

THE CYSTOSCOPIC STUDY OF UROLOGIC CONDITIONS IN CHILDREN

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Abnormalities of the urinary tract of children, apparently, are not prevalent.¹ But accurate methods of diagnosis are almost universally neglected. The majority of these little patients are unable to describe their symptoms or to indicate the type and degree of their suffering. When indications for accurate investigation do arise, one hesitates to subject a helpless baby to painful methods of study. The real anxiety should lie in regard to the wisdom of our clinical interpretation. It is probably a greater error to miss making an early diagnosis through neglect of proper examination than to mistake the indication and unnecessarily subject the child to the examination. These considerations are particularly prominent in urologic diagnosis, which so frequently requires an anesthetic and cystoscopy. Nevertheless, if technically possible and perfectly safe, is it logical to neglect in children those methods unhesitatingly used for the diagnosis of similar conditions in adults?²

In recent years the perfection of small caliber instruments has been such as to open for the direct application to the field of urology in children all of the knowledge and experience gained in the development of general urology during the past twenty or twenty-five years. Personal experience teaches me that it is a simple procedure to cystoscope the bladder and catheterize the ureters of girls of whatever age, and of boys over 4 or 5 years. For little fellows under 4 an external urethrotomy, which in itself is not mutilating or dangerous, permits of the examination.

Such an examination, which of necessity assumes the nature of a minor operation, must not be undertaken prematurely. The indications should be definite and most carefully considered. Pyuria and hematuria are signs readily recognized. Careful microscopic and bacteriologic urinary studies need no emphasis. But the value of urethral catheterization is too often overlooked. It will inform one of the condition of uncontaminated bladder urine, of the bladder capacity

and of the existence of urinary residual. This latter has a certain pathognomonic significance in boys. In the absence of congenital or traumatic stricture, or of urethral stone, the finding of a residual will be strongly indicative of posterior urethral valve formation, an early diagnosis of which must often mean the preservation of the child's life. Furthermore, the insertion of an urethral catheter permits of cystography which will demonstrate the bladder outline and position, and occasionally, insufficient ureteral papillae with hydroureters and hydronephrosis, or rarely a diverticulum. For purposes of bladder catheterization in infants a No. 5 or 6 F. Albarran flute-end ureteral catheter is ideal, and will be found of service in older children, particularly boys, who may thus be catheterized without pain or difficulty. In this connection may be emphasized the neglect of obstetricians and pediatricians to meatotomize their patients when this is plainly indicated. The virtue of circumcision has proper recognition, but not enough attention is paid to the meatus of the male urethra. Yet congenital narrowing at this point is quite common and undoubtedly frequently leads to urinary disturbances in infancy and childhood.

In addition to urinary and urethral studies, the evidence of roentgen ray and of renal functional studies should precede the decision to submit the case to cystoscopy. The roentgen ray will demonstrate the size, shape and position of kidneys much more reliably in children than in adults.⁴ In the latter it has small value for this purpose, but in children, because of the better definition and greater accuracy, it is often diagnostic, and plain pictures in suspected cases should never be neglected. Calculi occur in the kidneys, ureters, bladder and urethra in early life as well as later, and I believe it a safe rule, though expensive, to make roentgenograms of the whole urinary tract of every child with a pyuria or hematuria. This modern method of diagnosis is woefully neglected by general practitioners and others, if we may judge by the proportion of stone cases in which the patient voids pus and blood for years, being mistreated for a "cystitis" until some one finally stumbles on roentgenography.

Functional studies are as illuminating in suspected urinary disease in children as in adults. Phenolsulphonaphthalein is probably the most practical test for total function, but can only supplement a careful chemical, microscopic and bacteriologic study. Repeated tests should be made because the possibilities of error are even greater than in adults. Reduction in function signifies bilateral disturbance, but a normal output has a negative value inasmuch as one kidney may be affected or even completely destroyed, or both may be slightly damaged.⁵ Retention tests are rarely indicated.

When such preliminary investigation indicates a probable vesical or renal lesion, which is otherwise uncertain, cystoscopy and ureteral catheterization should be unhesitatingly advised irrespective of the patient's age. The following is a partial report of twenty-six children cystoscoped largely in conformity to this rule; the youngest boy was 3 years, the youngest girl, 11 months of age.

PYURIA IN GIRLS

In a small series of cases of pyuria in girls ureteral catheterization was not undertaken in the belief that it was absolutely required, nor solely for purposes of therapy; we were interested mainly in determining the exact location of the infection and then in applying modern methods of treatment. In view of the chaos in medical ideas regarding hematogenous, lymphogenous and ascending routes of infection in pyelocystitis, the findings have a tremendous significance. The average age was 6 years, the youngest 11 months; the oldest, 14 years. Of the twelve cases, six were acute or subacute infections and six chronic. In three of the acute and three of the chronic cases, infection was limited to the bladder; microscopic and cultural studies of the catheterized kidney urines were negative. There was cystoscopic evidence of bladder inflammation in all twelve cases. Infection was confined to the left side in two and was bilateral in four of the six pyelites. The total phenolsulphonephthalein was normal in all. In other words, of twelve cases of clinical pyelocystitis, simple cystitis was present in 50 per cent., bilateral pyelitis with cystitis in only 33 per cent., and unilateral pyelitis with cystitis in only 16 per cent. *Bacillus coli communis* was cultivated from the urine in all but one case in which a pure staphylococcus was secured. In all of the ureteral catheterizations silver nitrate in strengths of $\frac{1}{4}$ to 2 per cent. was used as pelvic lavage before the withdrawal of the catheters.

The negative findings in respect to kidney involvement in 50 per cent. of the cases should be forcefully brought to the attention of those who maintain that infection is blood-borne in practically 100 per cent. of cases of cystopyelitis of infancy.⁶ The possibility is admitted that the kidneys may have been infected and have cleared themselves before the examination, but this seems very unlikely, particularly in the acute cases, three of which showed repeatedly negative urines from both kidneys. The quick and remarkable benefit following silver nitrate lavage of the kidneys, when infected, is worthy of attention. The procedure takes from five to ten minutes, and, as it was done under primary gas and oxygen anesthesia, without trauma or any bad effects whatever afterwards, no hesitancy is felt in strongly advising this logical procedure in those cases resisting the ordinary method of treatment.⁷

Careful urologic studies have permitted accurate recognition of other types of urinary disease in children. Caseocavernous renal tuberculosis (surgical) is very rare in children. Morris found none under 10 years. The youngest case in the author's experience is 13 years (ten cases under 18 have been seen, two of which are remarkable examples of autonephrectomy). Surgery for renal tuberculosis, therefore, can rarely be applied in children. The kidneys, however, are involved in 100 per cent. of miliary tuberculosis, which is twice as frequent in children as in adults. Two cases of this type with pronounced bilateral renal involvement have been diagnosed, ages of patients 3 and 5 years, respectively, both terminating fatally.

Calculus formation has been recognized four times, left nephrolithiasis in a boy of 4 years (with congenital posterior urethral valve), large urethral calculus in a boy of 5 and large bladder stones in boys of 3 and 4 years, respectively.

Acute hemorrhagic nephritis has been studied cystoscopically in two girls of 6 and 10 years.

Urologic investigation with diagnosis has been made of a large retroperitoneal sarcoma, a large hypernephroma and an insufficient horseshoe kidney, all of these patients coming to operation or necropsy.

Three small boys, aged 3, 4 and 5 years, with symptoms of prostatism and residuals of 80, 320 and 110 c.c., have been subjected to examinations (the youngest required external urethrotomy) which revealed valve-like obstructions in the posterior urethra. This interesting anomaly has been recently emphasized.⁸ The writer, while resident in urology at the Johns Hopkins Hospital, had an opportunity to assist Dr. Young in the surgical treatment of two such patients and to observe the striking effects on the ureters and kidneys in a third case which came to necropsy. The occurrence of three additional cases in his own practice, in two of which the patients have been operated on, in less than four years supports the feeling that the condition is more common than is generally realized.

This brief outline of a relatively short experience will serve to support the contentions of this paper: First, a complete urologic study (cystoscopy and ureteral catheterization) is technically possible in children irrespective of sex or age; second, occasionally, clinical manifestations demand for their correct interpretation such a study, and the benefit of logical treatment, possible because of an accurate diagnosis, justifies its seemingly radical nature; third, in none of the cases to which these principles have been applied has there been any untoward consequences or disagreeable complications. The results in every instance have justified the procedure.

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REFERENCE FOOT NOTES

1. The apparent rarity of urologic diseases other than bladder stone, colon bacillus pyuria and renal tumor, is supported by a review of the pediatric literature. Nevertheless, there are many reasons for inaccurate diagnosis of affections of the urinary tract in children, and doubtless many urologic cases are overlooked.

2. The literature contains few references to the practical use of the cystoscope in early childhood. Only ten years ago Ditze (Ditze: *Lehrbuch der Kystoskopie*, 1907, p. 97) was the first to call attention to it and reported successful cystoscopies in a few instances of males as young as 8 years, and advised perineal urethrotomy for its use in younger males. A year later, Portner (Portner: *Deutsch med. Wchnschr.* **43**: 1908) reported successful cystoscopies and ureteral catheterization in a few cases (youngest boy 8 years). Seven years ago Beer (Beer, Edwin: *Cystoscopy and Ureteral Catheterization in Young Children*) reported his experiences, successfully catheterizing the ureters of a girl and cystoscopying the bladder of a boy, both 5 years of age. The method, however, has not become general. Last year, Quimby (Quimby, W. C.: *Pyelitis in Children*, *J. A. M. A.* **68**:591, 1917) referred to its occasional use in treating pyelitis in infancy. In February, 1918, Hyman (Hyman, A.: *Surgical Diseases of the Urinary Tract in Children*, *Am. J. Dis. Child.* **15**:116, 1918) reviews his and Beer's experiences in thirty cases subjected to careful urologic study, and commends the method highly.

3. Brown-Buerger 21 F. double catheterizing, and 16 F. single catheterizing cystoscopes have been used. The larger size may be safely used in girls of 2 years or older, and has the advantage of shortening the period of examination, since both ureters may be quickly catheterized and the instrument withdrawn, leaving the catheters in place. With the single catheterizing instrument, only one side may be explored at a time, and the instrument must either be left in until a specimen has been collected and treatment given before the catheter can be withdrawn and another passed in the opposite side, or the instrument must be withdrawn and reinserted for the second catheterization. In case silver nitrate has been injected for purposes of pelvic lavage, the bladder contents are often so clouded as to render catheterization of the other ureter quite difficult, and this cloudiness may persist for several minutes. In order to shorten the period of anesthetization, the 16 F. cystoscope may be withdrawn after one catheter has been passed, leaving this in place and the instrument immediately reinserted alongside of this ureteral catheter in the urethra. The opposite ureter may then be catheterized and the cystoscope withdrawn, leaving both ureteral catheters in place. The anesthesia may be stopped immediately on the removal of the cystoscope, and the specimens collected and treatments given with the child awake. Nitrous oxid and oxygen anesthesia has been found most satisfactory, as it is not followed by nausea or renal inhibition.

In order to avoid bladder contamination of kidney specimens, it has been the custom to have an assistant flush each catheter with a steady stream of sterile water by means of a syringe up to the actual insertion of the catheter tip into the ureter.

4. In pediatric textbooks little if any reference is made to roentgenology of the urinary tract. Rotch's recent book, "The Roentgen Ray in Pediatrics," makes no mention of it.

5. Chromocystoscopy (with indigo carmin, recommended by Hyman, Foot-note 2) would appear to be of practical value in children in determining the relative function of the two kidneys when ureteral catheterization is not done. But the normally late appearance of the dye prolongs the anesthesia beyond the period of justification for the small amount of information derived. After ureteral catheterization intravenous phenolsulphonephthalein is undoubtedly preferable, and for the same reasons as apply in the adult. Much more reliable

information is given by a careful study of the separate urines, and occasionally by pyelography. The indications for the use of chromocystoscopy is the same for children as for adults, namely, where ureteral catheterization is impossible.

6. In spite of the overwhelming opposition of clinical facts, many writers still favor the hematogenous, or descending, theory of kidney infection in children. This is thought to occur first as a bacterial invasion of the lymphatics from the intestinal tract or other focus. The organisms then pass into the blood and are carried to the kidneys. They may be excreted without damaging the kidney, or may cause pyelitis. The preponderance of cases in girls is explained (Smith, R. M.: Pyelitis of Infancy, *Am. J. Dis. Child.* **12**:235, 1916) by the fact that the vulva, urethra and vagina are the breeding places for bacteria, which enter the lymphatics, blood and finally the kidneys, but do not ascend through the urethra. The argument against ascending infection, that colon bacilli have never been shown to pass up a normal unobstructed ureter, meets opposition in some recent experimental work. By cystography in perfectly healthy small boys it has been shown that the bladder fluid could regurgitate to the kidney, beautiful ureteropyelograms being frequently obtained after simple collargol distention of the bladder. The simple intracystic injection by Helmholtz (Helmholtz, H. F.: Ascending Infection of the Urinary Tract, *Arch. Pediat.* **35**:375, 1918) of a colon bacillus isolated from spontaneous infection in a rabbit, produced pyelitis in ten of fifteen rabbits. Facts like these two, the overwhelming clinical evidence and the absence of kidney infection on ureteral catheterization in 50 per cent. of the author's cases, lead one to believe that the ascending route is by far the more frequent in female children.

7. It is not the purpose of this paper to give in detail the histories and findings so strongly favoring the idea of the frequent occurrence of an ascending route of infection; nor the very favorable results so highly commending the logical method of treatment by pelvic lavage.

8. This anomalous condition has been more recently described and emphasized by Lowsley (Lowsley, O. S.: Congenital Malformation of the Posterior Urethra, *Ann. Surg.* **60**:733, 1914) who gives complete bibliography.