URINARY BLADDER

I. INTRODUCTION

The urinary bladder is a hollow musculumembranous organ that constitutes with the terminal part of the ureters and the proximal part of the urethra the pelvic parts of the urinary system. Its muscular structure is adapted for mass contraction not peristalsis and acts as a urine container with major role in micturition. Although it is entirely situated in the pelvic cavity when empty, it expands superiorly into the abdominal cavity when full.

II. DESCRIPTIVE ANATOMY

A- SITUATION

The bladder is the most anterior element of the pelvic viscera. It is entirely situated in the pelvic cavity when empty and expands superiorly into the abdominal cavity above the pubic symphysis when full.

In men, it is situated in front of the seminal vesicles and the rectum and above the prostate.

In women, it is situated in front of the uterus and the vagina and above the pelvic diaphragm.

B- DIMENSIONS

In a coronal section when empty, the bladder is six centimetres long and five centimetres wide. Its dimensions double when full. The anatomic capacity of the bladder is two litres when the functional capacity before the need to urinate is one hundred fifty to three hundred

millimetres. This capacity is more important in women and increases progressively with age in the infant.

C- SHAPE AND SUPPORTS

The bladder has the same form and size in both sexes. It is globular and ovoid when distended and flattened from above downwards when empty. The standard description of the shape of the bladder applies when undistended. It has an approximate shape of three-sided pyramid without hard and fast dividing lines between the various surfaces. The bladder is highly fixed by fascias and ligaments at its different parts except the superior surface.

The sharp apex of the bladder is anterior pointing to the top of the pubic symphysis. It is attached by the median umbilical ligament running the midline of the anterior abdominal wall to the umbilical ring. The median umbilical ligament is a fibrous twelve centimetres long and two millimetres thick cord. It is the embryonic remnant of the urachus.

The base is positioned below the level of the rectovesical pouch and, thus, has no peritoneal covering. The seminal vesicle and ductus deferens are applied backwards on each side of the midline and the ureters enter the external surface of the base at the upper outer corner. The lowest part of the base is the trigone and the highest part is the retrotrigonal part. In women, a firm connective tissue unites the base to the anterior vaginal wall and upper part of the uterine cervix with no peritoneum, the vesicouterine ligaments. In men, by the rectovesical ligament and muscle that extend from the retrovesical fascia to the rectum and sacrum laterally limiting the rectovesical pouch of Douglas.

The two inferolateral surfaces are cradled by the anterior parts of levator ani and obturator internus. Each surface slopes downwards and medially to meet its fellow below the apex. They are covered towards the base and the retrotrigonal fossa by the retrovesical fascia containing the seminal glands, ductus deferens and retrovesical portion of the pelvic ureter in men and only the latter in women. Forwards, they are covered by the prevesical fascia doubled by the umbilical fascia that continues downwards into the false capsule of the prostate in men and into the superior fascia of urogenital diaphragm in women. The umbilical fascia contains in its superior borders the umbilical arteries and the medial umbilical ligaments depth limiting the retropubic space forwards and the paravesical space laterally. It continues laterally into lateral vesical ligaments which merge with the pelvic fascia and the lateral ligaments of uterus in women.

The neck is the lowest part of the bladder where the base and inferolateral surfaces meet. It is pierced by the urethra at the internal urethral orifice and lies against the upper surface or base of the prostate in men and against the pelvic fascia in women. The neck of bladder is fixed by the anterior vesical ligaments to the pubic symphysis. In men, the puboprostatic ligament is attached to the prostate also and the neck of bladder is, also, fixed by its fusion with the stroma of the prostate. The anterior vesical ligaments are crossed by the deep dorsal vein of clitoris in women and of penis in men.

The superior surface moves when the bladder fills and is covered by peritoneum continuous backwards with the peritoneum of the rectum through the rectovesical pouch in men and with the peritoneum of the uterus through the vesicouterine pouch in women. The rising bladder strips

peritoneum from behind rectus abdominis, for the fascia transversalis is here loose and tenuous, thus when full, the bladder is subcutaneous.

The trigone is an internal part of the bladder. It constitutes the anterior region of the base of the bladder when the retrotrigonal fossa is the upper posterior region. The trigone is a triangular area between the internal urethral orifice centrally and below and the two ureteral orifices backwards and laterally; the three openings are two centimetres and half apart in the empty bladder. It is the least mobile part of the bladder, fixed on top of the prostate by the urethra and the pelvic fascia surrounding the upper urethra at the front of the vagina. It overlies the median lobe of the prostate which, after the first flush of youth, may project above the internal urethral orifice as a rounded elevation, the uvula vesicae. The ureteric orifices are usually in the shape of an oblique slit forwards and medially and are connected by a transverse ridge, the interureteric bar, and the internal urethral orifice is a transverse slit. Behind the interureteric bar, is the retrotrigonal fossa.

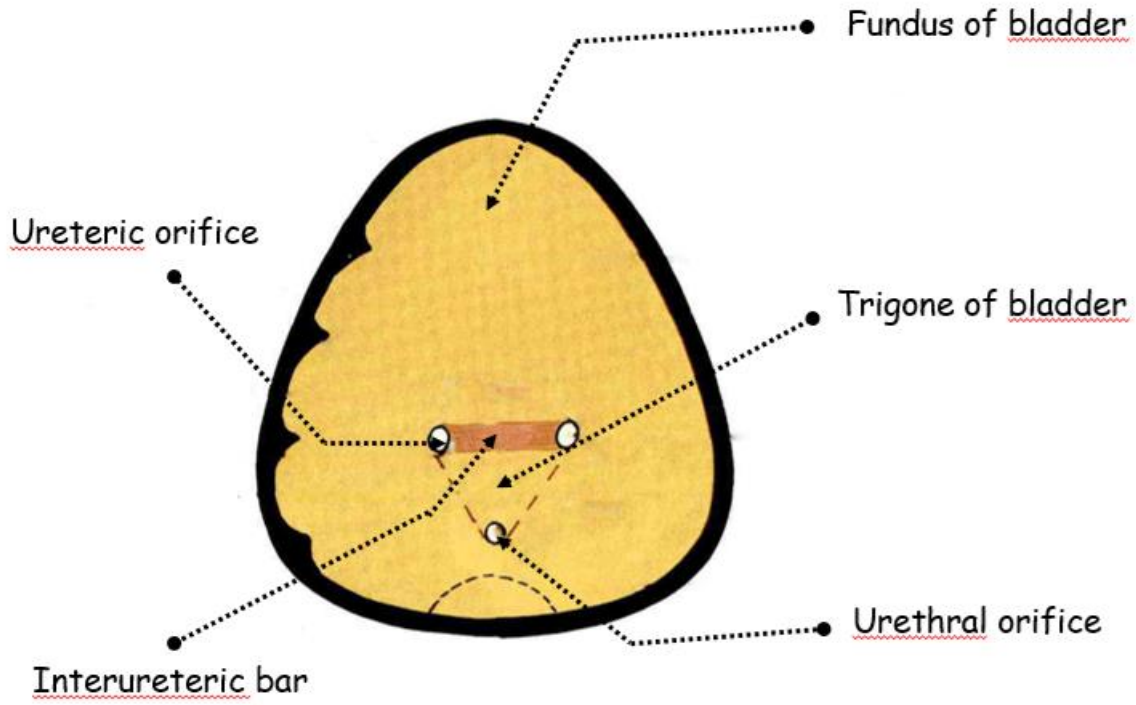

Figure 1: Horizontal section showing the shape of bladder

III. STRUCTURE

The wall of bladder is a three layers wall. It is one centimetre thick when the bladder is empty and five millimetres thick when distended.

The serous coat covers the superior face and is more adherent near the apex.

The adventitia, or the vesical fascia, is a connective tissue that covers the bladder except the superior face.

The muscle of bladder, the detrusor, is a smooth muscle composed of an interlacing network of fibres running in various directions that produce a trabeculated appearance. Schematically, three muscular layers can be distinguished. The outer layer is longitudinal and participates in the formation of the ligaments of the bladder. The middle layer is circular. The inner layer is longitudinal.

The superficial trigonal and the interureteric muscles are distinctive patches of muscle that extend from the inner longitudinal muscle of the ureters to the proximal urethra in both sexes.

The internal urethral sphincter consists of circular smooth muscle fibres of the middle layer of the detrusor towards the neck of the bladder continuous with the smooth muscle of the stroma of the prostate and seminal vesicle. It is absent in women.

The mucous membrane is thick and lax and lined by transitional epithelium without glands nor muscularis mucosae, mucus in shed urine has come from urethral glands and trigonal gland and has a protective role against urine. Macroscopically, the mucous membrane is bright yellow in colour with an irregular vascular network.

IV. ANATOMICAL RELATIONS

A- SUPERIOR SURFACE

The superior surface of the bladder is covered by peritoneum continuous with the parietal peritoneum of the anterior abdominal wall just behind the fascia transversalis and rectus abdominis.

When moderately distended, this continuity of the vesical peritoneum with the anterior parietal peritoneum forms the transverse vesical fold. It is overlied by intestinal coils, the sigmoid colon and the body of uterus in women. Laterally, the peritoneum of the distended bladder forms with the pelvic wall the paravesical fossae. The right paravesical fossa is in contact with the caecum and appendix.

B- INFEROLATERAL SURFACES

The inferolateral surfaces are cradled by the pelvic diaphragm medially and obturator internus muscle and its fascia laterally. Forwards, it lies on centimetre and half behind the pubic symphysis and the retropubic space of Retzius. Laterally, it is bordered by the paravesical fossae under which passes the obturator pedicle.

C- APEX

The apex is prolonged by the median umbilical ligament and its peritoneal fold.

D- BASE

The base of the bladder is divided by the opening of the ureters into a lower trigonal part and upper retrotrigonal part.

In men, the retrotrigonal part is in contact with ductus deferens and the tip of seminal vesicles and the trigonal part is in contact with the ampulla of ductus deferens, the body and neck of seminal vesicles and the base of the prostate. The rectum is separated from the urogenital organs by the rectovesical septum. The latter is separated by the rectovesical fascia into two divisible spaces, the rectovesical space upwards and the retroprostatic space downwards.

In women, the retrotrigonal part is in contact with the supravaginal part of the cervix, and the trigonal part with the anterior wall of the vagina both through the vesicouterine septum. The vesical trigone is applied against the vaginal trigone. The ureters travel the superior lateral parts of the vesicouterine septum.

E- NECK

The neck of the bladder is just behind the pubic symphysis. In men, it is strengthened by its continuity with the base of the prostate. In women, it is strengthened by the pubovaginalis part of levator ani.

V. BLOOD SUPPLY; LYMPH DRAINAGE AND NERVE SUPPLY

A- ARTERIES

All arteries of the bladder are provided from the internal iliac artery.

The superior and inferior vesical arteries provide most of the arterial blood with small contributions to the lower part of the bladder from the obturator, inferior gluteal, uterine and vaginal arteries.

The superior vesical arteries are one to four arteries that rise from the umbilical artery, they raise a small mesentery of peritoneum running from the side wall of the pelvis to the upper part of the bladder which they supply.

The inferior vesical artery rises from the internal iliac artery or the inferior gluteal, in men, it supplies the inferolateral surfaces and the neck. The artery of ductus deferens is a branch of the umbilical or internal iliac artery, it supplies the retrotrigonal part of the base. In women, the vesicovaginal and cervicovaginal branches of the uterine artery supply the retrotrigonal part of the base.

B- VEINS

The veins of the bladder do not follow the arteries. The bladder is drained by the vesicoprostatic plexus in the groove between bladder and prostate in men. A similar plexus in women communicate with veins in the base of the broad ligament. They drain backwards across the pelvic floor to the internal iliac veins through the vesical vein and forwards to the retropubic veinous plexus.

C- LYMPH DRAINAGE

The lymphatics of the bladder follow the arteries backwards to internal and external iliac and sacral nodes.

D- NERVE SUPPLY

Parasympathetic fibres which provide the main motor innervation of the bladder reach It via the pelvic splanchnic nerves. Sympathetic fibres come from L1 and 2 segments of the cord via the superior hypogastric and pelvic plexuses. For most of the bladder the sympathetic fibres are vasomotor and probably inhibitory to the detrusor muscle, but as noted above they supply the superficial trigonal muscle and, in the male, the internal sphincter. The sensation of normal bladder distension travels with parasympathetic fibres and in the spinal cord is conveyed in the gracile tract, but it appears that bladder pain, from a stone for example, reaches the spinal cord, the lateral spinothalamic tract for instance, by both parasympathetic and sympathetic pathways.

VI. CONCLUSION

The urinary bladder is a continuous muscular system with the ureters and the urethra that acts as a urine container and emptying system where intervenes voluntary control. It is a pelvic fixed organ variable in dimensions and relations with three layers' wall and exclusive supply by the internal iliac artery.