

2-1 Anatomy:

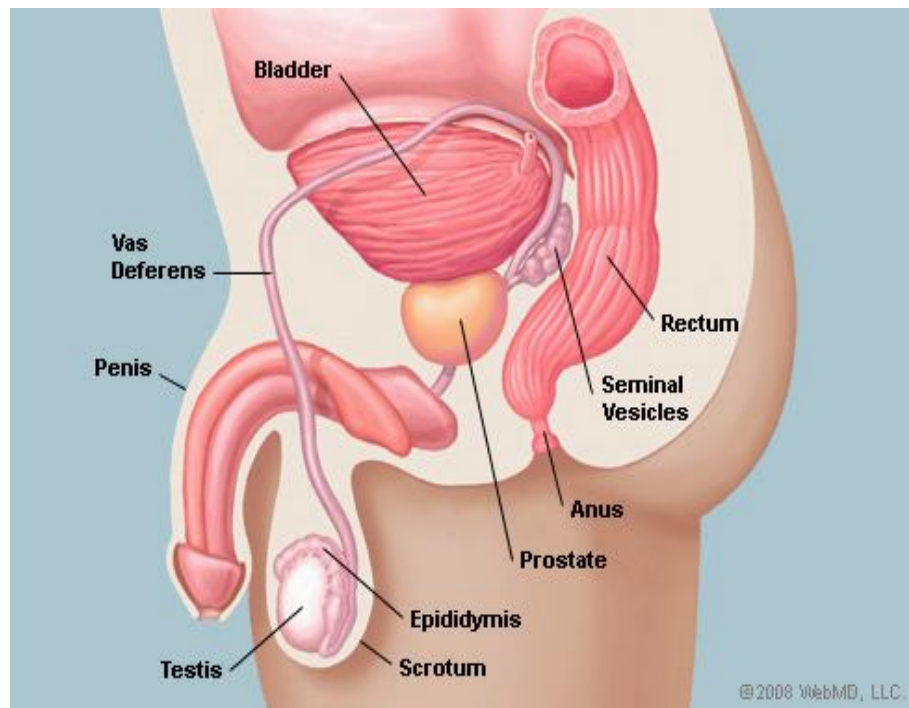
The prostate is firm fibro muscular, glandular organ. It is retro peritoneal organ which lies beneath urinary bladder and above urogenital diaphragm and is penetrated by the proximal part of the urethra. Its female homologue is the small group of Para urethral glands. It is normally broader than it is long, approximately 3-8cm cephalocaudally (long axis). 4.0 cm transversely, 3.0 cm antero-posterior dimension (thickness).(14).

The somewhat conical prostate has a base and an apex, and anterior posterior and inferolateral surfaces. The base is upper surface, fused with the neck of the bladder and perforated by the urethra which traverses the whole length of the gland, the blunt apex is the lowest part, and the prostatic urethra emerges from the front of the apex to become membranous urethra, the inferolateral surfaces are clasped by levator prostate part of the levator ani, the posterior surface is in front of the rectum but separated from it by rectovesical fascia, ejaculatory ducts pierce the posterior surface just below the bladder and pass obliquely through the gland for about 2cm to open into the prostatic urethra about half way down, the prostate own ducts also open into this part of urethra.(6). The prostate has different relations with adjacent organs (Fig.2-1) superiorly, the base of the prostate is continuous with the neck of the bladder, the smooth muscle passing without interruption from one organ to the other. The urethra enters the center of the base of the prostate. Inferiorly, there is the urogenital diaphragm, and the urethra leaves prostate just above the apex on the anterior surface. Anteriorly, the anterior surface of the prostate is related to the symphysis pubis, separated from it by the extra peritoneal fat in the retro pubic space (space of Retzius) the fibrous sheath of the prostate is connected to the posterior

aspect of the pubic bones by the puboprostatic ligaments. These ligaments lay one on either side of the midline and are condensations of pelvic ligaments lay one on either side of the mid line and are condensations of pelvic fascia. Posteriorly, the posterior surface of the prostate is closely related to the anterior surface of the rectal ampulla and is separated from it by the recto-vesical septum (fascia of Denonvillier), this septum is formed in fetal life by the fusion of the wall of the lower end of the recto vesical pouch of the peritoneum, which originally extended down to the perineal body. Laterally, the lateral surface of the prostate is embraced by the anterior fibers of the levator ani as they run posteriorly from the pubis symphysis.(14).



(A)



(B)

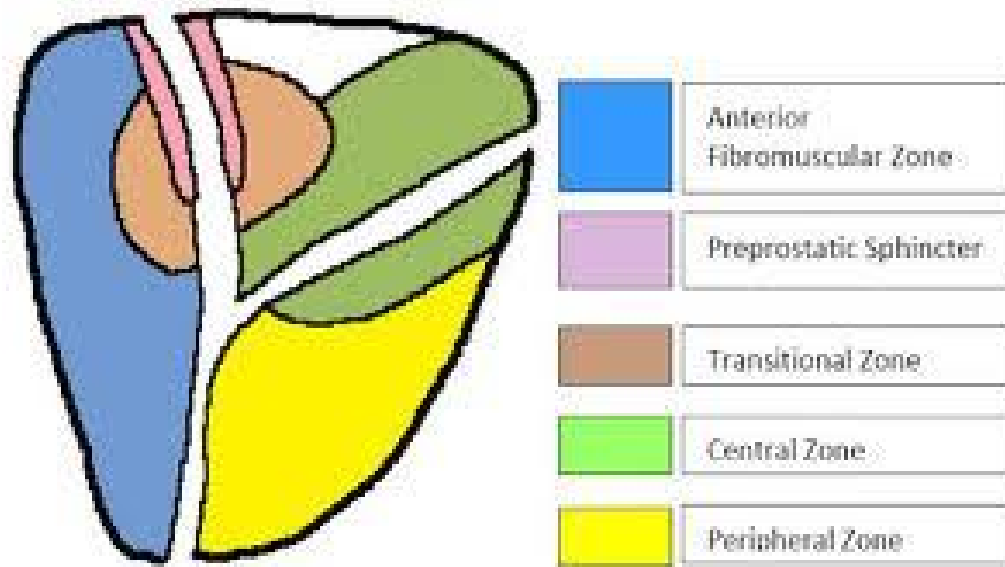
(Fig(2-1)a,b Show the different prostate gland relations with adjacent organ

A thin strong layer of connective tissue at the periphery of the gland forms the true capsule of the prostate, and outside this there is a condensation of pelvic fossa forming the false capsule. Between these two capsules lies the prostatic plexus of veins. The gland consists of acini of varying shapes sizes embedded in a fibro muscular stroma. A mixture of connective tissue and smooth muscular stroma, this is the characteristic histological feature. The prostatic urethra, 3-4cm in length, passes through the substance of the prostate closer to the anterior than posterior surface of the gland. It runs down wards and backwards from the internal meatus, then bends at the middle of its length and continues downward and forward to emerge from the anterior aspect of the apex. A midline ridge, urethral crest, project into the lumen from the posterior wall throughout most of the length of prostatic urethra. The shallow depression on either side of the crest is termed the prostatic sinus. At about the mid length of the crest the seminal colliculus, verumotantum, forms a midline rounded eminence. The prostate utricle, a small recess repressing the fused of the paramesonephric (mullerian) ducts open into the middle of the verumotantum and the ejaculatory ducts open in the other side of the utricle. The proximal part of the prostatic urethra, also termed the preprostatic part, is surrounded by a cylinder of smooth muscles and extension of circular muscle at the bladder neck, as been noted above, this muscles contract to prevent seminal regurgitation into the bladder during ejaculation (6).

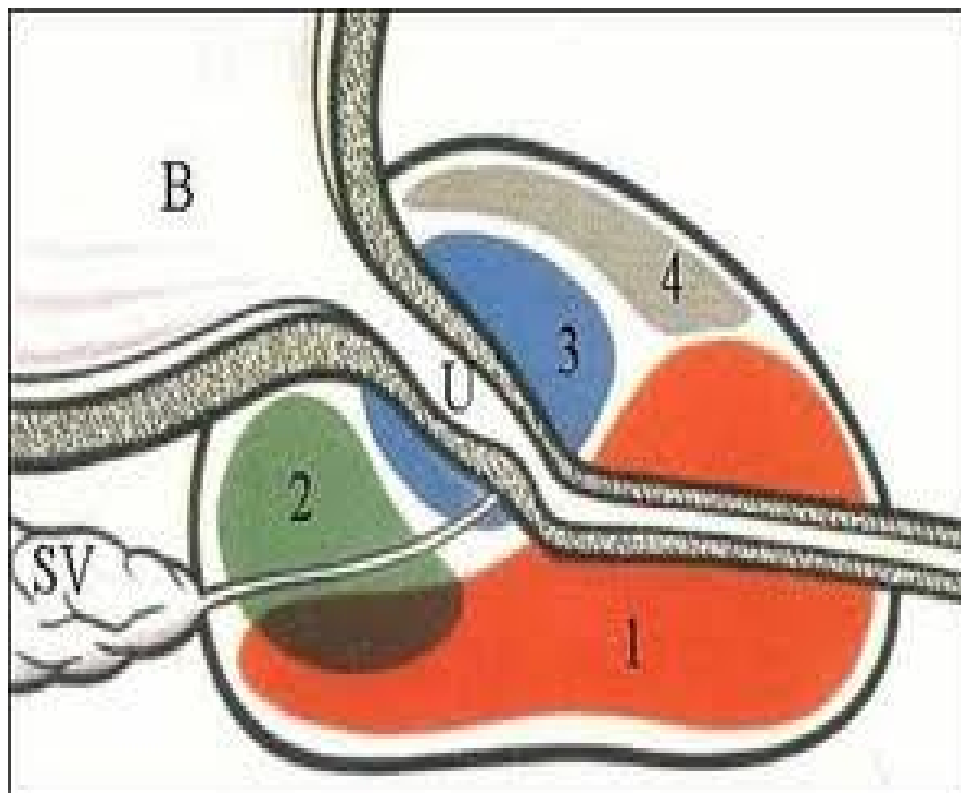
Posteriorly the sheath is continuous above with the fascial layers which enclose the ampullae of the ductus deferentes and the seminal vesicles, and it is adherent to the peritoneum of rectovesical pouch. In this position it is spoken of as rectovesical septum.(7).

The fibrous sheath of the prostate is dense fibrous portion of the pelvic fascia, and closely invested the prostate. Inferiorly, the sheath becomes continuous with the superior fascia of the urogenital diaphragm, and through it, gains attachment to the sides of the pubic arch. In front and at the sides, it is fused with the puboprostatic ligaments, by which it is connected with pubic bones, and the fascia on the levatores ani, between the puboprostatic ligaments of the two sides there is a shallow depression, the floor of which is formed by a thin layer of fascia which connects the anterior parts of sheath of prostate with the back of symphysis public. The medial edges of the levatores ani muscles are immediately below the puboprostatic ligaments, and embrace the lower part of prostate posteriorly to form the levator prostate. The lower fibers of the pubovesical muscle, which follow the puboprostatic ligament, constitute the puboprostatic muscle. Classically, the prostate has been divided into five lobes; the anterior lobe which lies in front of the urethra and is devoid of glandular tissue, the median, or the middle lobe is situated between the urethra and the ejaculatory ducts. The posterior lobe is situated behind the urethra and, below the ejaculatory ducts, and also contains glandular tissue. The right and left lateral lobes are lie on either side of the urethra .The contain many glands; the glandular portion of the prostate is divided into zones (Fig.2-2), rather than being made up of lobes, the central zone wedge shaped and forms the base of the gland with its apex at the verumotanium; it extends from the base of the prostate to the verumotanium, it surrounds the ejaculatory ducts as they course through the gland. Benign prostatic hyperplasia occurs in the central zone. The duct of the central zone opens on the verumotanium around the orifices of the ejaculatory ducts. The central zone occupies 25% of the glands volume. The peripheral zone is located posterior and lateral to the

distal prostatic urethra, it surrounds the central zone from behind and below, but does not reach up to the base; it extends downwards to form the lower Part of the gland. The ducts of peripheral zone open into the prostatic sinuses. The peripheral zone is almost exclusively the site of origin for carcinoma of the prostate. Peripheral zone occupies 70% of the gland. The transition zone is located on both sides of the proximal urethra. Normally, it is the smallest zone. The peripheral glandular tissue or zone contains the tissue that lines the proximal prostatic urethra. The anterior part of the prostate being mainly fibromuscular; it is overlapped from above by the detruser muscle of the bladder and from below by the striated muscle of the urethral sphincter. (14).



(A)



(B)

Fig (2-2) a, b Show zonal anatomy of the

At birth, the prostate has a system of ducts embedded in a stroma which forms a large part of the gland. Follicles are represented by small buds on the ducts. The hyperplasia and squamous metaplasia of the epithelium of the ducts, colliculus, seminal vesicle and prostatic utricle which preceded birth, possibly due to maternal estrogen in the fetal blood, subside and a regression period after birth is followed by a period of quiescence lasting for 12-14 years. At puberty, between the ages of approximately 14 and 18, the prostate gland enters a maturation phase and in approximately 12 months during this time, it more than doubles in size, due almost entirely to follicular development, partly from end buds on ducts and partly from modification of the ductal branches. Morphogenesis and differentiation of the epithelial cords starts in an intermediate part of the epithelial anlagen and proceeds to the urethral and subcapsular part of the gland, the latter being reached by the age of 17-18 years. Initially multilayered squamous or cuboidal, the glandular epithelium is transformed into a pseudo-stratified epithelium consisting of basal, exocrine secretory (including mucous) and neuroendocrine cells. The mucous cells are temporary, and are lost as the gland matures. The remaining exocrine secretory cells produce a number of products including acid phosphatase, prostate specific antigen and B-microseminoprotein. Immature glandular pouches are immunopositive for basic fibroblast growth factor (b-FGF), the role of which remains to be established. This growth of the secretory component is associated with condensation of stroma, which diminishes relative to the glandular tissue. These changes are probably due to the secretion of testosterone by the testes. During the third decade the glandular epithelium grows by irregular multiplication of the epithelial folding into the lumen of the follicles. After the third decade the size remains virtually unaltered until

45-50 years. When the epithelial folding tends to disappear, follicular outlines became regular and amyloid bodies increase in number. All these changes are signs of prostatic involution. After 45-50 years the prostate may undergo benign hypertrophy, increasing in size until death, or alternatively it may undergo progressive atrophy.(7).

The pelvic parts of endodermal urogenital sinus gives rise to lateral epithelial buds which became the prostatic acini of the peripheral zone. Dorsal outgrowths from above the level of the entry of mesonephric ducts form the acini of the central zone. The fibromuscular stroma develops from the surrounding mesenchyme. The different sites of the origin of the inner and outer zone acini may account for the different sites of incidence of benign and malignant disease. (6).

The main arterial supply of prostate is from the prostatic branch of the inferior vesicles artery, with some small branches from the middle rectal and internal pudendal vessels (Fig.2-3). The veins run into a plexus between the true and false capsules and this joins the vesicoprostatic plexus situated at the groove between bladder and prostate. This plexus receives the deep dorsal vein of the penis, and drains backward into the inferior vena cava. (Ivc)(14). The lymphatic of the prostate pass across the pelvic floor mainly to internal iliac nodes; a few may reach external iliac nodes. (6). The nerve supply to the prostate is from the inferior hypogastric plexus, the sympathetic nerves simulate the smooth muscle of the prostate during ejaculation. (14).

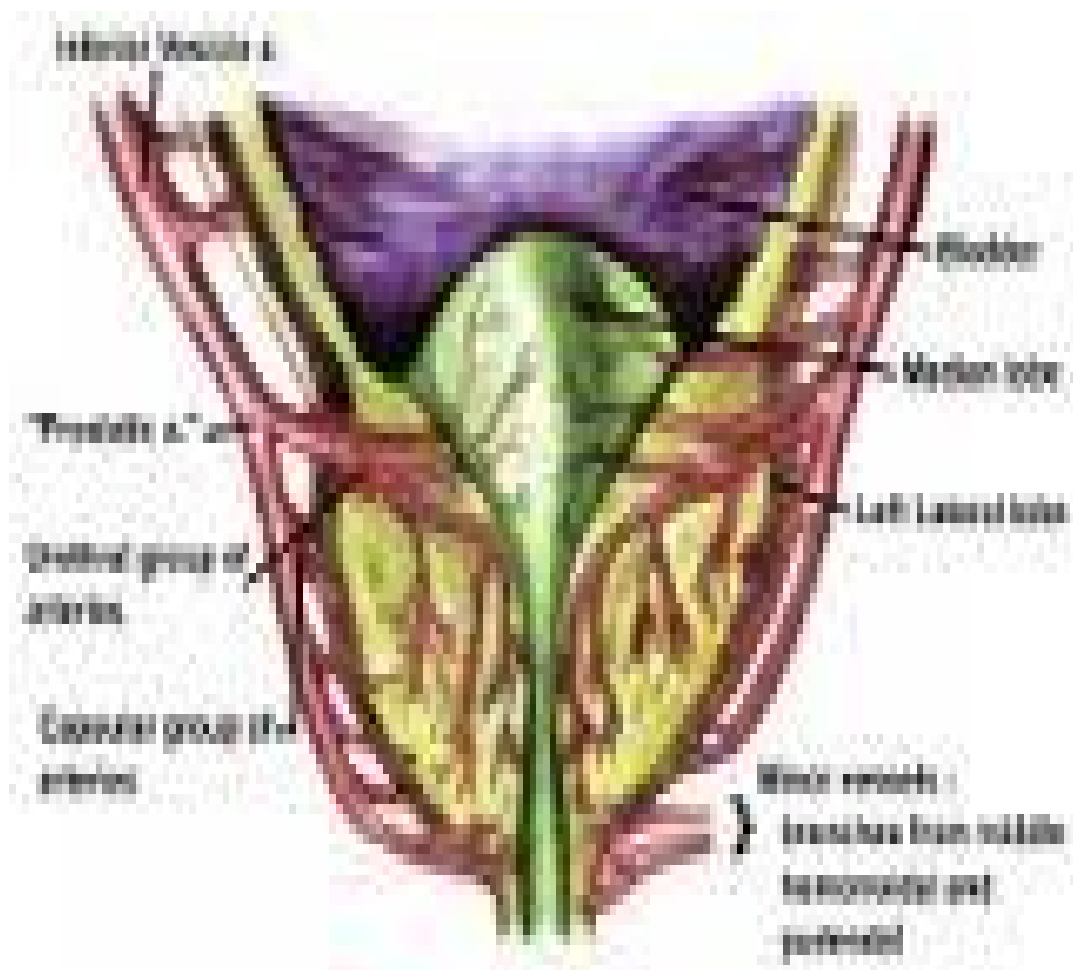


Fig (2-3) the blood supply of the prostate gland

2-2 Histology:

The prostate gland, composed of 30-50 small tubule- alveolar glands, surrounds the beginning of urethra and open into its floor by about twenty ducts; it is pierced by the ejaculatory ducts. The glandular tissues consist of branching tubules with dilated endings that appear in a section as large alveoli with folded walls; they are lined by anon ciliated columnar or cubical secretory epithelium supported by small basal cells. The secretory cells contain droplets in the cytoplasm between the nucleus and the alveolar lumen, and these are discharged during the secretory cycle. The cells are also rich in acid phosphates, they are very sensitive to the concentration of androgen becoming very much reduced in size and activity after castration, an affect which can reversed by the injection of male sex hormones. The alveoli often contain colloidal masses of secretion termed corpora amylase. There is no definite basal lamina, but layers of very vascular and elastic connective tissues surround the gland to from capsules which sends broad radiating trabeculea into its substance. The interalveolar tissue consists of dense connective tissues, which collagen and elastic network, and of numerous strands of smooth muscles around the urethra the muscles from a thick ring (Fig.2-4). Between the ejaculatory ducts is prostatic utricle, a fetal remnant of paramesonephric ducts, consisting of a blind sac that opens in the prostatic urethra lined by ciliated epithelium that dips down to forms short glands. (11).

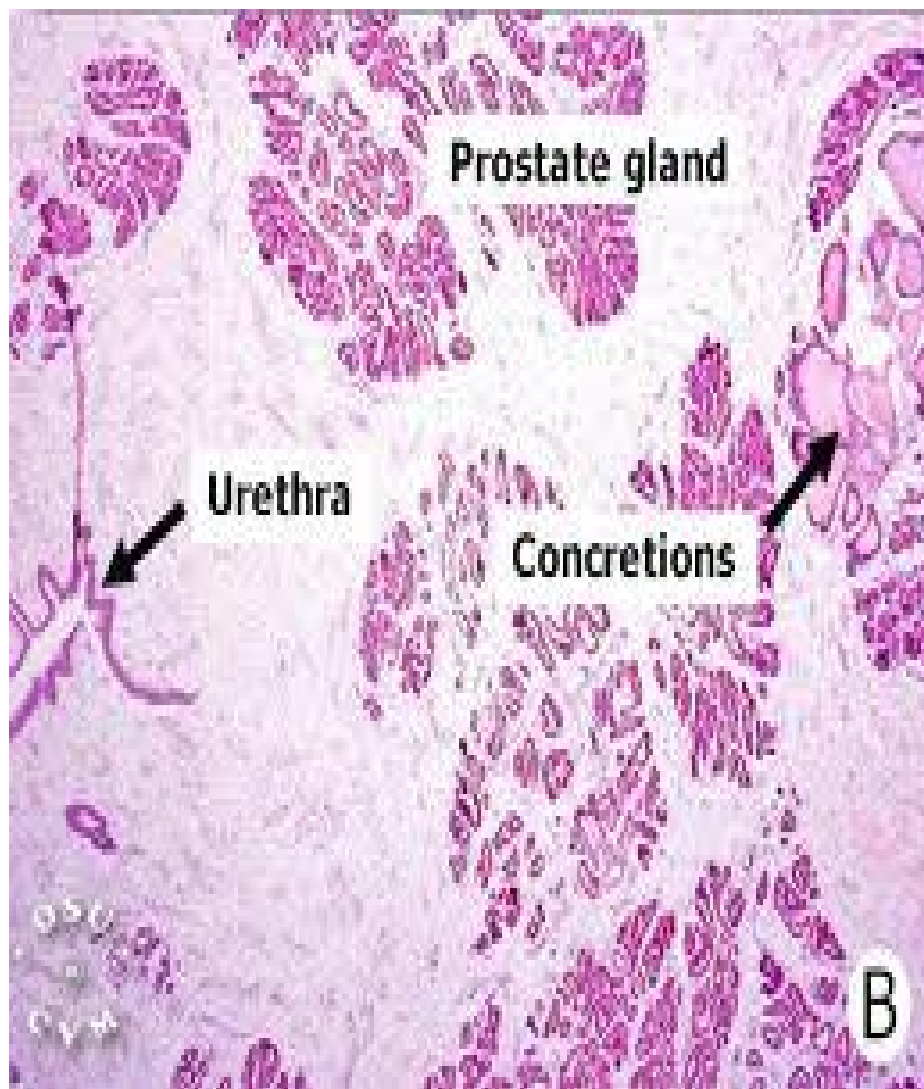


Fig (2-4) Show the histology of prostate

2-3 Physiology:

The scientists do not all the prostates functions. The prostate gland secretes a thin, milky fluid that contains calcium, citrate ions, phosphate ion, a clotting enzyme, and aprofibrinolysin. During emission, the capsule of the prostate gland contracts simultaneously with the contractions of the vas deferens so that the thin, milky fluid of the prostate gland adds to the bulk of the semen. A slightly alkaline characteristic of the prostatic fluid may be quite important for successful fertilization of the ovum, because the fluid of the vas deferens is relatively acidic owing to the presence of the citric acid and metabolic end products of the sperm and, consequently, helps to inhibit sperm fertility. Also, the vaginal secretions of the female are acidic (ph of 3.5 to 4.0). Sperm does not become optimally motile until the ph of surrounding fluids arises to about 6.0 to 6.5. Consequently it probable that the slightly alkaline prostatic fluid helps to neutralize the acidity of the other seminal fluids during ejaculation, and thus enhances the motility and fertility of the sperm. The prostate secretion is a thin opalescent liquid; it is rich in amylase and proteases, in particular in fibrinolysin. It is from the prostate that the semen receives its high concentration of citric acid and of acid phosphatase. Recently the prostate and seminal vesicles have been shown to be a rich source of substance known as prostaglandins: these are unsaturated hydroxy acid which, amongst other functions, stimulate the smooth muscle of the female genital tract to contract. (3). Just now generally believed that the normal glandular activity of the prostate is controlled by the androgens and estrogens circulating in the blood stream. The secretions of the prostate are poured into the urethra during ejaculation, and are added to the seminal fluid. Acid phosphatase is an important enzyme present in the secretion in large amounts. When the

glandular cells producing this enzyme cannot discharge their secretions into the ducts, as in the carcinoma of the prostate, the serum acid phosphatase level of the blood rises.

It has been shown the trace amounts of proteins produced specifically by prostatic epithelial cells are found in peripheral blood. In certain prostatic disease, notably cancer of the prostate, this protein appears in the blood in increased amounts. The specific protein level can be measured by a simple laboratory test called the PSA (prostatic specific antigen) test. The differences between the urinary tracts of men and women result in different incidence of pathologies. Women have much shorter urethras than men and are therefore much more susceptible to bacterial invasion of the bladder. In men, the urethra penetrates the prostate gland, which is about half of men over 60 undergoes benign hyperplasia. This enlargement only presents a problem when the prostate compresses the urethra to such a degree that the bladder cannot empty properly. In the early stages, the detrusor muscle hypertrophies, so helping to force urine out against the increased resistance. As the condition progresses, the discomfort of a constantly over bladder and damage to bladder and kidneys the retention can cause require treatment of the condition. This can be by drugs that shrink the prostate by interrupting the action of hormones that stimulate it or by surgical removal of the gland.(14).

2-4 Pathology:

Only three pathologic processes affect the prostate gland with sufficient frequency to merit discussion: Inflammation, benign nodular enlargement, and tumors of these three, the benign nodular enlargement is far the most common and occurs so often in advance age that can almost be construed as a (normal) aging process. Prostatic carcinoma is also an extremely common lesion in men and therefore merits careful consideration. The inflammatory processes are, for the most part, of less clinical significance and can be treated briefly.(15).

Prostatitis or clinically apparent inflammation of the prostate may be acute or chronic. The classification of prostatitis is based on a combination of clinical features, microscopic examination, and culture of fractionated urine specimen before and after prostatic massage. Acute bacterial prostatitis is caused by the same organism associated with acute urinary tract infection, particularly *Escherichia coli* and other gram-negative rods. In these cases, organisms may reach the prostate by direct extension from urethra or urinary bladder or by vascular channels from more distant sites. Chronic prostatitis may follow obvious episodes of acute prostatitis, or may it develop insidiously, without previous episodes of acute infection. In some cases of chronic prostatitis, bacteria similar to those responsible for acute bacterial prostatitis can be isolated. Such cases are designated as chronic bacterial prostatitis. In other instances, the presence of an increased number of leukocytes in prostatic secretion attest to prostatic inflammation, but bacteriologic findings are negative. Such cases, termed chronic bacterial prostatitis, or prostatodynia, account for most cases of chronic prostatitis. A number of nonbacterial agents implicated in pathogenesis of nongonococcal urethritis, including *Chlamydia trachomatis*, and *Ureaplasma urealyticum*, have also been

suggested as possible cases of chronic bacterial prostatitis. In acute form the patient present with sudden fever, chill, discomfort with voiding, lower back pain, and pain in perineum and rectum. It is commonly accompanied by acute cystitis and is caused by bacteria that cause urinary tract infection. (9).

Prostate sonography is normal in the most patients with prostatitis. Hypoechoic or anechoic mass within the prostate that may look similar to cyst, with thick wall and septations. Color Doppler indicates areas of hypervascularity.(17).

In chronic form; the patient may present with some symptoms as acute prostatitis, pain in lower back, perineal, and scrotal areas. In addition, the patient usually complains of frequency of urination, dysuria, urgency, and hematospermia.(9).

Heterogeneous pattern within the prostate with increased areas of echogenicity and acoustic shadowing from calculi. Peri-prostatic venous plexus and seminal vesicles are enlarged; thickening of the bladder neck may also be seen. (17).

Carcinoma of prostate is the second most common form of the cancer in males, followed in frequency by lung cancer. It is a disease of men above the age of 50 years and its prevalence increase with increasing age so that more than 50% of men 80 year old have asymptomatic (latent) carcinoma of prostate. Many times, carcinoma of prostate is small and detected as microscopic foci in prostate removed for BEP or found incidentally at autopsy. Although the causes of carcinoma of prostate remain unknown, clinical and experimental observation suggest that hormonal, genetic, and environmental factors may all play roles in its pathogenesis.(9). A hormonal influence is further suggested by the fact that the growth of many carcinomas of the prostate can be inhibited by

orchiectomy or by the administration of estrogens such as diethylstilbestrol. As in case of nodular hyperplasia of prostate, however, the role played hormones in the pathogenesis of carcinoma of the prostate is not fully understood. Genetic factors have been implicated, base on increased of disease among first degree relatives of the patients with prostate cancer. Symptomatic carcinoma of the prostate is more common and occurs at an earlier age in American blacks than in white, or Hispanics. A possible role for environmental factors is suggested by the increased frequency of prostatic carcinoma in certain industrial settings and by significant geographic differences in the incidence of the disease. In ultrasound the prostate may appear asymmetrically enlarged. Tumor shape variable, variable echo pattern: may be hyperechoic, or isoechoic to normal prostate parenchyma. It may calcification with irregular distribution in the prostate, often accompanied by diffuse, increased echoes around them due to inflammation. Color Doppler imaging may identify area of hypervascularity. (17).

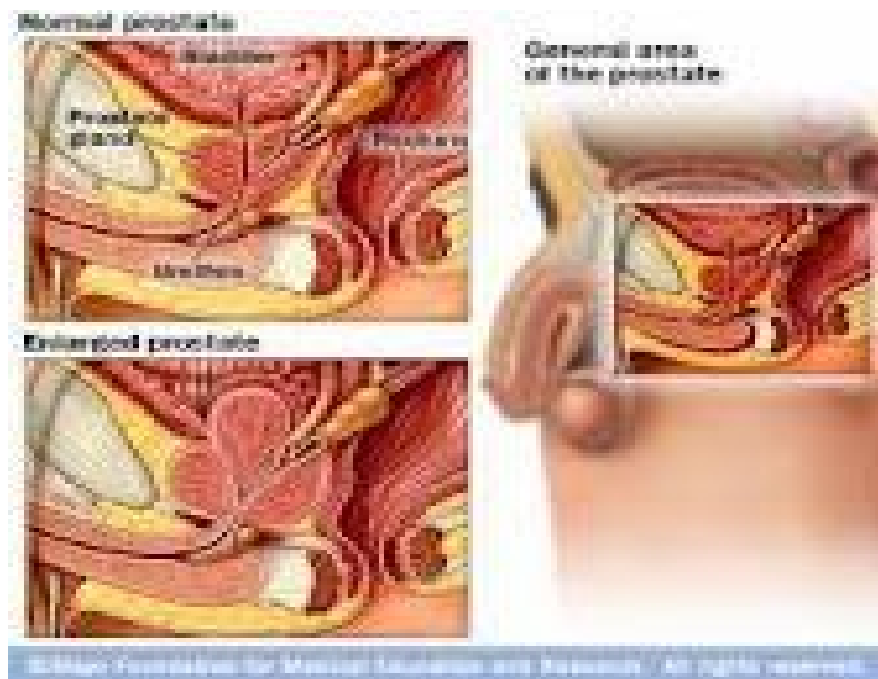
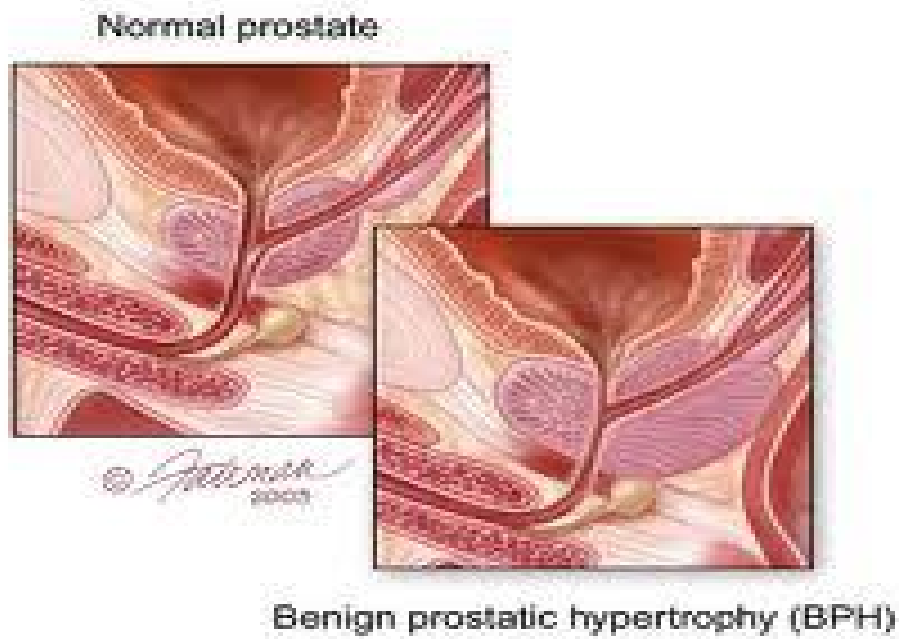
The cause of benign prostatic hyperplasia (BPH) has not been fully established.(Fig .2-5) However, a few etiologic factors, such as endocrinologic, racial, inflammation and arteriosclerosis have been implicated but endocrine basis for hyperplasia has been more fully investigated and considered a strong possibility in it genesis. It has been found that both sexes elaborate androgen and oestrogen, through the level of androgen is high in males and that of oestrogen is high in females, with advancing age, there is decline in the level of androgen and a corresponding rise of oestrogen in males. The periurethral inner prostate which is primarily involved in BPH is responsive to the rising level of oestrogen, whereas the outer prostate which is mainly involved in carcinoma is responsive to androgen. A plausible hypothesis suggested

that there is synergistic stimulation of the prostate by both hormones, the oestrogen acting to sensitize the prostatic tissue to the growth promoting effect of Dihydroxytestosterone (DHT) derived from plasma testosterone.(9.13) Grossly , the enlarged prostate is nodular , smooth and firm. Weights 2-4 times its normal weight i.e. may weight up to 40-80 gm. The appearance on cut section varies depending upon whether the hyperplasia is predominantly of the glandular or fibromuscular tissue. In primarily glandular BPH the tissue is yellow-pink, soft, honey combed, and milky fluid exudes, whereas in mainly fibromuscular BPH the cut surface is firm, homogeneous and does not exude milky fluid, the hyperplastic nodule forms a mass mainly in the inner periurethral prostatic gland so that the surrounding prostatic tissue forms a false capsule which enable the surgeon to enucleate the nodular masses.(15).

The common symptoms of BPH are: urinary frequency, urinary urgency, hesitancy, incomplete bladder emptying, straining, decreased force of stream, and dribbling. Symptoms often attributed to BPH can be caused by neurogenic bladder, carcinoma in situ of the bladder, urethral stricture from trauma or sexual transmitted disease (STD), Cystitis and prostatitis, excluding these entities based on finding from thorough history and appropriately direct diagnostic studies is essential. The complication of BPH may be classified to three groups, prostatic complications which include acute retention, chronic retention, and hemorrhage. The bladder complications contain urinary infection and stone formation. The renal complication consist of hydronephrosis (HN) and uremia. There are many lab studies essential for assessment of BPH, exclude attributed cases, and clarify associated pathologies and complication. These investigations include urinalysis, prostate specific antigen (PSA), urine culture, electrolytes, blood urea /nitrogen (BUN), and creatinine. The

treatment depends on whether the patient is an elective case, with troublesome prostatic symptoms, especially marked nocturnal frequency, or whether he present urgently with retention. BPH is treated by one of these routes: medical therapy, Endoscopic prostatectomy by transurethral resection (TUR) or open prostatectomy. (12).

(A)



(B)

Fig (2-5) a, b Diagram showing BPH architecture

The ultrasound finding of BPH include: asymmetric, enlarged homogenous gland with continuous borders, as hypertrophy develops the central zone occupies more of the prostate capsule, echo pattern may appear heterogeneous due to: formation of nodules (well circumscribed, round, hyper or hypoechoic), stone; which may or may not cast shadow, areas of infarction, ductal dilatation, and degenerative or retention cysts in transition zone. (Fig .6). (4).



Fig (2-6) Shows sonographic appearance of prostate enlargement

2-5 Ultrasonographic scanning of the prostate:

An investigation of the patient with symptoms of prostatism is best done transabdominally. Transabdominal ultrasound can adequately assess prostate size and presence of median lobe enlargement. It also can aid in evaluating bladder volume and post void residual urine volume, bladder wall character, trabeculation, diverticula, tumors and calculi, transabdominal ultrasound is useful in detecting hydronephrosis and masses in kidneys and ureters. (17).

Correlative studies have shown that volumetric evaluation of the prostate with supra pubic ultrasound is accurate and that a gram of prostate tissue is equivalent to 1ml of volume, hence the volume could be converted to the weight. (5).

Ultrasound imaging of prostate is now well-established and widely used technique to assess the prostate as well as the bladder, seminal vesicles and urethra. Recent advances in probe technology allow examination of these areas to be carried out using different approaches; transabdominal (suprapubic). Transrectal (TRUS) and transperineal. During conventional transabdominal scanning of the full bladder, the bladder neck, prostate and seminal vesicles can be visualized and a large prostate indenting the bladder base can evaluate and its volume measured. Large abscess or cystic lesions deep to bladder base can also be visualized to some extent; however, the detailed zonal anatomy of the prostate and surrounding structures and any smaller focal lesions will not be easily seen. The patient must come with full urinary bladder; 500-800ml of clear fluid should be ingested one hour before the exam and finished with in a 15-20 minutes time period. If for any reason the patient cannot have fluids, sterile water can be used to fill the bladder through a foley's catheter; the fully urinary bladder displaces the bowel and brings

the pelvic organs into view. And an over filled bladder can actually push the pelvic contents out view if so, have the patient partially void. Patient lies on supine position, with a normal respiration. When the bladder distended, its walls will be smooth and evenly stretched with or without diverticula, measurements confirm over distention, look for ureters, kidneys and rescanning after completely emptying the bladder.

The transducer used is convex type of 3-5 MHz frequency. Benign prostate scanning with transducer perpendicular at the body. Just superior to the symphysis pubis and angle inferiorly. The prostate will visualize here. Once the long axis of the prostate is located, angle the transducer inferiorly to scan the apex of the prostate until you are beyond it. Return to midline just superior to the symphysis pubis, with the transducer angle inferiorly "less than the former", locate the long axis of the prostate. It may be necessary to rotate the transducer varying degrees to visualize the long axis of the prostate, once the long axis of prostate is located, slowly move the transducer toward the patients right, scanning laterally through the prostate until you are just beyond it. Return to the midline just superior to the symphysis pubis "transducer angle inferiorly" and locate the long axis of the prostate. Once the long axis located, slowly move the transducer toward the patients left, scanning laterally through the prostate until you are just beyond it. Continue to scan left lateral through the pelvic side wall until you are beyond it, still in the sagittal plane, locate the long axis of the prostate. Rotate the transducer 90 degrees into the transverse scanning plane to transverse the prostate. Begin with the transducer angle inferiorly, at the midline of the body, just superior to the symphysis pubis. Angle the transducer inferiorly enough that you are out of the pelvic. Scanning superiorly through the prostate until you are beyond the base of the prostate. Slowly angle the transducer back into the

pelvis, looking first for the apex of the prostate.(4). Prostate volume measurement is based on mathematical formula known as Ellipsoid method, where the prostate is imaged in both transverse and sagittal midline plane; the images are stored or viewed simultaneously on split screen. The volume is calculated on using the prostate ellipsoid formula, known as Ellipsoid method

$$V = L \times H \times W \times c$$

Where L represents the length of the prostate and H the height (both of these measurements are best taken on sagittal image) W represents the width or traverse diameter, and c represents a constant approximately 0.532. The same formula is used to measure the bladder volume and bladder post void residual volume. There are many differential diagnosis pathologies of significant post micturation urine volume: urethral stricture or calculus in, a neurogenic bladder from damage to the spinal cord, and cytocele in same patients. (17).

The overall sonographic appearance of the normal prostate is symmetric as the probe is swept side to side. The majority of the parenchyma of the prostate gland appears as homogenous, mid gray, medium level echoes (Fig.2-7) the periurethral glandular stroma that surrounds the urethra is slightly hypo echoic in compare to the surrounding tissue. The contour of the gland should appear smooth and the margins well denned. Calcification may be seen throughout the gland in older patients. The normal prostate should appear symmetrical. The seminal vesicles appears asymmetrical mid gray or medium to low –level echo textures, superior to the prostate .They are easier to visualize when the urinary bladder is partially filled. They are seen in long axis on transverse scans. The prostatic urethra walls appear echogenic at the mid line of the gland. The vas deferens and ejaculatory ducts may be difficult

to distinguish from surrounding structures. However, when seen, the vas deferens are medial to, and have anechoic texture similar to the seminal vesicles. The ejaculatory ducts will appear as echogenic double lines. Normally, the central and transition zones are not sonographically distinctive. The peripheral zone appears homogenous and slightly hyperechoic to adjacent parenchyma (Fig.2-8). The catheter walls are seen as two highly echogenic lines and the balloon as highly echogenic wall with an anechoic interior. The patient may have an incompletely filled bladder resulting in bladder walls that are thick and irregular which is normal for a partially filled bladder. (15).

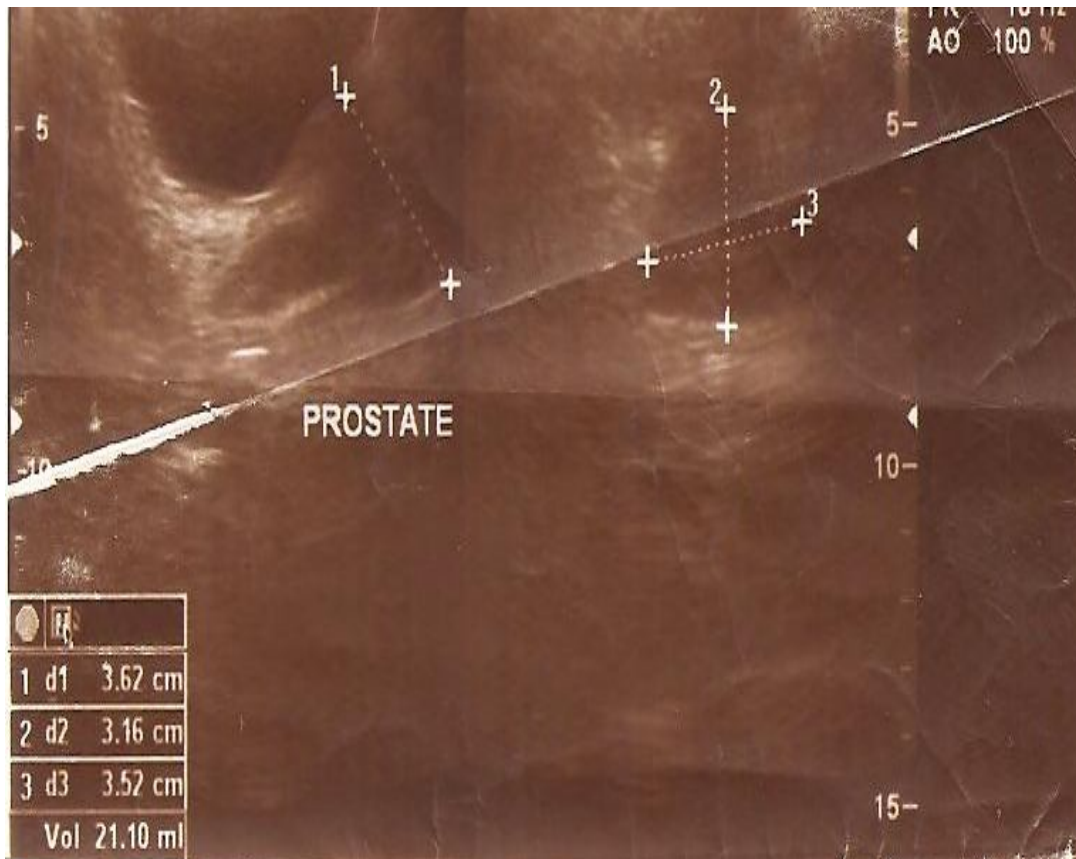


FIG (2-7) shows normal sonographic appearance of prostate



Fig (2 – 8) Transverse and sagittal u/s images showing BPH