THE COMPLICATIONS OF URINARY LITHIASIS*

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Although urinary lithiasis in children is a well recognised and important condition in Turkey it would appear that the seriousness of the disease is not sufficiently appreciated. None of the previous reports on the subject in Turkey [1-3] discuss the complications which may arise from stones in the urinary tract and in reports from other countries we find a similar lack of appreciation of the seriousness of the problem. [4-9] Only Assendelft,[10] reporting a series of 498 cases in children from Russia, and Brun,[11] reporting 217 cases from Tunisia, mention that many of their patients were toxic or uraemic, and Thomson [12] mentions that 51 % of his patients had a complication which could be directly attributed to the stone.

I have been impressed by the number and variety of the complications which urinary stones in children can produce, and it is surprising how often it is the complication and not the symptoms produced by the stone itself which makes the patient seek medical advice.

Our material is taken from 119 consecutive cases of urinary lithiasis which were seen and diagnosed at the Hacettepe Children's Hospital between January 1958 and May 1960. To appreciate the frequency of the disease we must realise that during this same period about 34,500 new patients were seen and 5,940 children were admitted to the hospital (table 1).

TABLE 1

Total cases seen at the hospital (January 1958 - May 1960)	42,500
Total admissions to the hospital	5,940
Urinary lithiasis patients seen	119

Lithiasis patients thus represent about 1 in every 360 patients seen or 1 in 51 patients admitted. About 10 % of all surgical procedures that have been carried out in our operating theater have been for calculous disease and its sequelae.

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Of the 119 patients no less than 72 or 61 % had a complication which could be attributed directly to the stone. The complications encountered and their relative frequency are shown in table 2.

TABLE 2.

Urinary infection	25
Hydronephrosis	21
Retention of urine	12
Pyonephrosis	4
Anuria	3
Extravasation of urine	2
Renal atrophy	2
Ureteric stricture	1
Perinephric abscess	1
Chronic renal insufficiency	1
Total	72 (61 %)

Urinary infection was present in 25 patients, and although in the sporadic type of urinary lithiasis chronic infection may, in itself, be the cause of a calculus, there is little doubt that in the endemic type of the disease the stone precedes infection. The organisms isolated in the urine are shown in table 3.

TABLE 3.

E. coli	12
B. proteus	10
A. aerogenes	3
P. pyocyaneus	2

In only two patients was more than one type of organism isolated. It has been our experience that the urine could not be sterilised by using antibiotics so long as the stone remained, but once the stone had been removed the urine became sterile usually within a few days. It is thus pointless to postpone operation for a stone in the hope of sterilising the urine first, but on the other hand the operation should be carried out under a suitable antibiotic cover.

Hydronephrosis was encountered 21 times; it was severe in 13 cases and moderate in 8. In all cases was the stone responsible for the hydronephrosis, and during the same period we have seen only two patients with a "congenital" type of hydronephrosis; in both there was no stone. The hydronephrosis may be caused by the stone itself obstruct-

ing the pelvi-ureteric junction or the ureter, or the stone may cause irritation and scarring of the pelvi-ureteric junction so that a secondary stricture forms.

Ret ntion of urine was seen in 12 patients and was always the result of an impacted urethral calculus. Impaction of the stone appeared to take place in one of three definite sites: the membranous urethra, the peno-scrotal junction and just inside the external meatus. Some of these patients had thick-walled hypertrophied bladders suggesting that a partial obstruction to the urinary outflow had existed for some considerable time before complete retention occurred.

Pyonephrosis was present in 4 patients. In none of these was there pyrexia or severe toxaemia which one might expect with such a closed infection. One child had passed stones per urethra on several occasions, two children had symptoms due to a bladder stone and one due to cystitis. In all four children an excretion pyelogram showed a non-functioning kidney, and in one, retrograde pyelography showed that the stone blocked the ureter so completely that no dye could be forced into the renal pelvis (fig.2). In all four patients a nephro-ureterectomy was carried out and the renal pelvis was found to be completely replaced by abscess cavities, undoubtedly of some months' duration.

Anuria occurred in three patients which have been reported previously.[13,14] In one patient it was caused by bilateral ureteric stones and in the other two by bilateral kidney stones. In one of these the stones were not opaque to x-rays so that the child presented a difficult diagnostic problem and finally died. This condition is considered rare by Campbell,[15] who thought that only about twelve cases had been reported in children, and since then Gürsel,[16] and Bower and Fowler,[17] have reported one further case each.

Extravasation of urine following perforation of the urethra occurred in two patients.[18] In both these patients attempted instrumentation was denied by the parents; there was no evidence of external trauma and it would appear that the stones ulcerated through the urethral mucosa and then caused obstruction so that the urine was forced into the tissues. One of these patients died, but the other survived following a very stormy convalescence. This condition would also appear rare and only one other case has been reported in a child, also from a country where lithiasis is endemic, namely India.[19]

Renal atrophy occurred twice in this series, in both cases associated with a ureteric stone. An excretion urogram showed a small kidney with a dilated calyceal system and on exploration the kidney was found to be scarred and fibrotic and nephrectomy was carried out.

Ureteric stricture was found in one patient. He was first seen with a calculus in the left ureter which was passed spontaneously, but, because of persistent urinary infection, excretion urograms were made at intervals which showed a persistently dilated ureter. This ureter was finally explored and a fibrous stricture was found 1 cm. above the vesico-ureteric junction. The ureter was therefore reimplanted into the bladder and a post-operative urogram showed that the dilatation was decreasing.

Fig. 1. — Plain abdominal radiograph showing calculi in both kidneys.

Fig. 2. — Retrograde urogram showing complete block of the renal pelvis by a stone.

Perinephric abscess was encountered once. This was a twelve year old girl who pr sented with ascites and oedema and was found to be suffering from severe hypoproteinaemia. The urine contained large amounts of albumin and an abdominal x-ray showed a stone in the region of the right kidney. An excretion urogram showed no function on this side and an ascending pyelogram show dea dilated and distorted calcyceal system and leakage of the dyeinto a cavity above the kidney (fig. 3). At operation the kidney was found to be densely adherent to the surrounding structures and the peri-nephric abscess was confirmed. Although she continued to pass small amounts of albumin in her urine, the oedema and ascites disappeared after operation and her plasma proteins rose to normal levels. It was thought that she was suffering from amyloid disease resulting from chronic infection, but this diagnosis could not be confirmed by liver and gingival biopsies.

Chronic renal insufficiency occurred in one boy with bilateral kidney stones (fig. 1). His N.P.N. was 60 mgm. per hundred milliters on admission and following operation it remained high. His kidneys were very scarred and fibrotic and presumably the stones had been present for a long time.

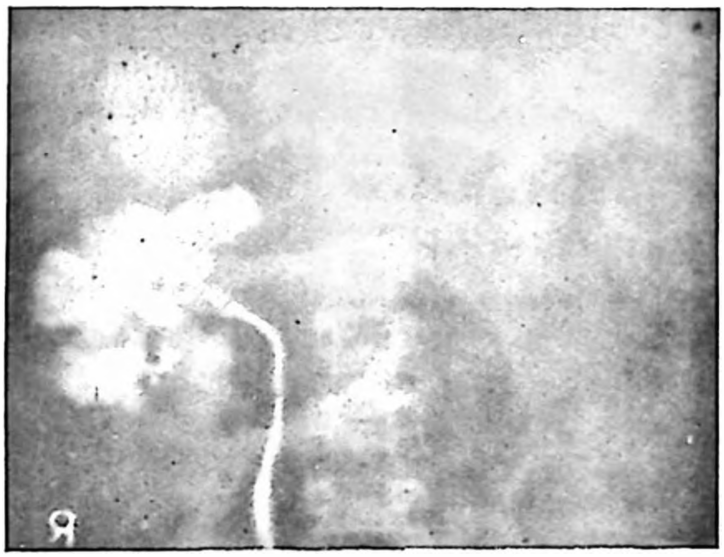

Fig. 3. — Retrograde urogram showing pyonephrosis and peri-renal abscess in right kidney.

A number of other and unusual operations have been reported in the literature. Thus, one of Assendelft's[10] patients was found to have peritonitis resulting from perforation of the bladder by a stone. Brun[20] reported two unusual complications, one a girl suffering from a complete uterine prolapse resulting from a bladder stone. The stone had obstructed the urinary outflow so that the resultant straining had led to the prolapse. The other patient was a girl of 14 in whom a large vesical calculus caused obstruction to the foetal head during labour.

Rectal prolapse is often suspected of being the result of a bladder stone but although rectal prolapse appears to be common in Turkey, probably resulting from malnutrition and recurrent diarrhoea, we have not seen this particular complication. Winsbury-White[21] gives a good illustration of an autopsy specimen from such a case.

Treatment

In most cases the treatment of the complication is that of the stone. Nephrectomy may have to be carried out for pyonephrosis or renal atrophy but our policy has been conservative in cases of hydronephrosis, provided that the kidney, on an excretion urogram, showed some function. Ideally the complications should be avoided by early surgical

treatment of the stones, and there is no doubt that all stones which are consid red too large to be passed spontaneously should be removed operatively as soon as they are diagnos d.

Summary

The complications which occurred in a series of 119 consecutive cases of urinary lithiasis in children are described and discussed. In no less than 6%of the cases were complications present as the result of a stone, and many of these were serious. Two children died of their complications, one of anuria and one of extravasation of urine. Many of th se complications could be avoided by the early diagnosis and surgical treatment of the stones.

REFERENCES

1. Erkun, S. A. : Çocuklarda İdrar Yolları Taşları Patolojik Fiziolojileri. Marifet Basımevi, İstanbul, 1935.
2. Taner, F. : Anadolu Kliniği, **8**: 48, 1940.
3. Özdilek, Ş. : Sağlık Dergisi, **20**: 499, 1946.
4. Noble, T. P. : Vesical calculus in Siam. Brit. J. Urol., **3**: 14, 1931.
5. Bokay, J. : Über die Infantile Lithiase in Ungarn. Zeitschr. für Kinderheilkunde, **4**: 365, 1912.
6. Balacesco: 76 Cas de calculs vesicaux de l'enfant. Bull. et mem. Soc. Nat. de Chir., **55**: 322, 1929.
7. Racic, J. : Calculus of the bladder in Dalmatia. The Urol. & Cutan. Rev. **39**, 158, 1935.
8. Chevalier, G. : Quarante et un cas de lithiase vesicale chez l'enfant. Soc. de Chir. de Lyon, **26**: 876, 1929.
9. Brown, R. K. and Brown, E. C. : Urinary stones, a study of their etiology in small children in Syria. Surgery, **9**: 415, 1941.
10. Assendelft, E. : Bericht über 630 stationar behandelte Steinkranke, Arch. f. Klin. Chir., **60**: 669, 1899.
11. Brun, R.G.: Quelques reflexions sur la lithiase vesicale chez les enfants indigenes de Tunisie d'apres 217 observations. Bull. Soc. Nat. Chir. Paris, **59**: 159, 1933.
12. Thomson, J. O.: Urinary calculus at the Canton Hospital. Surg., Gyn. & Obst., **32**: 44, 1921.
13. Eckstein, H. B., Oral, S. and Doğramacı, I. : Anuria caused by bilateral non-opaque renal calculi: Turk. J. Ped., **1**: 173, 1958.
14. Eckstein, H.B., Calculus anuria in children. Brit. J. Urol., in print.
15. Campbell, M. : Clinical Pediatric Urology, Saunders, Philadelphia, 1951, p. 638.
16. Gürsel, A. E. : J. Urol. Med. Chir., **58**: 121, 1952.

17. Bower, D. B. and Fowler, D.B. : Calculus anuria in a child. Brit. J. Urol., **31**: 164, 1959.
18. Eckstein, H. B., Marulyalı, K. and Tatman, N. : Rupture of the urethra and extravasation of urine caused by a calculus. Turk. J. Ped., **2**: 60, 1959.
19. Sukhavanam, B. : A case of extravasation of urine due to a calculus in a child six years of age. Ind. Med. Gaz., **69**: 450, 1934.
20. Brun, R.G. : Deux observations de complications rares chez deux fillettes indigenes atteintes de lithiase vesicale. Bull Soc. Nat. Chir. Paris, **59**: 162, 1933.
21. Winsbury-White, H.P. : Stone in the Urinary Tract, 2nd Ed., Butterworth, London, 1954, p. 316.