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Bladder Have Important Role in Urinary Tract System

Franjić S*

Faculty of Law, International University of Brcko District, Brcko, Bosnia and Herzegovina, Europe

***Corresponding author:** Siniša Franjić, Faculty of Law, International University of Brcko District, Brcko, Bosnia and Herzegovina, Europe, Tel: +38749490460; Email: sinisa.franjic@gmail.com

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Abstract

The bladder is a muscular organ that belongs to the urinary tract and serves as a reservoir for urinary output from the kidneys. Urine from the kidneys enters the bladder of the urethra, and from it drains the urinary tube. The volume of urine that the bladder can receive is 200-400 mL, and can be increased to 700 mL. Bladder emptying is under the control of the autonomic nervous system and conscious control. When the bladder is stretched, the parasympathetic nervous system stimulates the bladder smooth muscle to contract. Considering that the bladder plays a very important role in the body, it is necessary to point out that in medical practice there are certain health problems that interfere with its normal function. This paper talk about some of them.

Keywords: Kidneys; Bladder; Urology; Patient; Disorder;

Introduction

Urological disorders account for about one third of all surgical admissions to hospital [1]. Urological pathology is also a common reason for patients to present in primary care. Although few urological conditions are immediately life threatening, many may have a profound effect on the patient's quality of life.

As with all other medical and surgical specialties, subspecialisation has occurred within urological practice. Evidence in the confidential enquiry into perioperative deaths (CEPOD) highlighted that transurethral prostatectomy, the operation performed most often in urological departments, is associated with a significantly lower mortality when performed by surgeons who undertake more than 50 such procedures a year. Most urologists will undertake core urology and will subspecialise in one or two of the component parts of urology. One common theme is that urological surgery requires specialised urological nursing to be effective.

Bladder

In adults, the bladder is an extraperitoneal organ well protected deep within the retropubic space and surrounded by the pelvis [2]. Its anatomic position changes with its extent of distention. An empty bladder is bounded superiorly by the peritoneum, which passes into the median umbilical ligament. Inferolaterally, it is bounded by the pelvic floor fascia, levator ani musculature, and pelvic wall. Posteriorly, in males, it is bounded by Denonvillier's fascia and the rectum. In females, it is closely related to the anterior wall of the vagina. Last, at the neck of the bladder (where it opens to the prostate in males), it is bounded anteriorly by the pubic symphysis and held in place by the puboprostatic ligaments.

As the bladder fills, the dome exits the protective confines of the retropubic space and rises to become an intraperitoneal organ. On overfilling, it can even reach the level of the umbilicus. If the bladder is full at the time of rupture, it is more likely to result in an intraperitoneal injury; an extraperitoneal injury is more likely when the bladder is empty. In children, however, the bladder is largely an intraperitoneal organ and is more vulnerable to trauma. As the child grows, the pelvis enlarges, protecting the bladder from injury.

The bladder serves the twin functions of the regular storage and intermittent voiding of urine [3]. The latter process is known as micturition. In order to achieve these functionally antagonistic activities, the bladder has to maintain a balance of micturition. This means that, as the bladder becomes full of urine, it must empty in response to the twin demands of physiology and sociability. At birth, an infant's bladder will respond to physiology alone such that, when it reaches a certain capacity, the urine therein will be reflexly voided. With growth and development, there is a progressive improvement in the inhibition of such reflex micturition by way of greater control of the brain over the local reflex. Thus, in the adult

the balance of micturition will have social as well as physiological connotations.

The balance of micturition in the normal adult bladder is maintained by a series of neuromuscular reflexes involving the generally compliant detrusor muscle and the generally contracted sphincter muscle. These muscle systems are innervated mainly by autonomic nerves which arise in the lumbar and sacral segments of the spinal cord. From there, those nerves are connected via relays within the spinal cord to the brain.

With bladder filling, the bladder wall and its contained detrusor muscle gradually expands to accommodate the urine draining along the ureters from the kidneys. At a certain point, varying between individuals, the degree of stretching of the bladder wall is communicated first to nerves in the spinal cord and from there onwards to the brain. This results in the desire to micturate. This first sensation can usually be inhibited by the brain without difficulty. Thereafter, as the bladder continues to fill, further such sensation will cause an increasingly urgent desire to micturate. During this process of bladder filling, the sphincter muscle remains contracted so as to ensure continence of urine. In this way, the normal adult bladder can accommodate between 400-600 ml of urine. Thereafter, it would be at its maximum functional capacity and normally require emptying.

Prostate and bladder cancer are the two most common malignant diseases that present to urologists [1]. The numbers of renal and testicular cancers that are being found seems to be increasing. All patients with malignant diseases now come under the care of a multidisciplinary team that consists of urologists, oncologists, radiologists, and histopathologists. Urological oncologist nurses have an increasing role to play in the counselling and follow-up of patients with malignant disease.

Problems of bladder outflow obstruction secondary to benign prostatic hypertrophy constitute about one third of cases in urological practice. Other urodynamic disorders occur in patients with neurological disorders of many kinds. The management of patients with urinary incontinence may also be included under this heading, although urogynaecologists are now taking over a considerable part of this workload.

Kidneys

The kidneys are paired organs that lie on the posterior wall of the abdomen behind the peritoneum on either side of the vertebral column [4]. In the adult human, each kidney weighs between 115 and 170 g and is approximately 11 cm long, 6 cm wide, and 3 cm thick.

The medial side of each kidney contains an indentation, through which pass the renal artery and vein, nerves, and pelvis. If a kidney were cut in half, two regions would be evident: an outer region called the cortex and an inner region called the medulla. The cortex and medulla are composed of nephrons (the functional units of the kidney), blood vessels, lymphatics, and nerves. The medulla in the human kidney is divided into conical masses called renal pyramids. The base of each pyramid originates at the corticomedullary border, and the apex terminates in a papilla, which lies within a minor calyx. Minor calyces collect urine from each papilla. The numerous minor calyces expand into two or three open-ended pouches, which are the major calyces. The major calyces in turn feed into the pelvis. The pelvis represents the upper, expanded region of the ureter, which carries urine from the pelvis to the urinary bladder. The walls of the calyces, pelvis, and ureters contain smooth muscle that contracts to propel the urine toward the urinary bladder.

Bladder Outflow Obstruction

Symptoms may be minimal or even absent [5]. Hesitancy, narrowing and diminished forcefulness of the urinary stream, terminal dribbling and a sense of incomplete bladder emptying are typical features. The frequent passage of small volumes of urine occurs if a large volume of residual urine remains in the bladder after urination. Incontinence of such small volumes of urine is known as ‘overflow incontinence’ or ‘retention with overflow’. Infection is common, causing increased frequency, urgency, incontinence, dysuria and the passage of cloudy, smelly urine. It may precipitate acute retention.

Loin tenderness may be present and an enlarged kidney may be palpable. In acute or chronic retention the enlarged bladder may be felt or percussed. Examination of the genitalia, rectum and vagina are essential, since prostatic obstruction and pelvic cancer are common causes of urinary tract obstruction. The apparent size of the prostate on digital examination is a poor guide to the presence of prostatic obstruction.

Bladder outflow obstruction is most commonly the result of benign prostatic hyperplasia, which expands the transition zone of the prostate [6]. This is part of the normal ageing process, and 10% of men in their 40s and up to 90% of men aged $\geq$ 80 years will have symptoms that are attributed to benign prostatic hyperplasia. Other causes of bladder outflow obstruction include urethral stricture, bladder neck obstruction, and bladder neck dyssynergia.

The assessment of a man with bladder outflow obstruction begins with a history. Traditionally, symptoms have been divided into irritative (related to storage of urine) and obstructive (voiding symptoms). The severity of symptoms can be quantified by the use of numerical symptoms scoring sheets such as the International prostate symptom score (IPSS).

Urine should be sent for microscopy and culture to exclude a urinary tract infection. Haematuria should alert the doctor to other urological pathology that requires further evaluation. Serum electrolytes should also be requested. After discussion with the patient, an assay for prostate specific antigen should be requested, although this remains controversial.

Prostate specific antigen is a glycoprotein that is secreted by the epithelial cells that line the prostatic acini. Any disease process that interferes with the basement membrane of these cells will result in elevated levels of prostate specific antigen.

One of the most important investigations in patients suspected of having bladder outflow obstruction is measurement of the rate of urine flow and the volume of residual urine after the bladder is emptied. Normal bladder filling occurs up to a volume of 300–500 ml. The normal bladder, in the absence of outlet obstruction, empties to completion with a maximum flow rate of > 15 ml/second. A poor flow rate is not proof of obstruction as a

similar picture can be caused by detrusor failure.

Painful Bladder Syndrome

Painful bladder syndrome (PBS) is defined by the International Continence Society as the complaint of suprapubic pain related to bladder filling, accompanied by other symptoms such as increased daytime and night-time frequency, in the absence of proven urinary infection or other obvious pathology [7]. PBS has similar symptoms and a likely overlap with interstitial cystitis (IC), but the two conditions are not identical. One important distinction is that PBS was a new definition in 2002, whereas IC has been recognized for generations. Therefore, almost all of the literature on this topic is written about IC.

IC patients usually present with some combination of pelvic and/or perineal pain, urgency to urinate, frequent daytime voiding and nocturia. Approximately 90% of patients diagnosed with IC are women, which makes IC a relevant condition for gynecologists. Patients have often had problems for years by the time a diagnosis is made, and up to 85% have had a hysterectomy for pelvic pain prior to diagnosis. Outside of specialist centers, there has been little or no attention paid to IC as a diagnosis and as such, the services are predominantly fragmented, particularly with regard to pain management if treatments fail to cure or ameliorate symptoms.

A landmark study showed that IC patients formed two different groups. In one group, bladder ulcers were seen on cystoscopy, and bladder biopsies usually showed intense inflammation. The other group had no ulcers but had petechial bleeding on cystoscopy; they usually had scant or no inflammation. These two groups have several other clinical and pathologic differences, as well as different treatment responses, yet both could be included in the symptom definition of PBS. Therefore, any treatment trial should be read closely to determine the exact type of patients studied. Not all results can be generalized to the broad PBS population.

Urinary Tract Infections

Urinary tract infection (UTI) is the presence of micro-organisms in the urine or tissues of the normally sterile genitourinary tract [8]. Infection may be localized to the bladder alone or the kidneys or, in men, the prostate. Acute uncomplicated urinary tract infection occurs in women with a normal genitourinary tract and usually manifests as acute cystitis (bladder infection or lower tract infection). These same women experience, less frequently, kidney (upper tract or renal) infection, referred to as acute uncomplicated or acute nonobstructive pyelonephritis. Complicated urinary tract infection occurs in individuals with structural or functional abnormalities of the genitourinary tract, including those with indwelling devices such as urethral catheters. Recurrent urinary infection may be reinfection with a new organism or relapse, when the same organism is isolated post-therapy.

Urinary tract infections result in 3.6 million office visits each year and greater than 100,000 hospital admissions in the United States annually [9]. They may be confined to the lower urinary tract resulting in cystitis or involve the upper urinary tract and cause pyelonephritis. This is an important distinction as pyelonephritis may result in renal parenchymal damage, urosepsis, and death. Enteric or coliform bacteria are responsible for most UTIs with Escherichia coli being the most commonly identifi ed organism. UTIs are further divided into (1) uncomplicated UTIs, where there is no structural or anatomic abnormalities of the urinary tract, and (2) complicated UTIs, where they may be either structural or anatomic abnormalities of the urinary tract or functional predispositions to infection. In addition, microorganisms in patients with complicated UTIs are frequently multidrug resistant.

Because of certain unique characteristics of affected individuals, UTIs can also be classified according to the population affected, eg, in young women, in young men, during pregnancy, in diabetic patients, etc.

Ascending infection from the urethra is the most common route of infection. The periurethral epithelium is normally colonized by enteric bacterial flora that invade the bladder. This probably accounts for the markedly greater frequency of infections in females, in whom the urethra is short and is in close proximity to the vulvar and perianal areas, thereby increasing the likelihood of contamination. While the majority of UTIs are due to E coli, only a few serogroups of E coli (O1, O2, O4, O6, O7, O8, O75, O150, and O18ab) can actually cause infections. An important virulence factor of these uropathogens is the presence of adherence factors, such as Type I fimbriae, or P fimbriae which allow binding of the organism to uroepithelial cells. Bacteria rapidly multiply in the bladder and may travel up the ureters to the renal pelvis and parenchyma, thereby causing pyelonephritis.

Uropathy

Patients presenting with unexplained acute or chronic kidney disease, with or without obstructive symptoms, should be evaluated for the possibility of obstructive uropathy [10]. Chronic obstruction can result in chronic tubulointerstitial disease. Bladder outlet obstruction is common in older males due to prostatic hypertrophy or carcinoma. Urinary retention can be seen in both genders postoperatively and as a complication of urinary tract infection.

Patients complaining of voiding dysfunction including hesitancy, decreased force of stream, interruption in stream, or postvoid dribbling should be evaluated for the presence of urinary retention. These symptoms are usually due to prostate disease, urethral stricture, or neurogenic bladder. Medications can often be used to treat many of these symptoms and prevent complications. Patients with bladder spasticity can benefit from anticholinergic agents such as oxybutinin and propantheline bromide. Patients with bladder outlet problems can be treated with antagonists, which act by relaxing the smooth muscle of the bladder neck and prostate. Patients with severe bladder atony may require intermittent bladder catheterization.

Clinical manifestations of urinary tract obstruction vary depending on the location, duration, and degree of obstruction. In patients with complete bilateral obstruction or with an obstructed solitary kidney, anuria (<50 mL urine output in 24 h) can be the presenting feature, whereas in patients with partial obstruction, the urinary output can vary from oliguria to polyuria. Although pain is more likely to be associated with acute blockage, obstruction may be totally asymptomatic and occur without overt clinical manifestations or suggestive laboratory findings. Therefore,

obstructive nephropathy should always be considered as a cause of renal failure when an obvious pre-renal failure or intrinsic renal cause is not identified. The location of obstruction is anatomically divided into upper and lower urinary tract at or below the level of the bladder. Common causes of lower urinary tract obstruction include urethral strictures, prostatic hypertrophy, and neurogenic bladder.

Diagnosis of urinary tract obstruction can be difficult. Anuria, flank pain with a palpable mass, or apalpable bladder areo bvious clues. The laboratory evaluation can be helpful. Hyperkalemia with a nonanion gap metabolic acidosis is suggestive of a renal tubular acidosis associated with obstruction. The urinary sediment maybe bland or demonstrate crystals or hematuria, depending on the etiology of the obstruction. Patients may have very dilute urine due to the presence of an acquired form of nephrogenic diabetes insipidus.

Ultrasonography is the most useful test for the presence of obstruction. Although hydronephrosis is usually demonstrated, there are circumstances when hydronephrosis is not seen despite urinary tract obstruction:

- Early in the course of obstruction (12– 24 h) when the collecting system is relatively noncompliant.
- In the face of severe volume depletion when glomerular filtration is severely depressed.
- When the collecting system is encased by retroperitoneal lymphadenopathy or fibrosis.

Conclusion

Organs of urinary system are involved in regulating the volume and composition of body fluids. The urinary system removes waste matter as well as excess water and electrolytes from the blood plasma and so it arises urine. Carbohydrates and fats as the end products of carbon dioxide and water, while the degradation of proteins produces different end products depending on the type of organism. The basic organ of the urinary tract is the kidney, which produces urine. In addition to the production of urine as a primary role, the kidneys also perform other important functions for the functioning of the body, from regulating blood pressure to producing hormones and controlling electrolyte levels in the blood. Urine is transferred from the kidney to the bladder via urethra.

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