urinary tract malformations represent the most frequent malformation in children, with a frequency in the range 0.3-5.25 per 1000. The association of these malformations with lithiasis is not rare. In developed countries, more than 30% of urinary lithiasis are associated to urinary tract malformation,[1] and this possibility needs consideration because of its specific management. The ultrasonographic, urographic, and cystographic data are vital for the diagnostic confirmation. From a set of 34 patients with urinary tract malformations complicated by urinary lithiasis and a review of literature, we studied the different clinical, radiological, and therapeutic specifications of this association.

PATIENTS AND METHODES

This is a 20-year retrospective study (1985-2004) in the paediatric surgery department of Fattouma Bourguiba Teaching Hospital in Monastir-Tunisia. A total of 34 patients were diagnosed with urinary tract malformation associated with urinary lithiasis, all of whom were treated surgically. A spectrophotometric study of the lithiasis was realised in 13 cases.

RESULTS

The mean age of all 34 patients was 4.8 years (range, 2 months to 14 years). The sex ratio was 1.25, with a male predominance (19 males and 15 females). The most frequent clinical features were abdominal pain in 13 cases (38%; lumbar in 7 cases and vague in 6 cases) and urinary infection in 13 cases. A macroscopic haematuria was noted in 10 cases (29%). An abdominal X-ray was practiced for all cases, which identified radio-opaque lithiasis in 29 cases (85%). Lithiasis was found at the left side in 9 patients, at the right side in 5, bilateral in 6 and in the bladder in 9 patients. It was unique in 13 patients and multiple in 16.

Abdominal ultrasound was carried out in 27 patients, which revealed lithiasis in all cases.

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Intravenous urography was performed in 30 patients; it showed a destroyed kidney in one patient, a secretion delay in 10, a pyelocaliceal dilation in 18, a uretero-pyelocaliceal dilatation in 10 patients. Further, it showed a ureterocele in two patients and a double-dealing in four. Lithiasis of the upper urinary tract was mobile in 12 patients and multiple in 16. Retrograde urethrocystography performed in 22 patients substantiated the diagnosis of uretero-vesical reflux in 8 patients and of posterior urethral valve in 3. DTPA or DMSA Renal isotopic scan was performed in 15 patients, which it showed a destroyed kidney in one patient.

The outcome of the clinical and radiological investigation identified seven abnormalities of the urinary tract responsible for the lithiasis:

- Eight cases of megaureter
- Eight cases of vesico-ureteral reflux
- Seven cases of uretero-pelvic junction
- Four cases of ureteral duplicity and bifidity
- Three cases of posterior-urethral valve
- Three cases of closed-bladder extrophy
- One case of ureterocele

These urinary tract malformations were involved in lithiasis formation in 23 patients and were suspected to be involved in lithiasis formation in 10 patients, and the confirmation was based on surgical intervention data.

The eight patients with a megaureter underwent a reimplantation according to Cohen technique in four cases and to Leadbetter Politano in other four cases associated with lithiasis extraction in six cases. Four of eight patients with vesico-ureteral reflux had high-grade vesico-ureteral reflux for which they had lithiasis extraction with reimplantation according to Cohen technique. The remaining four patients with low-grade vesico-ureteral reflux were treated by a simple lithiasis extraction and medical treatment of the reflux. The six patients with uretero-pelvic junction syndrome underwent lithiasis extraction with pyeloplasty according to Anderson Hynes technique. The seventh patient underwent a nephrectomy of the destroyed kidney.

Four patients with ureteral duplicity had lithiasis extraction associated in one case with a uretero-ureteral anastomosis because of an associated ureterocele. For the three cases of bladder extrophy, surgical extraction of the lithiasis was carried out.

The three patients with posterior urethral valve had an endoscopic section of the valve, with a surgical extraction of the lithiasis. The patient with a ureterocele underwent an excision of the ureterocele with lithiasis extraction.

Postsurgical evolution was uneventful in all cases. Only one case of recurrent lithiasis associated with a closed bladder extrophy was observed. The spectrophotometric study showed that whewellite was present in 69% of the cases and was dominant in 38% of the cases, suggesting a hyperoxaluria of flow or concentration.

DISCUSSION

The incidence of lithiasis disease and urinary tract malformation association is variable; it ranges from 9% to 34%.[2-3] In our set, this frequency is for about 13%. Most authors attribute lithiasis complication in case of urinary tract malformation to an obstruction to urine flow, which promotes urine stagnation and leads to urine infection with lithiasis formation.

Individual factors should also be considered, as lithiasis is rare with regard to the number of malformations. Metabolic disorders seem to play a significant role in the incidence of lithiasis with anatomic abnormalities of the urinary tract of the child and metabolic investigations are necessary. In the particular case of closed bladder extrophy, lithogenesis is explained by a bladder cervix not perfectly in the axis of the bladder, which leads to urine stagnation. It seems that the discovery of lithiasis associated with a urinary tract malformation was made earlier than simple lithiasis. In more than 60% of the cases, the patient's age is less than 5 years.[3] In our set, the patient's age ranged from 2 months to 14 years, with less than 5 years in 65% of the cases. A male predominance with a sex ratio of 1.5-3 is also reported.

Urinary infection represents the most frequent discovery circumstance, reaching 90%.[4-6] Yet in our set, this discovery circumstance was not frequent and represented only 21% of all cases. Abdominal pain is often atypical in children, and it can be associated with urinary symptoms (dysuria, pollakiuria), nausea, and vomiting. In older children, typical nephritic pain crisis is observed.[7]

Difficulties in micturition must be systematically looked for at the first physical examination.

With a boy, the absence of an evident urinary gush, a trickling miction, or/and the presence of a permanent bladder globe is indicative of a posterior urethral valve. Macroscopic or microscopic haematuria is not rare and

is found in 20%-30% of the cases.

Abdominal plain X-ray permits to put in evidence radio-opaque lithiasis. The existence of a lithiasis with an inconstant localisation on multiple abdominal X-ray is an argument for a mobile lithiasis of urine stagnation developed secondary to a urinary tract malformation. The typical aspect of lithiasis of urine retention is the one of a mobile lithiasis, multiple, round and slightly dense.

Kidney ultrasonography detects all lithiasis measuring more than 5 mm independent of their chemical nature or their tonality to X-rays. It has also the advantage to identify associated urinary tract malformations. It permits to measure dilatation of the pelvic, caliceal, ureters, as well as to identify any repercussions of lithiasis on the excretory tract.[8] For some authors, intravenous urography still remains an essential investigation method to obtain information about renal anatomy and function.[8,9] Retrograde cystography represents a unique investigation method to confirm or infirm the presence of a reflux. In certain cases, it allows diagnosing the posterior valve. The indication of cystography in lithiasis pathology is not unanimous. It is justified every time infectious complications are frequent. Moreover, ureteral dilation or uretero-pelvic-caliceal is important in the absence of an evident obstacle in the lower urinary tract. Some authors advocate practicing cystography after lithiasis extraction.[10] Currently, DTPA kidney isotopic scan occupies a crucial place in lithiasis investigations and follow-up of urinary upper tract dilation. DMSA kidney isotopic scan allows for evaluation of the renal function and study of its excretion. Isotopic kidney scan is the investigation of choice to evaluate each renal function separately, and thus to complete DTPA isotopic scan.[9,11,12]

Lithiasis complication of urinary tract malformations seems to be the consequence of an abnormal urine flow. Indeed, anatomical abnormalities promote urine stagnation and infection, leading to lithiasis formation. The junction syndrome is the most frequent urinary tract malformation (20%) in lithiasis formation. Its frequency in our series was 11%. Renal lithiasis and vesico-ureteral reflux association is not rare. Lithiasis can induce reflux by urinary infection, but it is often difficult to confirm whether lithiasis is the cause or the consequence of the reflux. The frequency of lithiasis induced by the reflux seems to vary. It is recommended to search systematically a reflux in case of lithiasis.[11]

For the other urinary tract malformations, lithiasis complication is not rare and its frequency varies according to urinary tract malformation. The frequency is 12-20% for megaureter,[12] 15% for closed bladder extrophy,[13] and 1% for ureteral duplications.[11] Urinary lithiasis associated with posterior urethral valve or ureterocele seems to be rare in children.[2,14] Lithiasis disease associated with urinary tract malformation can lead to diagnostic and therapeutic problems, depending on urinary tract malformation. Generally, we can consider two situations:

- In case of urinary tract malformation with reflux associated with lithiasis, it is often difficult to say if lithiasis is the cause or the consequence of the reflux. Lithiasis must be treated as a first step and observe the clinical and radiological evolution. It is only in case of persistent symptomatic reflux that a specific anti-reflux treatment should be realised.
- In case of a non-reflux urinary tract malformation and precisely obstructive one, the diagnosis of a urinary tract malformation complicated by lithiasis is possible only if the lithiasis is mobile. Thus, a specific treatment of the malformation associated with lithiasis extraction is performed. In the opposite case, when lithiasis seems to be obstructive, it is difficult to conclude whether the dilation of the excretory urinary tract before lithiasis is due to the lithiasis itself or to the urinary tract malformation. In doubtful cases, we should first treat the lithiasis and then complete by a postoperative radiological re-evaluation.

After lithiasis treatment, we must stress on the advantage of an aetiologic investigation and a continuous evaluation because of risk of lithiasis recurrence.

CONCLUSION

Lithiasis and a urinary tract association is a frequent occurrence in children. An early and appropriate treatment is crucial before any renal dysfunction or destruction occurs. Treatment differs according to urinary tract malformation and lithiasis specifications. Usually, the treatment involves surgical intervention.

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