UROLOGY

VOL. 3 SECOND EDITION

UROLOGY

VOLUME THREE

Edited by

MEREDITH F. CAMPBELL, M.S., M.D., F.A.C.S.

EMERITUS PROFESSOR OF UROLOGY, NEW YORK UNIVERSITY, AND CONSULTING UROLOGIST, BELLEVUE HOSPITAL, NEW YORK

With the Collaboration of

SIXTY-FOUR CONTRIBUTING AUTHORITIES

SECOND EDITION

W. B. SAUNDERS COMPANY

Philadelphia and London 1963

Made in the United States of America

Press of W. B. Saunders Company

Library of Congress catalog card number: 63–7037

Contents

VOLUME THREE

Section XVI

Section XII

Urology in Infancy and Childhood

Chapter 39

Examination and Diagnosis

Meredith F. Campbell, M.D.

The broad fundamentals of urologic pathology, diagnosis, and therapeutic management are essentially the same, regardless of the patient's age. For the greater part the discussions of these subjects in other sections and/or chapters of this book have been presented chiefly from the standpoint of urology in adults. In this chapter attention is directed particularly to the differing points and phases of diagnosis and treatment of urologic disease in the young, and indicating wherein such differences lie.

Although Morgan in his Lettsomian lectures in 1898 was able to compose a surprisingly good monograph on urologic disease in children, reflecting an experience with neither roentgenographic nor cystoscopic aids, the greatest interest and most rapid progress in this special field have occurred during the past 30 years, notably since the introduction of safe excretory urography in 1928–1930. Extensive urographic and postmortem studies have demonstrated an unsuspected high incidence of urologic disease, and predominantly congenital, in infants and children. This stimulation together with the introduction of the several varieties and types of miniature cystoscopes, resectoscopes and other small urologic instruments, has brought about world-wide increased interest and clinical activity in

the comparatively new field of urology in children. It is notable that today a newborn male infant can be given the benefit of complete instrumental and roentgenographic urologic examination, diagnosis, and treatment which we customarily employ when the patient is an adult. The reader interested in a wider discussion and exploration of diseases in this field is referred to Campbell's *Clinical Pediatric Urology* (1951), the present limitations of purpose and space precluding such an extensive consideration.

In infants and young children the pronounced anatomic, physiologic, pathologic, and immunologic differences from older patients demand utmost consideration in every step of urologic diagnosis and treatment; the younger the patient, the greater these variations will be. Not only are special miniature instruments required in the investigative study, but unusual care is demanded in their use as well as in the clinical management of the young and particularly when major surgery is necessary. In short, *a child is not a small adult.* Fifty years ago Holt observed that it is not so much that diseases in early life are peculiar, as that the patients themselves are peculiar. Moreover, urologic disease in the young commonly produces surprisingly different clinical manifestations from those observed in adults when caused by the same lesion or conditions. For example, an acute urinary infection which in an adult might produce only the symptoms of grippe, in an infant or young child is notoriously apt to cause sharp gastrointestinal disturbances with excessive vomiting and even grave diarrhea.

Also, in the young there are relatively greater nutritional needs (calories, water, proteins, minerals, and vitamins). The condition of the child with diarrhea, persistent vomiting, fever, or toxemia may rapidly become dangerous and even critical through dehydration and acid-base disturbances. A disproportionately larger pulmonary dead space during anesthesia, the intolerance to loss of blood and to shock, as well as the high susceptibility to infection are especially notable in infants and young children.

Infants and children are subject to practically every urologic condition we are accustomed to meet in adult life; even some unusual epithelial cell malignancies such as carcinoma of the penis have been described in the young. Not only are these young people subject to the same diseases, but the methods of examination and diagnosis are fundamentally the same in each age group. The successful investigation of these young patients as well as their subsequent treatment, including surgery, demands unlimited patience together with sympathy, gentleness, and tact. Approached in a forthright manner and with simple honesty, most children will be cooperative. These are the keynotes; *deception by the physician or parent works but once* and the child's cooperation and confidence are lost.

Urologic disease must be considered in its relation to the entire body, and particularly is this true in children; otherwise, serious disease of other systems may be overlooked. The same perspective frequently discloses urologic disease when non-urologic symptoms are under investigation. This is splendidly exemplified in the study of gastrointestinal disturbances in

patients free of focal urologic symptoms; it is notable that gastrointestinal disturbances are symptomatically prominent in half of all children with chronic urinary obstruction or infection. Finally, investigative short cuts commonly lead to serious diagnostic error.

UROLOGIC SYMPTOMS

Pyuria, pain, and *hematuria* are the symptomatic cardinal triad of urinary tract inflammation which generally results from infection.

Pyuria. This is the commonest symptom of urinary infection and may originate at any point within or adjacent to the urinary tract (Fig. 7–2). The degree of pyuria indicates neither the kind nor the severity of the urologic disease; it is not uncommon to observe young patients with advanced hydronephrotic renal destruction who show macroscopically normal urine. *Sterile pyuria* is rare in infants or children but may occur in (1) the extreme dehydration of (a) pyloric obstruction, (b) low fluid intake, or (c) acute toxemia; (2) exsiccosis, (3) trauma caused by instruments or calculi, (4) when infection has disappeared but an irritating agent remains, (5) in chemical inflammation, (6) in abacterial or amicrobic pyuria. The etiology has been variously ascribed to (1) syphilis because arsenicals are so often curative, (2) the virus infections, (3) toxins from organisms situated in a focus of infection, and (4) ultra-microscopic organisms. In the newborn, pyuria occurs more often in males.

Pain. The chief potential causes of urinary tract pain in infants and children are:

1. Kidney: Abnormal mobility, ectopia, horseshoe formation, fusion, hydronephrosis, calculus, tumor, pyelonephritis, pyonephrosis, solitary abscess, perirenal tumor, cyst, or abscess.

2. Ureter: Obstruction by stricture, stone, kink, diverticulum; compression by (a) aberrant vessels, (b) fibrous bands, (c) periureteral masses.

3. Bladder: Stone, retention (neuromuscular), contracted outlet, prostatic obstruction, tumor.

4. Urethra: Stricture, meatal stenosis, stone, valves, hypertrophied verumontanum, diverticulum.

5. Adrenal: Tumor or abscess.

6. Infection or inflammation of these structures (cf. Campbell, 1945).

By somatic reference or radiation, renal pain may be widely dispersed, as by extension through the vagus (celiac ganglion) to the medulla; gastrointestinal upsets with nausea, vomiting and diarrhea, or vasomotor disturbances such as fainting, sweating, or collapse may occur. Downward extension of the painful stimuli from the irritated cord center may be manifested by reflex vesical or urethral disturbances, chiefly in urinary frequency or pain, and may explain these symptoms in the absence of demonstrable upper tract disease. Moreover, lower urinary tract disease by nerve reference may cause pain over the tip of the last rib (tenth dorsal nerve), over the posterior iliac spine (eleventh dorsal), or even

pain in the soles of the feet (third sacral). Reflex urethrovesical disturbance through the inferior hemorrhoidal nerve reflex may cause pruritus ani. Urinary tract pain may simulate gastrointestinal disease, especially appendicitis, and this is notably true in congenital right ureteral stricture which has commonly caused chronic appendicitis to be misdiagnosed and a normal appendix needlessly removed. In renal colic, by viscerosensory (ilio-inguinal) reflex, there is generally hyperesthesia over the skin of the isolateral upper inner thigh. When this area is coarsely pinched, severe cutaneous pain is felt. The observation of this phenomenon definitely localizes the disease to the upper urinary tract and distinguishes it from acute biliary, appendiceal, or other intra-abdominal disease.

Severe pain in infants is usually manifested by a distinctive sharp cry, facial contraction, marked irritability, or sometimes by an attempt to localize the pain with a hand; the patient shows that he does not wish to be moved. Lesser pain may cause only restlessness and irritability.

Pain originating in the genital tract is rare in children and is usually most severe at the site of an acute lesion (orchitis, torsion of the spermatic cord, acute epididymitis, hydrocele, varicocele, or even new growth) from which it may radiate to the groin, loin, back, or epigastrium. Epididymitis is much more frequent in children than generally appreciated and may induce subsequent hydrocele. Most hydroceles in the young are congenital but later increase in size. Varicocele in young boys is almost always the result of intra-abdominal venous compression by tumor, but I have twice seen it result from compression of the spermatic vein by an aberrant renal vessel. Varicocele on the right is practically always due to extravascular compression and most often by tumor; excessive masturbation as a cause is seen only occasionally in older boys.

Hematuria. This symptom in a child is most likely to mean nephritis, acute urinary infection, obstruction, or tumor, and in this order. The wide variety of lesions which may cause hematuria are indicated in Figure 7–3, and to these should be added hemorrhagic disease of the newborn, uric acid infarction, subacute bacterial endocarditis (renal infarction), acute rheumatic carditis, measles, severe renal passive congestion, renal papillitis, varices, angioma, or hereditary telangiectasis, hypothrombonemia, aplastic anemia, bilharziasis, trauma, sepsis, appendicitis, physical exercise, exposure to cold, and occasionally poison by such drugs as methenamine, salol, sodium salicylate, phenol, turpentine, sulfonamides, Dicumarol; hematuria due to allergy (unboiled milk; Kittredge and Johnson, 1949), and tetanus antitoxin. Congenital stenosis of the external urethral meatus with ulceration has been the commonest cause of lower tract bleeding in young boys in my experience. Hemorrhagic disease of the newborn has occasionally led to circumcision fatalities; Wittner reported two brothers and eight uncles of a child, all dead of hemorrhage following ritualistic circumcision. Hematuria from renal hemorrhage is rare in the newborn. Congenital hereditary or familial hematuria has been reported in the young. Hematuria may also be caused in infants by syphilis, nephritis, or hemoglobinuria. The red urine following the ingestion of beets (antho-

cyanin) must not be mistaken for hematuria nor the red color in the stool for blood!

Disturbances of Urination. The *normal urinary schedule* in 24 hours for children at different ages is as follows: Three to six months, 20 times; six to twelve months, 16 times; one to two years, 12 times; two to three years, 10 times; three to four years, 9 times; at twelve years of age the schedule and volume are essentially those of adults, namely 4 to 6 times with 1200 to 1500 cc. output.

After two years a child normally should hold his urine for two hours or more. Inadequate training, nervousness, excitement, or mental defectiveness explains some instances of pathologic frequency, and except when it results from diminished vesical capacity caused by inflammation or postsclerotic contracture, the volume of the bladder is normal or enlarged. When a large residuum exists and the net operating vesical capacity is thereby reduced, frequency is a dominant symptom, often an overflow manifestation.

About one in 60,000 children has *diabetes insipidus,* in which large amounts of pale watery urine of low specific gravity (1.001 to 1.005) are passed and the patient suffers extreme thirst. It reflects disease or functional deficiency of the posterior pituitary lobe and may follow falls on the head, or cerebral concussion, or may be associated with chronic hydrocephalus, luetic meningitis, and brain tumors. Occasionally frequency and sometimes incontinence result from the enormous urinary excretion of diabetes insipidus and this has even been diagnosed as enuresis.

Nocturia, nycturia, dysuria, hesitancy, urgency, tenesmus, vesical spasm, burning on urination, and strangury are caused by the same conditions in children as in adults (q.v. Section II). A halting, irregular, stuttering voided stream merits thorough investigation, as it may reflect obstruction or neuromuscular disturbance. Scott and McIllheney (1959) determined the *voiding rates* in normal male children between the ages of four and 13 years, and found them to be 15 to 20 cc. per second for a total volume of 100 to 150 cc. The child with a stuttering stream will not void the normal amount per second and probably not the normal volume at a time either.

Vesical spasm is common in children, and results from (1) the passage of highly concentrated urine which is usually acid, (2) sudden body chilling, (3) vesical calculus, (4) irritation of the nervous system, or (5) reflexly from urinary tract stone, diseases of the rectum, urethra, appendix, vulva, hip joint, or juxtavesical inflammation or suppuration. Crying on urination accompanies strangury in children and commonly occurs with other forms of dysuria.

Complete urinary retention, although comparatively rare in children, may result from some conditions which are rare in adults, while others of these lesions are more common in adults. Thus it may be due to neuromuscular vesical disease, congenital valves of the posterior urethra, congenital contracture of the vesical outlet, hypertrophy of the verumontanum, acute prostatitis, prostatic abscess, urethral stone, urethral foreign body;

congenital, gonorrheal, or traumatic stricture; marked phimosis, labial atresia, hematocolpos, hydrocolpos, anterior sacral meningocele, sacral teratoma, or retrovesical cyst. Occlusion of the small external urethral meatus by precipitated phosphates of metabolic or dietary origin may cause complete urinary retention in infancy. Chronic complete retention in children most often results from neuromuscular vesical disease which may be due to spina bifida, central or peripheral myelitis consequent to syphilis, primary anemia, to acute disease such as diphtheria, scarlet fever, and so forth, or to a tumor of the spinal cord and/or its membranes. The urine dribbles away by vesical overflow, i.e., paradoxical or pseudo-incontinence. Fecal impaction or rectal fecal overdistention may compress the urethra to cause complete urinary retention (cf. Grunberg, 1960). Similarly, as in a 6-year-old boy reported by Cordonnier (1961), diverticulum of the bladder base may compress the vesical outlet to cause complete retention; following diverticulectomy the boy voided freely.

Anuria. This is normal during the first few hours of life but rarely occurs in older children. Anuria of 24 hours' duration occurs in a third of the newborn and need give no concern if the child appears otherwise normal. It is believed to result from (1) failure of the bladder to initiate the emptying reflex or (2) from sphincterospasm, and will disappear following the ingestion of large amounts of fluid. In *true anuria* there is no urine in the bladder.

Transient anuria is not uncommon in children following urethral instrumentation and especially cystoscopy and pyelography, but generally disappears spontaneously in 12 to 24 hours. When it persists longer, it is cause for alarm. Anuria followed complete urologic examination in two girls, three and four years of age respectively, who had known sensitivity to the medium used for excretory urography. Yet there was urgent indication for urographic study of the upper urinary tract and this medium was injected retrograde for pyelography. Threatening total anuria followed for 48 and 60 hours respectively, with uremia and rapidly mounting blood nitrogen. Renal flow was re-established promptly after the administration of Benadryl and Thyroprotein. In the treatment of anuria, care must be observed not to drown these patients with intravenous fluids; if they do not excrete urine, and are not dehydrated, only sufficient fluid need be given to maintain the fluid balance, that is, to replace the imperceptible water loss through the skin and lungs. This is rarely more than a fourth of the usual normal intake by mouth. Induced sweating does no good and only debilitates the patient.

Incontinence of Urine. In children this common condition is too frequently designated as enuresis which is discussed later in this section. So-called enuresis is rarely a true incontinence but rather a manifestation of ill-formed habits, partial obstruction, local inflammation at or near the vesical outlet, or may be reflexly produced by lesions of the upper urinary tract, by rectal worms, phimosis, and so forth. It should be ascertained whether the incontinence is diurnal, nocturnal, or both, is totally voluntary or is associated with a completely or partially filled bladder, is influenced

by changes of emotion or environment, and whether the leakage is from the urethra, vagina, rectum, urachus, or other unusual site such as occurs with an ectopic ureteral orifice or urinary fistula.

Paradoxical, or *overflow,* incontinence is sometimes erroneously designated as enuresis in children, though etiologically it is due to chronic complete retention. True incontinence in children most often results from lesions of the spinal cord which are usually congenital (meningocele, spina bifida, congenital syphilis, and so forth) but may be acquired (birth trauma or tumor of the cord). Rarely does it follow operation on the lower urinary tract in the young.

Temperature. *Fever* of unexplained origin in a child always demands a careful urinalysis of a properly (aseptically!) collected specimen.

Masses. Abdominal masses in the young are chiefly renal or vesical; hydronephrosis or distended bladder frequently shows variation in size. Large loin tumors such as hydronephrosis, renal neoplasm, or polycystic disease may cause dystocia. A midline suprapubic progressively growing mass is generally a distended bladder, but it may be an umbilical or urachal cyst, an ectopic fused or unfused kidney, hydrocolpos, or when the distended bladder falls to one side, it may erroneously lead to the diagnosis of appendiceal, ovarian, or enteric abscess, or new growth.

Reflex, or Neurotoxic, Disturbances. These disturbances of the gastrointestinal tract or central nervous system are extremely common in the young and may be so severe in children with urinary infection, and particularly an acute invasion, as completely to overshadow any localizing symptoms of the bacterial process. Too frequently in children the attention is thus misdirected entirely to the alimentary tract, or when toxic meningismus exists, a spinal tap too frequently takes precedence over urinalysis. Gastrointestinal disturbances and malnutrition are outstanding in over half of all children with chronic urinary tract disease, but with correction of the urologic lesions they usually disappear. Such enteric manifestations commonly lead to the diagnosis of chronic gastritis, biliousness or indigestion, constipation, diarrhea, anemia, malaise, ease of fatigue, failure to gain, or loss of weight. The symptoms of faulty alimentation reflect the urotoxic retention. *In fine,* chronic gastrointestinal symptoms in the young always merit investigation and in a surprising number of cases can be translated into terms of urinary tract disease.

Uremia. This is discussed in Section II and is of essentially the same etiology and clinical picture in patients of all ages.

Pneumaturia. The passage of feces and air per urethram, or urine by rectum or vagina is more common in the young than in adults and at once suggests rectourethral or rectovesical fistula, which in this age group is usually congenital.

Virilism. Sudden or premature physical or genital developments suggest endocrinopathy which is usually the result of adrenal tumor but occasionally in the female reflects ovarian neoplasm, or pituitary or pineal disease (cf. Index and Sections XII and XVII).