

between the interweaving hypertrophied muscle bundles.

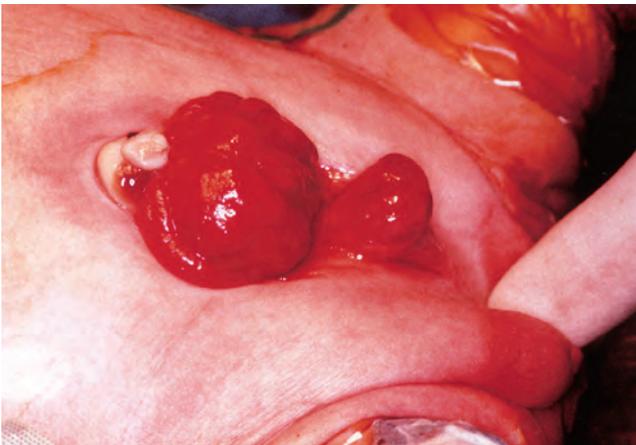
Although most diverticula are small and asymptomatic, they may be clinically significant, since they constitute sites of urinary stasis and predispose to infection and the formation of bladder calculi. They may also predispose to vesicoureteral reflux as a result of impingement on the ureter. Rarely, a carcinoma may arise in a bladder diverticulum; such tumors tend to be more advanced in stage as a result of the thin or absent muscle wall of diverticula.

- **Exstrophy of the bladder** is a developmental failure in the anterior wall of the abdomen and the bladder, so that the bladder either communicates directly through a large defect with the surface of the body or lies as an opened sac (Fig. 21-3). The exposed bladder mucosa may undergo colonic glandular metaplasia and is subject to infections that often spread to upper levels of the urinary system. Patients have an increased risk of adenocarcinoma arising in the bladder remnant. These lesions are amenable to surgical correction, and long-term survival is possible.
- **Urachal anomalies.** The urachus (the canal that connects the fetal bladder with the allantois) is normally obliterated after birth, but it sometimes remains patent in part or in whole. When totally patent, a *fistulous urinary tract* connects the bladder with the umbilicus. In other instances, only the central region of the urachus persists, giving rise to *urachal cysts*, lined by either urothelium or metaplastic glandular epithelium. **Carcinomas**, mostly glandular tumors, may arise from such cysts (see “Neoplasms”). These account for only a minority of all bladder cancers (0.1% to 0.3%) but 20% to 40% of bladder adenocarcinomas.

## Inflammation

### Acute and Chronic Cystitis

Bacterial pyelonephritis is frequently preceded by infection of the urinary bladder, with retrograde spread of microorganisms into the kidneys and their collecting systems



**Figure 21-3** Exstrophy of the bladder in a newborn boy. The tied umbilical cord is seen above the hyperemic mucosa of the everted bladder. Below is an incompletely formed penis with marked epispadias. (Courtesy of Dr. John Gearhart, The Johns Hopkins Hospital, Baltimore, MD.)

(discussed in Chapter 20). The common etiologic agents of cystitis are the coliforms: *Escherichia coli*, followed by *Proteus*, *Klebsiella*, and *Enterobacter*. Women are more likely to develop cystitis as a result of their shorter urethras. *Tuberculous cystitis* is almost always a sequel to renal tuberculosis. *Candida albicans* and, much less often, cryptococcal agents cause cystitis, particularly in immunosuppressed patients or those receiving long-term antibiotics. Schistosomiasis (*Schistosoma haematobium*) is rare in the United States but is common in certain Middle Eastern countries, notably Egypt. Viruses (e.g., adenovirus), *Chlamydia*, and *Mycoplasma* may also cause cystitis. Predisposing factors include bladder calculi, urinary obstruction, diabetes mellitus, instrumentation, and immune deficiency. Finally, irradiation of the bladder region gives rise to *radiation cystitis*.

### MORPHOLOGY

Most cases of cystitis produce nonspecific acute or chronic inflammation of the bladder. In acute cystitis there is hyperemia of the mucosa and neutrophilic infiltrate, sometimes associated with exudate. Patients receiving **cytotoxic antitumor drugs**, such as cyclophosphamide, may develop **hemorrhagic cystitis**. Adenovirus infection also causes a hemorrhagic cystitis. Persistence of the bacterial infection leads to **chronic cystitis** associated with mononuclear inflammatory infiltrates.

Other patterns of chronic cystitis worthy of brief mention are not always related to infection. **Follicular cystitis** is characterized by the presence of lymphoid follicles within the bladder mucosa and underlying wall. **Eosinophilic cystitis**, manifested by infiltration with submucosal eosinophils, typically is a nonspecific subacute inflammation but may also be a manifestation of a systemic allergic disorder.

All forms of cystitis are characterized by a triad of symptoms: (1) frequency, which in acute cases may necessitate urination every 15 to 20 minutes; (2) lower abdominal pain localized over the bladder region or in the suprapubic region; and (3) dysuria—pain or burning on urination.

The local symptoms of cystitis may be merely disturbing, but these infections may also be antecedents to pyelonephritis, a more serious disorder (Chapter 20). Cystitis is sometimes a secondary complication of an underlying disorder associated with urinary stasis, such as prostatic enlargement, cystocele of the bladder, calculi, or tumors. These primary diseases must be corrected before the cystitis can be relieved.

### Special Forms of Cystitis

Several variants of cystitis have distinctive causes or morphologic appearances.

**Interstitial Cystitis (Chronic Pelvic Pain Syndrome).** This form of chronic cystitis occurs most frequently in women and is characterized by intermittent, often severe, suprapubic pain, urinary frequency, urgency, hematuria and dysuria, and cystoscopic findings of fissures and punctate hemorrhages (glomerulations) in the bladder mucosa after luminal distention. The etiology of this troubling condition is unknown, its evaluation and diagnosis remain controversial, and its treatment is largely empiric. Some