

A Dissertation on

**“A STUDY ON ANALYSIS OF UROLOGICAL INJURIES IN BLUNT
INJURY ABDOMEN”**

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THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

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Reg. No: 221711213



THANJAVUR MEDICAL COLLEGE, THANJAVUR.

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

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This is to certify that this dissertation titled “A STUDY ON ANALYSIS OF UROLOGICAL INJURIES IN BLUNT INJURY ABDOMEN” has been prepared by DR.M.SRINIVASAN under my supervision in the Department of General Surgery, Thanjavur Medical College, Thanjavur, during the academic period 2017 - 2020, and is being submitted to The Tamilnadu Dr. M.G.R. Medical University, Chennai, in partial fulfillment of the University regulation for the award of the Degree “Master of Surgery” (M.S., General Surgery) and his dissertation is a bonafide work.

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ABBREVIATIONS

RTA	-	ROAD TRAFFIC ACCIDENT
AI	-	ACCIDENTAL INJURY
ASLT	-	ASSAULT
IAT	-	IATROGENIC INJURY
PI	-	PENETRATING INJURY
BG	-	BULL GORE INJURY
SII	-	SELF INFLICTED INJURY
US	-	UNSTABLE INJURY
S	-	STABLE
LL	-	LIVER LACERATION
RPH	-	RETROPERITONEAL HEMATOMA
SI	-	SPLENIC INJURY
SBI	-	SMALL BOWEL INJURY
SPC	-	SUPRA PUBIC CYSTOSTOMY
OIU	-	OPTICAL INTERNAL URETHROTOMY

INTRODUCTION

Trauma is evolving as the leading cause of death in the world . It is also a major mortality next to coronary artery disease in India. Urological trauma victims due to various modes of injury like RTA, penetrating injury, blunt injury, accidental fall and others.

The initial evaluation of the patient to know about the mechanism of injury and its extent. Early resuscitation is needed to improve the outcome.

The signs and symptoms of urological trauma is often masked by associated injuries and hence requires, careful and repeated evaluation.

Urological trauma accounts for 10% of total trauma and trauma is currently the sixth leading cause of death in the world.

Advancement of Radiological imaging helps to evaluate the patient needed for intervention.

AIM OF THE STUDY

1. To study the various modes of injury and their presentation.
2. To arrive the age, sex, etiology and other distributions of urological trauma patients.
3. To evaluate the urological trauma patients attending our casualty.
4. To evaluate the various associated injuries and their influence on the outcome.
5. To evaluate the value of available investigation tools for diagnosis of urological trauma.
6. To discuss about the various treatment patterns.
7. To study about the prognosis of the patients who underwent various treatment modalities
8. Conclusions drawn as a result of this study.

MATERIALS AND METHODS OF STUDY

This is a prospective study of various aspects of Urological Trauma encountered in Thanjavur medical college during the period of December 2017 - October 2019. 27 numbers of cases have been recorded in the study.

The age varied from 12 to 70 years.

INCLUSION CRITERIA:

- i) All the patients admitted with blunt injury abdomen above 12 yrs
- ii) patients having clinical, radiological evidence of urological injuries in blunt injury abdomen
- iii) intraoperative evidence of urological injuries in blunt injury abdomen.

EXCLUSION CRITERIA:

- i) Age group below 12 yrs

All the data's from the time of presentation of urinary tract injuries, to the definitive surgical treatment have been collected and processed in the form of tabular columns. Various aspects of Urological Trauma are

discussed in the study including their presentation ,evaluation and management. The time intervals between sustaining of injury and that of admission have been noted and their significance also studied. The various modes of injury causing Urological Trauma and their surgical treatment were studied. The hemodynamic status and associated injuries were assessed and noted and they are managed accordingly. Routine biochemical testing for sugar, urea, creatinine and hemoglobin estimation was done for all patients prior to surgery. Radiological evaluation of the patient to rule out the associated injuries has been done.

REVIEW OF LITERATURE

EMBRYOLOGY

KIDNEY

The urinary tract is formed from the cloaca and intermediate mesoderm in parallel with the early differentiation of the metanephric blastema which will ultimately form the kidney. In the 6 week old embryo, the mesonephric (wolffian) duct and the paramesonephric (mullerian) ducts run in parallel. By week 7 in the male the mullerian duct starts to regress and the wolffian duct will eventually develop into the epididymis and the caudal part of vas deferens. In the female the mullerian ducts fuse to form the uterovaginal cord which will develop into the vagina. As the urogenital tract develops, there is simultaneous development of the fetal kidney. The ureteric bud arises from the distal end of the wolffian duct as an unbranched diverticulum and invades the adjacent metanephric mesenchyme, initiating the branching collecting system within the primitive kidney. If the ureteric bud fails to develop the kidney will not form renal development is controlled by the function of a number of transcription factors including PAX-2 and WT1.

URINARY BLADDER AND URETHRA

The cloaca, a cavity lined with endoderm develops around the 4th or 5th week and receives the Allantois and the Mesonephric ducts. The urorectal septum, a transverse ridge divides the cloaca into an anterior urogenital sinus and posterior Rectum. Vesical portion forms the urinary bladder and Continues with the Allantois. Pelvic portion forms the Prostatic and Membranous portions of the urethra in the male and the Membranous

Urethra in the female. Phallic portion forms the penile urethra in the male and vestibule of the vagina in the female. The caudal ends of the Mesonephric ducts forms the Trigone of the bladder.

PENIS Under the influence of the testosterone, the genital tubercle is responsible for the genesis of penis.

TESTIS

Medulla of Genital ridge forms the seminiferous tubules, rete testis, interstitial cells, fibrous septa and intrinsic coverings of the testis. Efferent ductules are derived from the proximal 12 to 15 Mesonephric tubules. Canal of the Epididymis and Vas deferens are developed from the Mesonephric duct.

SCROTUM

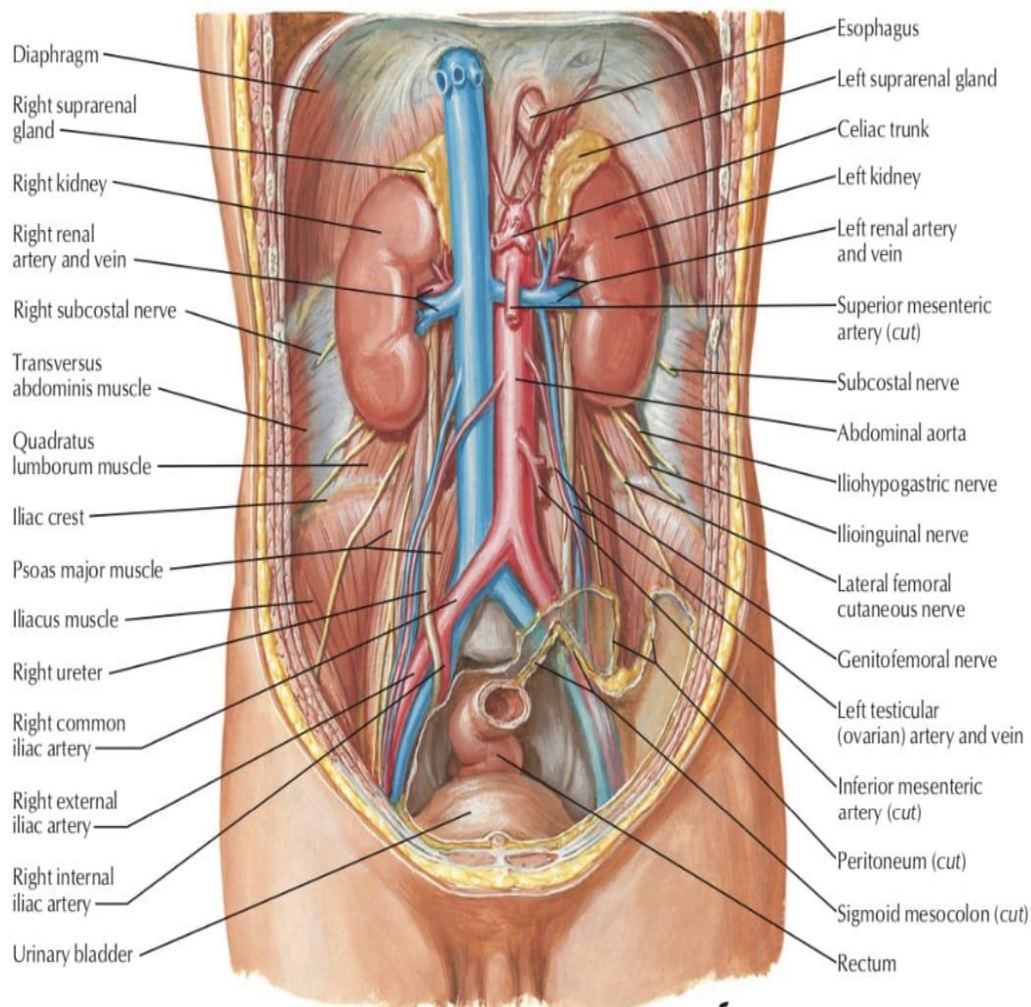
The formation of the scrotum as a result of the fusion of right and left labioscrotal folds. A scrotal septum separates into two halves.

SURGICAL ANATOMY

KIDNEY

It is a reddish brown organ. Right kidney is 2cm lower compared to the left. Right kidney resides at the level of upper border of L1 to lower border of L3(fig.1). Left kidney resides at the level of body of T12 to body of L3. It is divided into outer cortex and inner medulla.(Fig.2). Both the kidneys surrounded posteriorly by diaphragm, psoas muscle, quadratus lumborum and transversus abdominis aponeurosis. Anteriorly, the right

kidney is bounded by liver, adrenal gland, descending part of duodenum and hepatic flexure and the left kidney is bounded by adrenal gland, tail of pancreas, spleen, stomach and splenic flexure (Fig.3). Gerota's fascia encompasses the perirenal fat and kidney on three sides except inferiorly.



ANATOMY OF KIDNEY

Both the Renal arteries arise from the Aorta and enter the kidney via the renal hilum which splits into 5 segmental arteries without any collaterals which further split to form Lobar, interlobar, arcuate and afferent arteries to the glomeruli. The veins drain into the inferior vena cava (Fig4). At the hilum the renal vein, renal artery, and renal pelvis are arranged anterior to posterior. Renal lymphatics follow blood vessels and drain into hilar and paraaortic lymph nodes. Sympathetic preganglionic nerve fibers originate from T8 to L1 and plexus. Parasympathetic fibers arise from the vagus and travel along the sympathetic fibers.

URETER

It is a bilateral tubular structure, 22 -30 cm of length. Its wall is composed of transitional epithelium, lamina propria, inner longitudinal and outer circular muscle fibers and adventitia, which surrounds the blood vessels and lymphatics.

It begins at the ureteropelvic junction and progresses inferiorly along the anterior edge of the psoas muscle and it is crossed anteriorly by gonadal vessels. As it enters the pelvis the ureter crosses anterior to the iliac vessels. Anteriorly, right ureter is related to ascending colon, Caecum,

colonic mesentery and appendix, left ureter is related to descending colon, and sigmoid colon along with its mesentery.

On entering the pelvis, they diverge widely towards the ischial spine and runs anteriorly and medially to reach the bladder. In males it is crossed anteriorly by the vas deferens. In females it is crossed anteriorly by the uterine artery and closely related to the cervix.

Ureter is divided into upper, middle and lower segments. Upper ureter extends from the pelvis to the upper border of sacrum. Middle ureter extends from the upper to lower border of sacrum. Lower ureter extends from the lower border of the sacrum to the bladder.

Proximal ureter receives blood supply from renal artery, gonadal artery, abdominal aorta and common iliac artery branches. Distal ureter receives blood supply from internal iliac artery, middle rectal artery and vaginal artery branches. These branches approaches from medial aspect for abdominal ureter and from lateral aspect for pelvic ureter. Venous and lymphatic drainage parallels the arterial supply. Sympathetic nerve supply from T10 - L2 and parasympathetic nerve supply from S2 - S4 , through renal, aortic, and hypo gastric plexus.

BLADDER

It has superior, two infero lateral, base or posterior surfaces. Superior surface is covered by peritoneum and infero laterally bladder is cushioned by retro pubic and perivesical fat and loose connective tissue. Base of the bladder is related to seminal vesicle, ampullae of vas deferens and terminal ureter. Bladder neck is located at the internal urethral meatus. In female the peritoneum over the dome of the bladder is reflected over the uterus to form the vesicouterine pouch and then continues posteriorly over the uterus as recto uterine pouch. Hence base of the bladder and urethra rests on the anterior vaginal wall.

Mucosa is lined by transitional epithelium, deep to this is lamina propria which is traversed by numerous blood vessels. Beneath this muscle fibers arranged in inner and outer longitudinal fibers, middle circular fibers. The ureter pierces the bladder wall obliquely and travels 1.5 - 2 cm and terminates at the ureteral orifice. The triangular area between the two ureteral orifice and internal urethral meatus is called the trigone of the bladder.

Superior and inferior vesical branches from the internal iliac artery supplies the bladder. Veins of the bladder coalesce to form the vesical plexus and drains into the internal iliac vein. Lymphatics drains along the blood vessels and then into the external and internal iliac nodes. Inferior hypo gastric plexus contains both sympathetic and parasympathetic nerve supply of bladder. Parasympathetic fibers from S2-4 and sympathetic fibers from T11-L2.

URETHRA

Male urethra is 18-20 cm long. It is divided into anterior and posterior compartments. Anterior urethra includes glandular, penis and bulbar segments. Posterior urethra includes membranous and prostatic segments. Prostatic urethra is the widest and most dilatable part of urethra. Membranous urethra is the narrowest and least dilatable part of urethra except urethral meatus. Internal urethral sphincter is involuntary and external urethral sphincter is voluntary in nature. The urethra is supplied by vessels of prostate and penis. Lymphatics from the anterior urethra drains into deep and superficial inguinal nodes, posterior urethra drains

into the external and internal iliac nodes. Female urethra is 4 cm long . It begins at the internal urethral orifice, runs downwards and forwards and embedded in the anterior wall of the vagina. It ends at the external urethral orifice.

PENIS

The root of the penis is made of three erectile masses. Two crura attached to the margin of pubic arch and covered by ischiocavernosus. One bulb is attached to the perineal membrane in between the two crura which is covered by bulbospongiosus. The deep surface is pierced by urethra.

The body of the penis is made of three elongated masses of erectile tissue. Two corpora cavernosa is surrounded by tunica albuginea and terminates under the cover of glans penis. The corpora spongiosa is surrounded by a fibrous sheath and expanded at its tip called glans penis. It is traversed by the urethra. Superficial fascia of the penis contains loose areolar tissue and superficial dorsal vein of the penis. The deep fascia of the penis is called Buck's fascia, surrounds all the three erectile masses but does not extends into the glans penis. The deep dorsal vein, dorsal artery,

dorsal nerve of the penis are deep to deep fascia. The penis is supported by the fundiform ligament and the suspensory ligament. The skin covering the penis is thin and elastic, loosely attached to the fascial sheath. Prepuce of the penis is the folded at the neck.

The internal pudendal artery supplies the penis through the deep artery of the penis which runs in the corpus cavernosa, dorsal artery of the penis and artery of the bulb. The skin supplied by the superficial external pudendal artery. The superficial and the deep dorsal vein drains into the superficial external pudendal vein and prostatic plexus of veins respectively. Sensory nerve supply is derived from the dorsal nerve of the penis and the ilioinguinal nerve. Autonomic nerves derived from the pelvic plexus via prostatic plexus. Lymphatics from the glans drains into the deep inguinal node and rest of the penis drains into the superficial inguinal nodes.

SCROTUM

Scrotal skin is highly folded, devoid of fat and rich in sebaceous and sweat glands. The scrotum is separated into two compartments by a

median raphe. Dartos muscle is derived from the colles', scarpa's and dartos fascia. Below which external spermatic fascia, cremasteric fascia and internal spermatic fascia, derives from external oblique, internal oblique, transversalis fascia respectively. Anterior part of the scrotum is supplied by superficial and deep external pudendal vessels, ilioinguinal and genital branch of genitofemoral nerve.

Posterior part of scrotum is supplied by scrotal branches of internal pudendal artery and cremasteric branches of inferior epigastric artery, Posterior scrotal branches of pudendal nerve and perineal branches of posterior cutaneous nerve of thigh. Lymphatics drain into the superficial and deep inguinal nodes. It does not cross the median raphe.

TESTIS

It is suspended in the scrotum by the spermatic cord. It is enclosed from outside to inside by tunica vaginalis, tunica albuginea and tunica vasculosa. The epididymis attaches to the posterolateral aspect of the testis. Tunica albuginea projects to form the mediastinum testis from which septa radiates to form 200 - 300 lobules. Each lobule contains 2 -3 seminiferous tubules. These tubules join to form a straight tubules which enter the

mediastinum. They anastomose with each other to form a network of tubules called rete testis which in turn gives rise to efferent ductules and emerge near the upper pole of the testis and enter the epididymis and continues with the ductus deferens. The testis is supplied by testicular artery, a branch of abdominal aorta at the level of L2 and descends on the posterior abdominal wall to reach the deep inguinal ring and enters the spermatic cord. The testicular vein starts as the pampiniform plexus around the testicular artery, which forms four veins at the superficial inguinal ring and reunites to form two veins at the deep inguinal ring deep to it forms the single vein. On the right side it drains into the inferior venacava and on the left side it drains into the left renal vein. Lymphatic drainage along the testicular vessels which drains into pre and paraaortic lymph nodes. Sympathetic nerve supply from segment T 10 which passes through renal and aortic plexus.

PRESENTATION, EVALUATION AND MANAGEMENT

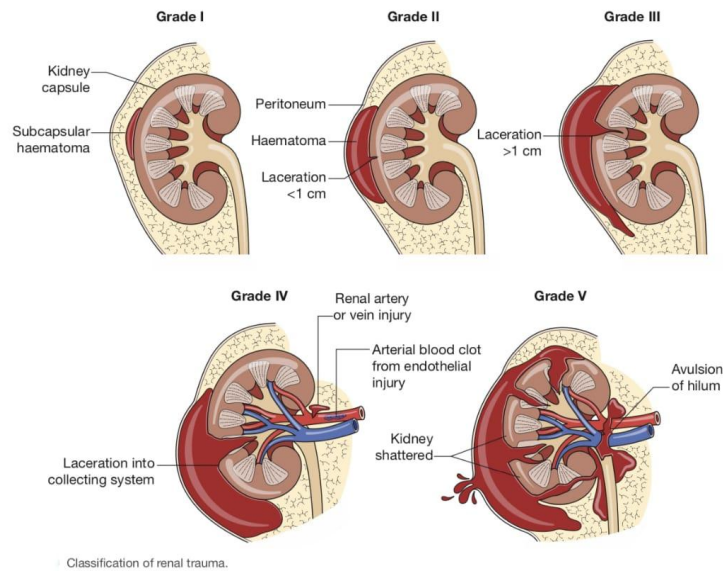
RENAL INJURIES

Renal injuries are mostly due to road traffic accidents, Penetrating injuries and fall from a heights. The rapid deceleration can cause damage to the renal vessels causing renal artery thrombosis, renal pedicle avulsion, renal vein disruption. 10% of all trauma cases involve the genito urinary tract. This is usually as a result of blunt trauma and the injury is usually self-limiting.

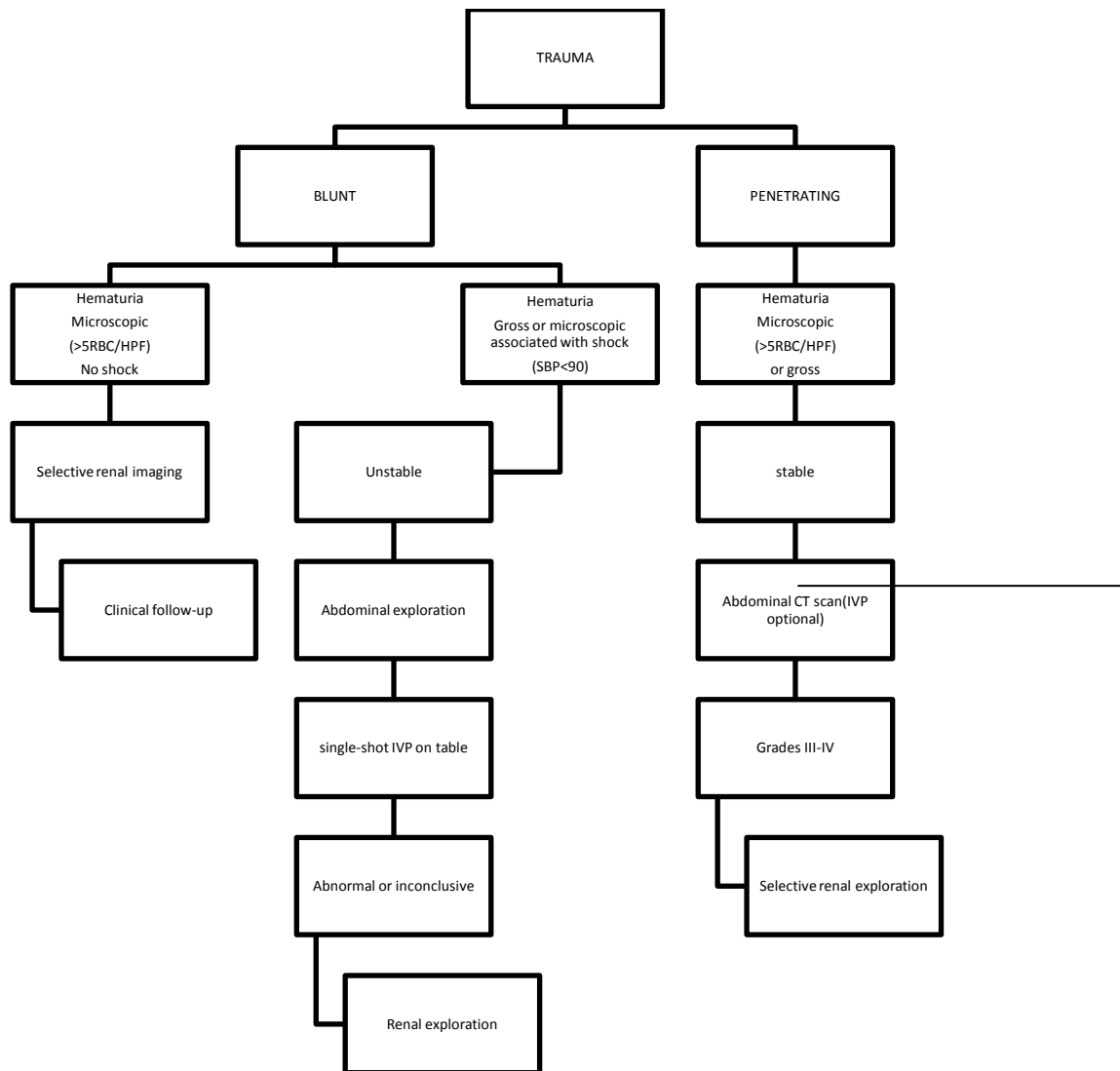
HAEMATURIA

Presence of gross or microscopic hematuria is presence of > 5 RBC's in urine, which is an indicator for urinary tract injury. Major renal injury should be suspected with gross hematuria , shock in combination with microscopic hematuria, pediatric renal trauma and penetrating renal injuries. Hematuria may be absent in up to 40% of renal injuries and 24% of pedicle injuries

GRADE	DESCRIPTION
I	Contusion or non enlarging subcapsular perirenal hematoma, and no laceration.
II	Superficial laceration <1cm depth and does not involve the collecting system(no evidence of urine extra vasation), non expanding perirenal hematoma confined to retroperitoneum
III	Laceration > 1cm without extension into the renal pelvis or collecting system (no evidence of urinary extravasation)
IV	Laceration extends to renal pelvis or urinary extra vasation.Vascular Main renal artery or vein injury with contained hemorrhage Segmental infarctions without associated lacerations. Expanding subcapsular hematomas compressing the kidney
V	shattered kidney Vascular Avulsion of renal hilum, devascularizing the kidney. Ureteropelvic avulsions. Complete laceration or thrombus of the main renal artery or vein



Grade I to III clearly established with appropriate studies but grade IV and V have areas of overlap in vascular and parenchymal injuries. Appropriate imaging studies combined with history and physical examination provides the staging information which guides the management.



INDICATIONS FOR RADIOLOGICAL ASSESSMENT

1. Hematuria is used as a indicator of renal injury.
2. Blunt injury patients has gross hematuria and microscopic hematuria with shock.

3. Penetrating injury with hematuria .

4. Children in whom the kidneys are much lower and less protected.

IMAGING STUDIES

COMPUTED TOMOGRAPHY

CT scan with contrast is the best imaging study, which assess the extent of the injury, laceration, extravasation, surrounding hemorrhage and vessel injury. It also shows non renal injuries and effectively stages renal pedicle injuries.

CT FINDINGS

I	Medial hematoma	Renal pedicle injury
II	Medial extravasation	Renal pelvic injury or ureteropelvic junction disruption
III	Lack of parenchymal contrast	Renal artery injury

Spiral CT has the advantage of rapidity and the disadvantage of requiring delayed films.

INTRAVENOUS PYELOGRAM

IVP is largely replaced by CECT with the exception of single short intraoperative IVP when patient hemodynamically unstable and there may be an unexpected retro peritoneal hematoma surrounding the kidney. Single film taken 10 minutes after the bolus administration of 2cc/kg of IV contrast material shows abnormal findings. Main purpose of single shot IVP is to assess the function of contralateral kidney.

ANGIOGRAPHY

To localize arterial bleeding and therapeutic embolization.

ULTRASOUND

To define retroperitoneal hematoma along with associated intra abdominal injury.

NON OPERATIVE MANAGEMENT

98% of blunt renal injuries can be managed non operatively with the exception of grade V vascular pedicle avulsion injury. Grade IV and V injuries requires surgical exploration even these patients can be managed with close observation and abdominal CT scan. If delayed bleeding occurs, angiography with embolization obviate surgical intervention. If urinary extravasation persists beyond 48 hrs requires internal ureteral stenting. The patient should be imaged, well staged, hospitalized and bed rest until hematuria resolves.

OPERATIVE MANAGEMENT

ABSOLUTE INDICATION

1. Persistent, Life threatening renal bleeding.
2. Renal pedicle avulsion
3. Expanding, perirenal hematoma.
4. Pulsatile or uncontained retro peritoneal hematoma

.In the setting of renal pedicle avulsion or a severely shattered kidney, reconstruction may be impossible and nephrectomy maybe life saving.

RELATIVE INDICATION

1. Urinary extravasation.
2. devitalized tissue.
3. Delayed bleeding of renal artery injury.
4. Segmental renal artery injury.
5. Incomplete staging

RENAL EXPLORATION

Midline Trans abdominal approach allows complete inspection of intra abdominal organs as well as renal exploration. proximal vascular control before exploration improves renal salvage rate. Transverse colon is wrapped in moist sponges and placed on the chest and small bowels are retracted superiorly to expose the root of mesentery, ligament of treitz, great vessels. An incision is made superior to inferior mesenteric

artery over the aorta and extending up to the ligament of Treitz to expose the anterior surface of aorta. Left renal vein which crosses the Aorta anteriorly is dissected and secured. Right renal vein is secured by reflecting the second part of duodenum. In case of hematoma obscuring the aorta then incision made medial to inferior mesenteric vein will expose anterior surface of aorta. Kidney is exposed by mobilizing the ipsilateral colon along the white line of Toldt and reflecting it medially followed by incision over Gerota's fascia which requires release of splenic and hepatic flexure attachments of colon.

PRINCIPLES OF RENAL RECONSTRUCTION

1. Complete exposure of kidney.
2. Debridement of non viable parenchyma.
3. meticulous hemostasis.
4. Water tight collecting system closure.
5. Reapproximation of parenchymal edges

6. Omental interposition flap placement.

7. Retroperitoneal drain placement.

Renorrhaphy denotes repair of parenchymal laceration. polar injuries are treated by partial nephrectomy, laceration to the mid kidney should undergo renorrhaphy. If the capsule destroyed to close primarily with omental flap or perinephric fat or peritoneal free flap. In shattered kidney, it is stabilized by vicryl mesh. Delayed diagnosis of renal vascular injury >8 hours cannot salvage the kidney. Reno vascular injuries repaired with 5-0 nonabsorbable suture along with endovascular stents or replacement graft by using hypo gastric or splenic arteries. In renal pedicle avulsion injury nephrectomy is the procedure of choice. Damage control surgery improves the renal salvage rate.

INDICATIONS FOR NEPHRECTOMY

1. patients with persistent renal bleeding, requiring damage control management, nephrectomy can be done for hemodynamic stability

2. large segment of devitalized renal tissue and urinary extra vasation required partial or total nephrectomy to prevent long term complication

3.continued urinary extravasation despite percutaneous or endoscopic urinary diversion may require nephrectomy

COMPLICATIONS

1.Early complication(within 1 month) Urinary extravasation can result in urinoma,delayed bleeding,urinary fistula,abscesses, hypertension .Late complication include hydronephrosis and renin mediated hypertension .managed by endoscopic stenting and/or percutaneous drainage

2. Delayed renal bleeding usually occurs within 1 to 2 weeks of injury, managed by bed rest, hydration followed by angiography and embolization.

3. Hypertension due to rennin angiotensin axis stimulation by partial renal ischemia caused by stenosis of renal artery, external compression of renal parenchyma and post traumatic atrio venous fistula.

URETERAL INJURIES

Ureteral injuries are rare,accounts of <1% of all urological trauma but more common intraoperatively (80%) than blunt trauma (15%) and penetrating injuries(5%) .

Surgical procedures involving pelvis and retro peritoneum are responsible for ureteral injuries. Most commonly during abdominal Hysterectomy followed by colorectal, pelvic, abdominal vascular surgeries. Large pelvic mass, reoperation, retroperitoneal inflammation and placement of vascular grafts anterior to the ureter are the risk factors.

Fractured lumbar process and thoracolumbar dislocation due to blunt injury had increased the level of ureteral injury. Uretero pelvic disruption due to rapid deceleration can be missed because of absence of hematuria. Laparoscopic injury is rare but most common during electrosurgical or laser assisted lysis of endometriosis due to endometriosis involving the ureter, intra peritoneal adhesions, deviations of ureter away from its normal position. High index of suspicion is necessary for its recognition. In children injury occur during rapid deceleration causing disruption at UPJ. Hydration and diuretic administration can visualize ureteral injury intraoperatively. IVP diagnosing injury accurately. Preoperative intra ureteral stenting does not prevent injuries but may assist in the identification of an injury. Intravenous Injection of 5 - 10 ml Indigo

carmine dye followed by cystoscopy after laparoscopic procedure ensures the patency of ureters.

Flank pain, low grade fever, paralytic ileus, abdominal distention, peritonitis, urinary fistula and leukocytosis which are all due to urinoma may be the possibility of missed ureteral injury. Rigid ureteroscopy, ureteroscopy in irradiated tissues, thermo- ablation of renal tumor occasionally associated with ureteral injuries. Lower pole and medially located tumors, microwave therapy are high risk factors.

DIAGNOSIS

1. Hematuria.
2. Intraoperative identification of urinary leak.
3. Retrograde ureterography.
4. Intraoperative 1- 2 cc of methylene blue dye injected into the renal pelvis can stain and spill the local tissues.

GRADING

American association for the surgery of trauma organ injury severity scale for the ureter.

GRADE	DESCRIPTION
I	Contusion or hematoma without devascularization
II	<50 % transection
III	>50 % transection
IV	Complete transection with < 2 cm devascularization
V	Avulsion with >2 cm devascularization

IMAGING STUDIES

EXCRETORY UROGRAPHY

Intra operative one shot pyelography with intra operative inspection to detect ureteral injuries.

COMPUTED TOMOGRAPHY

1. Medial extravasation of contrast or non opacification of the ipsilateral ureter on contrast CT.
2. Spiral CT with delayed films after contrast injection.

RETROGRADE URETEROGRAPHY

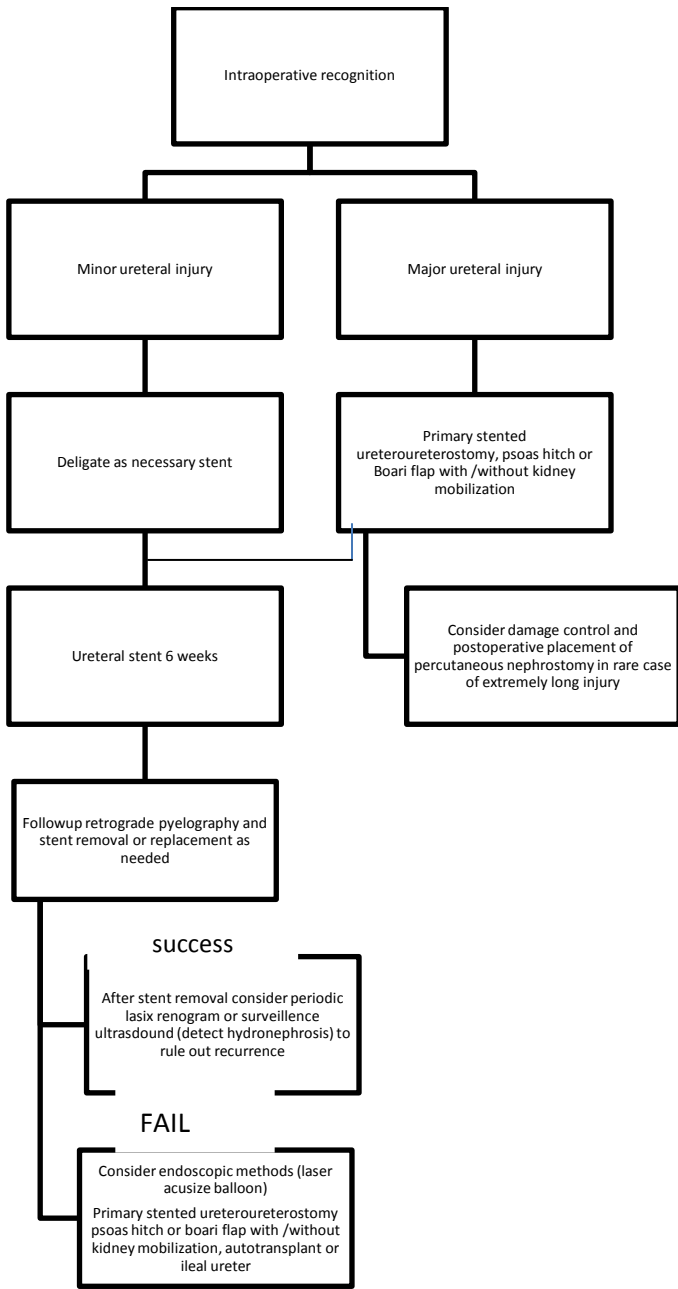
To identify the extension of injury in missed ureteral injuries and simultaneous placement of ureteral stent.

ANTEGRADE URETEROGRAPHY

It is rarely used now except where retrograde stent placement is not possible.

MANAGEMENT

Repair of ureteral injury is based on the length and site of the injury.



PRINCIPLES OF URETERAL REPAIR

1. Mobilization of ureter with care to preserve the adventitia.
2. Tissue Debridement up to the viable tissue
3. Spatulated, tension free, stented, watertight repair.
4. Omental interposition.
5. Placement of retroperitoneal drain.

UPPER AND MID URETERAL INJURIES

URETEROURETEROSTOMY

For upper $\frac{2}{3}$ of ureteral injury and large areas of contusion which leads to micro vascular injury results in ureteral necrosis can be managed by primary ureteroureterostomy or transureteroureterostomy i.e. end to end repair. For stable patients primary repair with stenting for eight weeks. For unstable patients planned staged repair, tie off the damaged ureter using long silk to help in dissection during 2nd stage operation. Otherwise percutaneous placement of nephrostomy tube or placement of 8-f size feeding tube into the ureter exteriorizing it until repair can be completed.

Rarely nephrectomy is required in ipsilateral severe renal injury, severe pan ureteral injury and persistent ureteral fistula. When a large segment is destroyed creation of ureteral conduit harvested from ileum is used in delayed or staged repair called as Monti procedure. Appendix can also be used for interposition.

COMPLICATIONS

1. Urinary leakage.
2. Urinoma, abscess and fistula formation.
3. Peritonitis.
4. Ureteral stenosis.
5. Stone formation.
6. unilateral injury converting into a bilateral injury.

TRANSURETEROURETEROSTOMY

When there is an extensive ureteral loss, it is indicated. It involves bringing the injured ureter across the midline and anastomosing it end to side to the uninjured ureter with double J stent placement. Mostly it is performed in delayed or staged repair.

LOWER URETERAL INJURIES URETERONEOCYSTOSTOMY

The free end of the proximal ureter is debrided, spatulated and tunneled in the sub mucosal plane which is superior and medial to the native ureteral orifice. The length should be three times that of the diameter of the ureter towards the direction of bladder neck and the repair should be stented postoperatively along with Supra Pubic Catheter and Foley's catheter. SPC can be removed in 7 - 10 days, Foley's catheter can be removed when the urine is clear and the stent should remain for 8 weeks.

VESICO PSOAS HITCH

The bladder is mobilized in the space of Retzius and ligating the contralateral superior vesical pedicle aids in mobilization. The bladder is opened vertically and tented up against the ipsilateral psoas muscle, nonabsorbable sutures are placed in the bladder wall outside the epithelium and in the psoas muscle away from genitofemoral nerve and ureter is reimplanted.

BOARI'S FLAP

A flap of bladder wall is fashioned into a tube to replace the lower ureter. the disadvantage of implanting the ureter end to side into

the contralateral ureter is that it risks converting unilateral injury into a bilateral one.

SURGICAL INJURY

Sutural ligation and surgical clips are removed and stented. In complete transection of ureter retrograde stenting and repair should be done. If it fails, ante grade stenting and nephrostomy should be done. In ureteroscopic injuries ureteral stenting should be considered.

BLADDER INJURIES

Bladder injuries after blunt or penetrating trauma are rare. 15% of pelvic fractures are associated with bladder or urethral injury. 90% of bladder injury associated with pelvic fracture. It constitutes < 2% of abdominal injuries requiring surgery. Bladder injuries after blunt trauma are most commonly associated with pelvic fracture. Most of the bladder injuries are the result of road traffic accidents, accidental fall, crush injuries. Iatrogenic injury can occur during gynecological procedures. Two types of bladder injuries. Extra peritoneal rupture (> 90%) is more common than the intra peritoneal rupture (< 10 %).

DIAGNOSIS

HEMATURIA

1. Any degree of hematuria is significant in penetrating injuries.
2. In case of blunt injury lower abdominal pain, tenderness, bruising are present and failure of the urinary catheter to provide adequate drainage in bladder injury. Physical examination is vital especially a vaginal speculum examination in women, as vaginal laceration or traumatic communication between vagina and bladder.

IMAGING STUDIES

RETROGRADE CYSTOGRAPHY

1. Gross hematuria with associated pelvic fracture is an absolute indication for immediate cystography.
2. Gross hematuria without pelvic fracture, microscopic hematuria with pelvic fracture, isolated microscopic hematuria are relative indications for cystogram.

It provides a 95% accurate result. Retrograde filling of bladder with 350 ml of 30% contrast material diluted with normal saline, AP and

oblique view films provides excellent results. Dense flame shaped collection of contrast in the pelvis is characteristics of extra peritoneal rupture. Sunburst appearance from the bladder dome with the collection in the paracolic gutter outlines the loops of bowel is characteristic of intraperitoneal rupture.

CT CYSTOGRAM

It involves retrograde placement of contrast material(350-400ml) through the urethral catheter followed by CT scan of the pelvis

CLASSIFICATION AND MANAGEMENT

I.CONTUSION

Hematuria without extravasation indicates bladder contusion. It is managed by catheterization and observation up to clear urine drain. Follow up cystogram before removal of catheter.

II. EXTRAPERITONEAL RUPTURE

It is most commonly managed by catheter drainage alone. If other surgical services are operating, extraperitoneal rupture repair should be performed.

CONTRAINDICATIONS FOR CONSERVATIVE MANAGEMENT

1. Bone fragment projecting into the bladder.
2. Open pelvic fracture.
3. Rectal
4. Vaginal laceration or traumatic bladder vaginal communication.

RELATIVE INDICATION FOR OPEN REPAIR

1. Other associated abdominal injuries.
2. At open repair the bladder is opened at the dome and by using self-retaining retractor the bladder mucosa is visualised. Extra peritoneal lacerations are closed from intra vesically with absorbable sutures.

COMPLICATIONS

Open repair has fewer complications when compared to non-operative management.

1. Vesico cutaneous fistula.
2. Failure to heal.
3. Sepsis.
4. Incontinence

III INTRAPERITONEAL RUPTURE

Intraperitoneal rupture requires transperitoneal repair with two or three layered closure by using absorbable sutures and placement of perivesical drain. All urinary fluid should be removed from the peritoneum prior to closure.

COMPLICATIONS

1. Persistent urinary leakage.
2. Failure to heal spontaneously.
3. Chemical peritonitis and death.

Injury involving the ureteric orifice should be stented or reimplanted. Supra pubic drainage along with Foley's urethral drainage and omental interposition followed by cystography after 7 - 10 days.

COMPLICATIONS OF UNRECOGNIZED BLADDER AND BLADDER

NECK INJURIES

1. Fever, sepsis, acidosis, azotemia.
2. Peritonitis, ileus, urinary ascities.
3. Low urine output.
4. Incontinence.
5. Fistula and stricture.

URETHRAL INJURIES POSTERIOR URETHRA

Urethral injuries are most commonly due to road traffic accidents, accidental fall and associated pelvic fractures. Straddle injury and pelvic instability are high risk for urethral injury. Posterior urethra is fixed and anterior urethra is freely mobile and hence bulbomembranous junction is more vulnerable to injury.

DIAGNOSIS

Blood at the meatus, retention of the urine and palpable bladders are the triad of findings in urethral injury. In females vulval edema and blood at the vaginal introitus along with pelvic fracture.

CLASSIFICATION

Most common classification is described by Colapinto and McCallum by using radiological findings.

Type1. Rupture of puboprostatic ligaments and surrounding periprostatic hematoma stretch the membranous urethra without rupture.

Type2. Partial or complete rupture of the membranous urethra above the urogenital diaphragm. On urethrography, contrast material is seen extravasating above the urogenital diaphragm into the pelvis.

Type3. Partial or complete rupture of membranous urethra with disruption of the urogenital diaphragm. Contrast extravasation into both the pelvis and perineum.

Type4. Bladder neck injury with extension into the urethra.

Type5. Pure anterior urethral injury.

Type 1 & 2 are uncommon. Type 3 is more common. Type 4 is rare.

URETHROGRAPHY

A small bore urethral catheter is placed in the fossa navicularis and balloon filled with 1 ml of water or rolled gauze bandage can be used to provide penile traction to achieve a snug fit of the catheter. Patient should be placed in an oblique or lateral decubitus position. The thigh closer to the table is 90 degree flexed and 25 ml of contrast is injected and the film is to be taken during contrast injection. Smooth and continuous contour will be seen in normal urethra which is altered in urethral injury.

INITIAL MANAGEMENT

Single gentle attempt to place a Foley's catheter, if not possible Suprapubic cystostomy is the immediate management.

SUPRAPUBIC CYSTOSTOMY

Trocar SPC when there is no other indication for surgery in full bladder or open SPC through an small infra umbilical incision and proper placement of catheter.

PRIMARY REALIGNMENT

It is done in stable patients who had an another indication for surgery. It is associated with impotence and incontinence. It is important to retain supra pubic catheter because most patients will develop stricture following realignment. Urethral catheter can be removed 4 - 6 weeks later . If the patient voids through the urethra satisfactorily SPC can be removed after 7 - 14 days.

In case of females immediate primary repair over a catheter to avoid subsequent urethra vaginal fistula or urethral stricture. Delayed reconstruction is difficult in female urethra which is too short.

DELAYED RECONSTRUCTION

At 3 and 12 months, scar tissue at the urethral disruption site is stable enough to do posterior urethroplasty provided that the associated

injuries are healed and the patient is ambulant. SPC tube is maintained until the associated injuries become stable.

PREOPERATIVE EVALUATION

A cystogram and retrograde urethrogram(RUG) should be obtained simultaneously this enables the extent of urethral injury.

ENDOSCOPIC TREATMENT

For defects less than 1 cm, direct vision internal urethrotomy is the best procedure of choice. In case of defects more than 1 cm, complications such as false passage, long term dilatation and multiple urethrotomies are more common.

SURGICAL RECONSTRUCTION

Open posterior urethroplasty through perineal approach in a single stage is the treatment of choice. In lithotomy position a midline or Lambda shaped incision is made, bulbar urethra and prostatic urethra are mobilized from the injured site, scar tissue is excised until 28-F bougie is passed

without resistance through the proximal urethra. Then end to end ,tension free anastomosis is made over the Foley's catheter. Other maneuvers

1. Corporal separation.
2. Corporal rerouting
3. Inferior pubectomy.
4. Abdomino pelvic approach.

COMPLICATIONS

1. Incontinence
2. Impotence
3. Stricture.

ANTERIOR URETHRA

It is distingly rare encompassing at most 10% of urethral injuries. It is often occurs as isolated injuries after straddle-type injury where bulbar urethra is crushed upward against the pubic rami. It also occurs in penile fracture, foreign body injuries and iatrogenic injuries.

DIAGNOSIS

1. Blood at the meatus.
2. Perineal hematoma.
3. Urinary retention or inability to void
4. Butterfly sign. If Bucks fascia is disturbed.
5. Retrograde urethrogram.

CLASSIFICATION

Most widely used classification is described by McAninch and Armenakas based on the radiological findings.

1. Contusion - retrograde urethrography normal.
2. Incomplete disruption - urethrography demonstrates extravasation but urethral continuity is partially maintained.
3. Complete disruption - urethrography demonstrates extravasation without filling of proximal urethra.

MANAGEMENT

1. Most of the anterior urethra disruption managed by immediate repair consisting of minimal debridement followed by tension free, spatulated anastomotic repair
2. Contusion and incomplete disruption can be treated with catheterization.
3. SPC is the treatment of choice for complete disruption.
4. Primary surgical repair – With limited debridement.
5. Delayed reconstruction – proximal and distal urethra can be mobilized and tension free end to end anastomosis.
6. Partial urethral narrowing can be treated by endoscopic urethrotomy.

INJURIES TO THE EXTERNAL GENITALIA

Traumatic injuries to the external genitalia are uncommon because of the mobility of the penis and scrotum.

PENILE FRACTURE

Penile fracture is the disruption of the tunica albuginea with rupture of corpus cavernosum due to blunt phallic injury to the erect penis, sexual intercourse and masturbation. The tensile strength of the tunica albuginea is existing rupture until intercavernous pressure rises > 1500 mmHg. Usually the site of rupture is distal to the suspensory ligament and the tunical tear is transverse. Associated urethral injury is rare.

GRADING

American association for the surgery of trauma described a grade for Penile injury.

GRADE	PENILE INJURY
I	Cutaneous Laceration or contusion
II	Laceration of buck's fascia without tissue loss
III	Cutaneous avulsion, laceration through glans or meatus, or cavernosal or urethral defect less than 2 cm
IV	Partial penectomy or cavernosal or urethral defect 2cm or more
V	Total penectomy

DIAGNOSIS AND IMAGING

1. Cracking or popping sound during sexual intercourse followed by pain, rapid detumescence, discoloration and swelling of the penile shaft.
2. If the Buck's fascia is intact, hematoma is contained and resulting in eggplant deformity.
3. If the Buck's fascia is disturbed, hematoma can extend up to the scrotum, perineum and supra pubic regions.
4. Rolling sign - firm, mobile, discrete tender swelling over which the penile skin can be rolled.
5. Cavernosography assists in diagnosis but false negative studies have been reported.
6. Magnetic resonance imaging is accurate in demonstrating disruption of the tunica albuginea but it is expensive, time consuming and limited availability, it is not routinely used.

MANAGEMENT

Distal circumcising incision provides exposure of all three penile compartments followed by skin retraction and closure of the tunical defect

with interrupted absorbable sutures. Excessive debridement should be avoided. Antibiotics and one month of sexual abstinence are recommended. Those patients undergoing repair within 8 hrs of injury had better results.

COMPLICATIONS

1. Abscess.
2. Penile curvature.
3. Longer hospitalization in delayed repair.

GUNSHOT AND PENETRATING INJURIES

These injuries are most commonly associated with urethral injury. Urethral injury is closed primarily by standard urethroplasty principles.

ANIMAL AND HUMAN BITES

Animal bites are most commonly due to dogs and victims are boys. Managed by primary closure along with antibiotics and rabies immunization. Human bites produce contaminated wounds, should not be closed primarily.

AMPUTATION

Self mutilation by psychiatric patients is more common. Reconstruction of urethra and reanastomosis of corpora cavernosa along with microsurgical repair achieves good results. In thermal injuries reimplantation is possible after 16 hrs of cold ischemia and 6 hrs of warm ischemia.

COMPLICATIONS

- a. Urethral stricture.
- b. Skin loss.
- c. Sensory abnormalities.

These are more common in macroscopic repair.

ZIPPER INJURIES

It usually occurs in boys and intoxicated adults. After a penile block the zipper sliding piece and the adjacent skin can be lubricated followed by unzip. The cloth material connected to the zip is incised and it allow the device to fall apart and release the trapped skin. A bone cutter is used to cut the median bar of the sliding piece. It allows the separation of upper

and lower shields of the sliding piece. Otherwise elliptical skin incision can be performed under anesthesia.

STRANGULATION INJURIES

Accidental injury is caused by hair, thread and rubber bands in children and for sexual pleasure in adults. This can be managed by incising the materials. Constricting devices may produce edema and induce ischemia gangrene and urethral injury. This can be managed by lubrication of the penis and foreign body followed by its direct removal. If distal edema is present, a tourniquet can be wrapped around the distal shaft. It aids its removal by reducing the swelling. If this method fails a string technique should be considered. A silk suture or umbilical tape is passed proximally under the object and wrapped distally. The tape proximal to the ring is grasped and unwinding from the proximal end will push the objects distally. Glandular puncture will allow escape of edema fluid and aids in the removal of foreign body.

TESTICULAR INJURY

Testicular injury is rare because it is protected by mobility of the scrotum, reflex cremasteric muscle contraction and its tough fibrous tunica

albuginea. Penetrating and blunt trauma are most common cause for testicular injury.

DIAGNOSIS

1. Scrotal pain, nausea, scrotal swelling and ecchymosis.
2. Ultrasonography is helpful in assessing the integrity and vascularity of the testis. The findings suggestive of testicular rupture are in homogeneity of the testicular parenchyma and disruption of the tunica albuginea.
3. A non palpable testis should raise the possibility of dislocation outside the scrotum or into the surrounding tissues.

MANAGEMENT

Minor injuries can be managed with ice, elevation, analgesics and irrigation. Early exploration and repair within 3 days of testicular injury is associated with increased testicular salvage rate. The objectives of surgical exploration are testis salvage, prevention of infection, hemostasis and preservation of fertility. Even small defects in tunica albuginea should be closed. If there is a loss of capsule, it may require removal of additional

parenchyma to allow closure of the remaining tunica albuginea. Delayed repair increases the orchidectomy rate.

COMPLICATIONS

1. Hematocele, pressure necrosis and testicular atrophy.
2. Wound infection and pyocele.

SCROTAL INJURY

Most commonly due to blunt injury, machinery accidents and stab wounds.

GRADING

American association for the surgery of trauma described the grading system.

GRADE	SCROTAL INJURY
I	Contusion
II	Laceration < 25% of scrotal diameter
III	Laceration = 25% of scrotal diameter

IV	Avulsion < 50%
V	Avulsion = 50%

MANAGEMENT

Scrotal laceration can be closed primarily in the absence of gross infection along with hemostasis, drain and scrotal support.

GENITAL SKIN LOSS

Necrotizing gangrene due to polymicrobial infection or Fournier's gangrene is the common cause of extensive genital skin loss. Penile skin loss can result from traction by mechanical devices.

DIAGNOSIS

1. Genital edema, erythema, skin ischemia are the evidence of Fournier's gangrene.
2. Scrotal ultrasound and CT reveals subcutaneous air which is a helpful indicator of necrotizing infection.

MANAGEMENT

Urinary drainage along with wet dressing and surgical debridement until active infections controlled.

PENILE RECONSTRUCTION

In uncircumcised patients mobilization of redundant foreskin allows primary closure of distal penile skin loss. Scrotal rotational flaps and local flaps from abdomen and thigh can also be used.

Thick, non meshed split thickness skin grafts are preferred for extensive penile skin loss. Meshed grafts may contract and cosmetically less acceptable. If grafts are used, lymphatic obstruction of the distal foreskin leads to lymph edema. It is prevented by excision of foreskin.

Complete penile skin loss is managed by bury it in the scrotum leaving the glans exposed with separation of structures after two months.

SCROTAL RECONSTRUCTION

Scrotal skin loss up to 50% can be closed primarily. For extensive injuries the testis may be placed in the thigh pouches or with wet dressing for several weeks until reconstruction.

Meshed split thickness grafts are used in scrotal reconstruction. The spermatic cords are sewn together before grafting to prevent bifid neoscrotum. The testis serves as natural tissue expander. Local flaps can be used for reconstruction. Fibrin sealant is useful in healing.

METHODS OF HEALING IN THE URINARY TRACT

Renal tubular epithelium has extensive powers of regeneration. when nephrons or glomeruli are destroyed, degeneration does not occurs. Healing occurs primarily by fibrosis. Kidney, though it is a cellular organ it has well developed fibrous capsule. Hence repair of wounds is easier than liver and spleen. Partial and subtotal nephrectomy is the preferred method to salvage the kidney according to the segments involved in injury. If the injury is too extensive then the available treatment is total nephrectomy followed by hypertrophy of the remaining kidney. Maximum levels of mitosis and epithelial proliferation occurs within 48 hours of nephrectomy. Wound contraction is the prominent feature in the healing of collecting system.

Prevention of stenosis and consideration of blood supply must always be the primary aim of treatment. When compared to renal pelvis which is very rich in blood supply, ureteric blood supply is precarious. Urinary leakage promotes fibrosis and cicatrisation. Urinary tract anastomotic procedures require diversion. Mucosal regeneration of urothelium is rapid.

The regenerating capacity of transitional epithelium begins within 24 hours of injury. The regenerating tissues often form crypts like down growths. The repair process is rapid than that of bowel and skin wounds. The bladder achieves 95% of its original strength within 10 days and almost 100% after 14 days. Therefore bladder wounds need to be supported for 7 to 10 days. The voiding and bladder capacity are not significantly altered.

Urethral capacity for regeneration is made use in the resurfacing of prostatic urethra after prostatectomy. Loss of some portion of its epithelium results in fibrosis, which is aggravated by urinary leak. Hence proximal urinary diversion is advocated along with accurate mucosal approximation, free drainage of the wound and antibiotics.

OBSERVATION AND CORRELATION

In our study 92 cases admitted with history of blunt injury abdomen. Among them 27 cases were Urological Trauma and other cases are with bowel injury, spleen injury, liver injury, retroperitoneal hematoma and pelvic bone fractures treated accordingly. Out of 27 cases of urological trauma 25 patients were Males and 2 patients were Female. Among these 11 patients met with upper urinary tract injury, 13 patients met with lower urinary tract injuries and 3 Patients met with genital injury and 1 patient met with both upper and lower urinary tract injury.

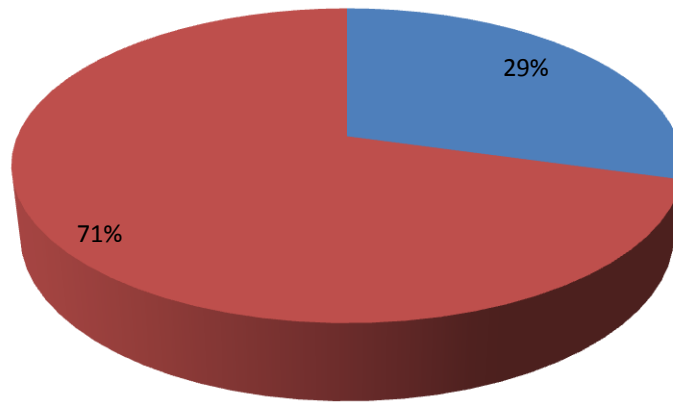
	No.of cases	Percentage
Blunt injury abdomen	92	100%
• Urological injuries	27	29%
• Others	65	71%

INCIDENCE AND SEX DISTRIBUTION OF UROLOGICAL TRAUMA

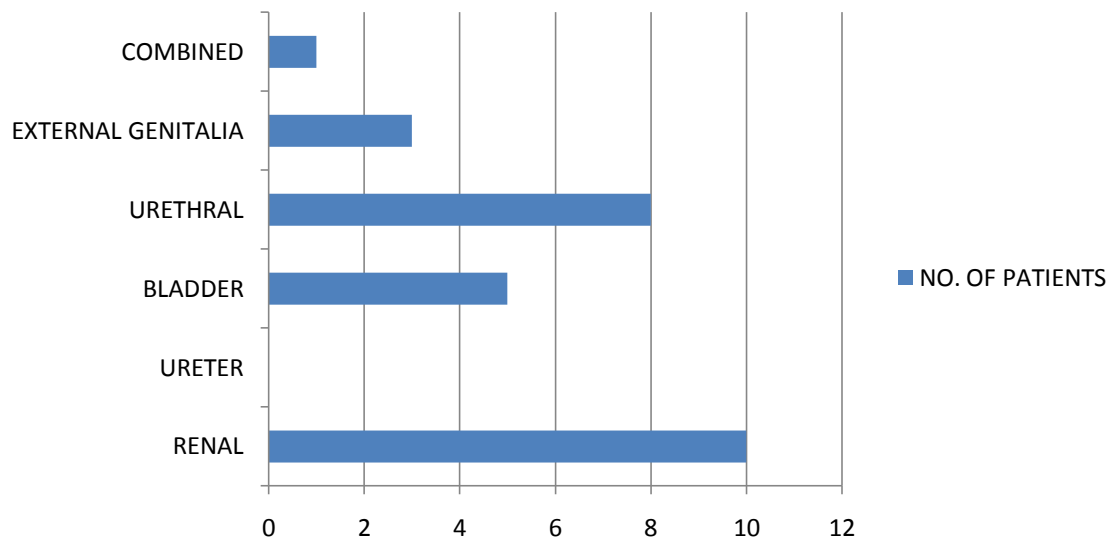
ORGAN	MALE	FEMALE	TOTAL	PERCENTAGE
KIDNEY	8	2	10	37%
URETER	-	-	-	-
BLADDER	5	-	5	18.5%
URETHRA	8	-	8	29.5%
GENITALIA	3	-	3	11%
COMBINED	1	-	1	4%
TOTAL	25	2	27	100%
PERCENTAGE	92%	8%		

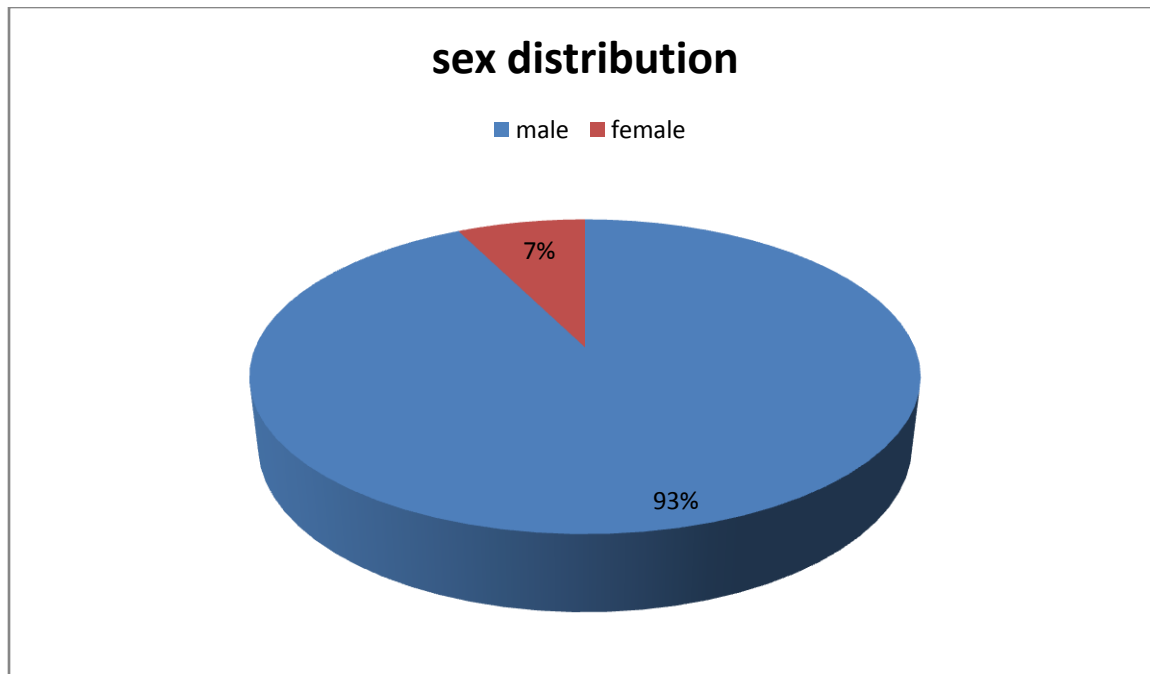
organ injuries

■ urological trauma ■ others



UROLOGICAL INJURIES





RENAL INJURY

According to my data 10 patients had renal injury , of all the 10 patients four patients had isolated renal injury, one patient had associated splenic injury and two other patients had associated liver and chest injury and other two patients had polytrauma. The mode of injury in most of patients is road traffic accident and accidental fall.

CAUSES OF RENAL INJURY

MODE OF INJURY	NO OF CASES
Road traffic accident	9
Accidental fall	1
Wall collapse	-
Total	10

All the ten cases were received in our Emergency department within 24 hrs of sustaining injury. Among them few cases were presented with severe abdominal pain , distension, hematuria and urinary retention.

The patient admitted due to road traffic accident was unstable on admission. He underwent resuscitation and catheterization. Blood stained urine drained through the catheter. After resuscitation with IV fluids and blood transfusion, emergency ultrasound and CT taken. Ultrasound showed contusion in the upper pole of right kidney along with free fluid in the abdomen, CT shows right kidney contusion with perinephric collection and liver laceration with collection in the peritoneal cavity and hence emergency laparotomy was proceeded intraoperatively found to have liver

laceration and non expanding retroperitoneal hematoma. Liver laceration was primarily sutured and kidneys not explored as suggested by urologist.

The case due to accidental fall injury also received in unstable condition. Patient presented with Swelling in the left hypochondrium and left loin. Patient was resuscitated and CT taken. It shows lacerated left Kidney and spleen laceration with fluid collection in the peritoneal cavity and hence patient was taken up for emergency laparotomy and found to be spleen lacerated into two parts active bleeding from the splenic vessels, laceration at the Gerota's fascia with active bleeding and hence left kidney explored and found to be avulsion of left renal artery and vein from the hilum. Then we proceed with splenic artery ligation, splenectomy, left renal artery and vein clapped and ligated followed by left Nephrectomy. DT kept and abdomen closed.

The other patient admitted with history of RTA. Emergency Ultrasound shows perinephric collection in the Left kidney, CT shows left kidney contusion with perinephric collection and normal right kidney. Since the patient was stable, the case was managed conservatively.

Patient managed postoperatively with IV fluids, Ryle's tube aspiration, antibiotics. The conservatively managed patient followed up with CT which showed 1cm size of nonexpanding perinephric hematoma. Hematuria resolved after 8 days of injury. And patient discharged in tenth POD .

BLADDER INJURY

In our study, five patients had bladder injury. Three patients were due to Road traffic accident , among of them ,two cases associated with pelvic bone fracture. Another one case was due to wall collapse

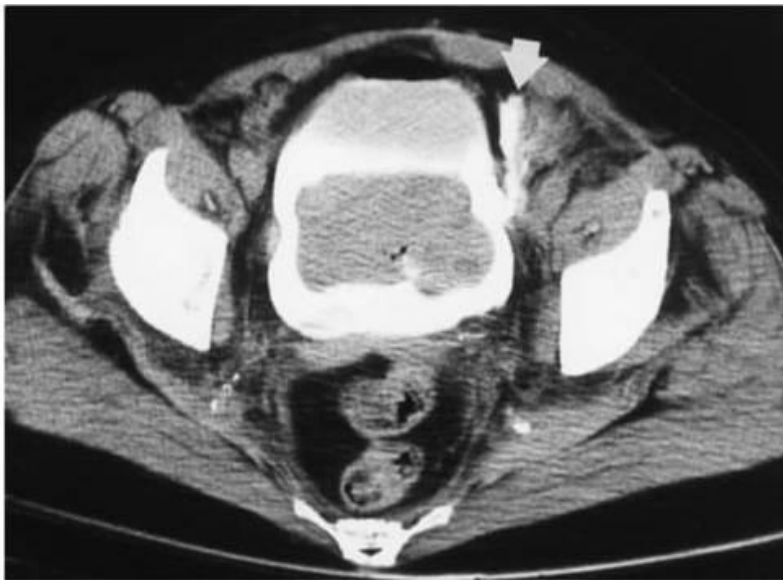
CAUSES OF BLADDER INJURY

ORGAN INJURED	MODE OF INJURY	NO OF CASES
Bladder	Road traffic accident	3
Bladder	Accidental fall	1
Bladder	Wall collapse	1
Total		5

COMBINED(bladder and renal)	Accidental fall	1
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CONTRAST CT - INTRA PERITONEAL RUPTURE OF BLADDER

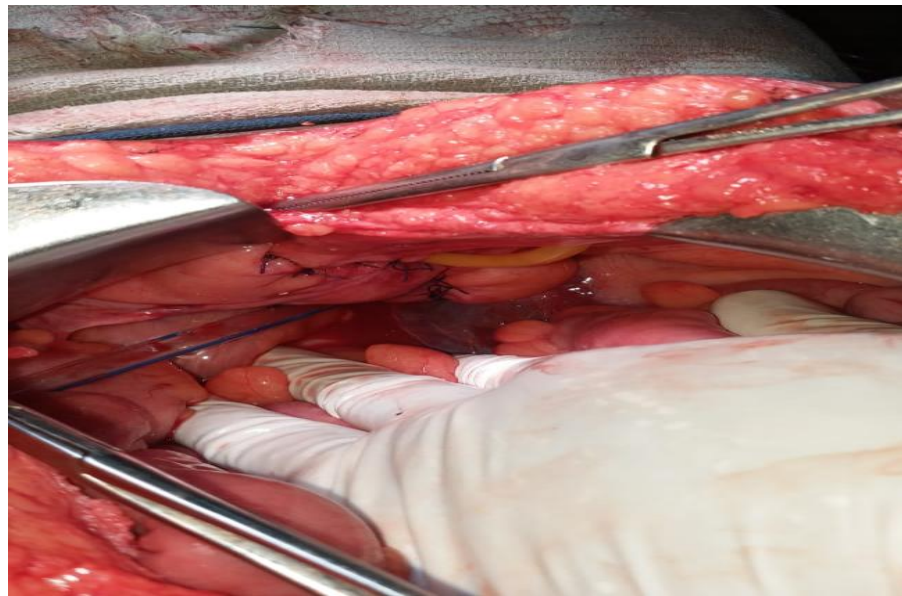


CONTRAST CT - EXTRA PERITONEAL RUPTURE OF BLADDER

RUPTURE BLADDER:



BLADDER REPAIR DONE:



One patient had both bladder and renal injury due to accidental fall.

One patient admitted with abdominal pain,hematuria,urinary retention,abdominal distension ,had a history of accidental fall .Emergency CTand USG taken it showed fat stranding present in the pelvic region.

patient proceeded with emergency laparotomy and intraoperative findings were blood stained fluid present in the peritoneal cavity and tear in the posterior wall of the bladder. All other solid organs were normal. bladder closed in two layer with open SPC and foleys catheter. peritoneal lavage done, DT kept. wound closed in layer.

Another case due to road traffic accident associated with pelvic bone fracture had abdominal distension, guarding, rigidity and hemodynamic instability, hematuria. Patient resuscitated with blood transfusion and IV fluids. Emergency ultrasound showed hyper echoic collection in the bladder and peritoneal cavity. During emergency laparotomy, blood in the peritoneal cavity aspirated and found 4cm tear in the dome of the bladder which is closed in two layers along with SPC and Foley's catheterization. Post operative clear urine drained. Patient managed by orthopedician for pelvic bone fracture. Both the patients managed postoperatively with IV fluids, Ryle's tube aspiration, antibiotics, analgesics and discharged after voiding clear urine.

URETHRAL INJURY

In our study, 8 patients had urethral injury. All cases were male, mode of injury follows;

CAUSE OF URETHRAL INJURY

MODE OF INJURY	NO OF CASES	PERCENTAGE
Road traffic accident	4	50%
Accidental fall	2	25%
Wall collapse	-	-
Train traffic accident	2	25%
Total	8	100%

Out of 8 cases of urethral injury, 6 cases were managed with supra pubic cystostomy initially and 2 cases managed with gentle catheterization. Evaluation of urethra by retrograde urethrogram after stabilization of pelvic bones, urethroplasty reconstruction done in 3 cases later. Other cases managed with optical internal urethrotomy..

GENITAL INJURY

In our study, 3 patients had genital injury. All of them were male. Among these patients 2 patients had penile hematoma, 1 patient had scrotal injury with retracted testis ,penile laceration.

CAUSES OF GENITAL INJURY

MODE OF INJURY	NO OF CASES
Road traffic accident	3
Accidental fall	-
Wall collapse	-
Train traffic accident	-
Total	3

Among these three, one patient had buck's fascia tear and penil hematoma ,sutured and hematoma treated conservatively.The another patient due to RTA and had swelling in the right inguinal region with penile laceration and empty scrotum on right side.Inguinal region explored and testis found to be in the right inguinal region and right orchidopexy

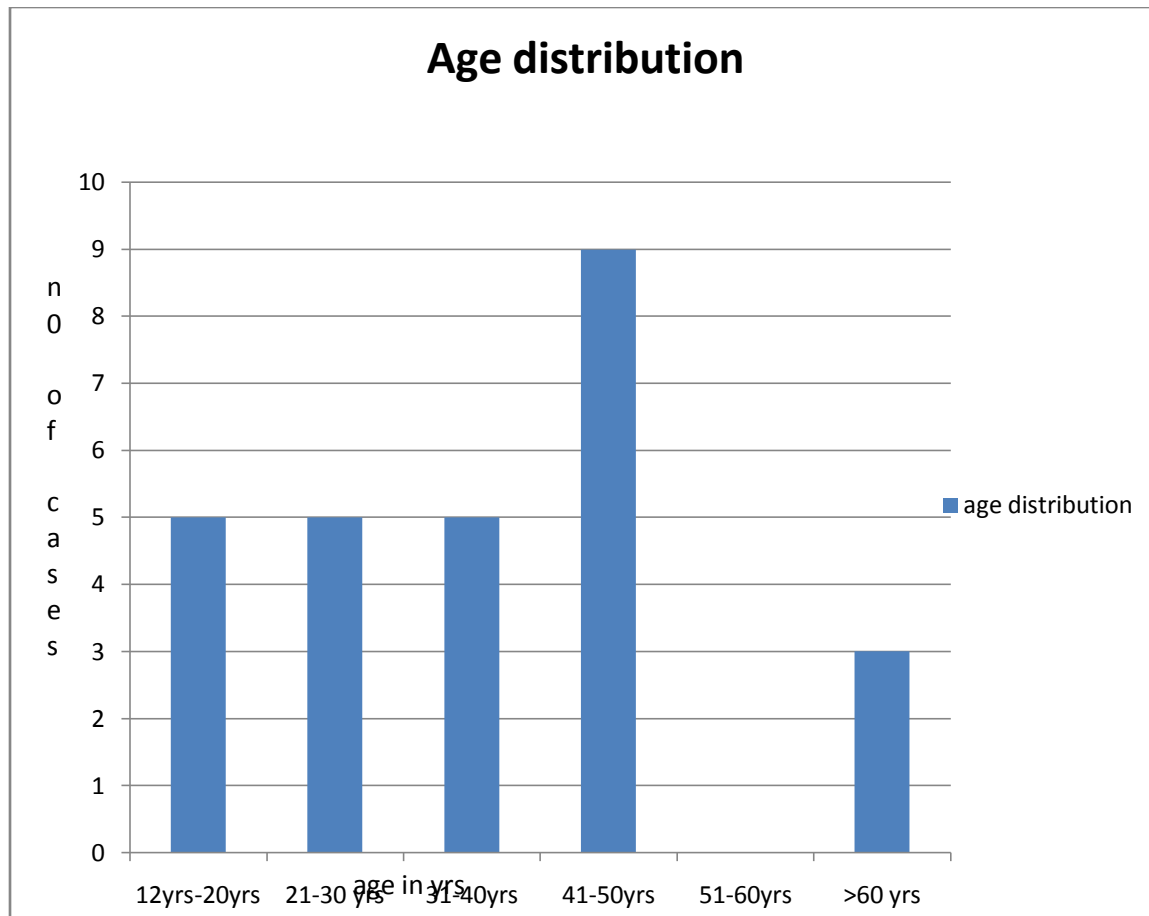
done,penile laceration sutured. Patient voids urine freely in post operative period.

DISCUSSION

The current study includes, the observation made in 27 cases of Genitourinary trauma patients admitted in our hospital.

AGE DISTRIBUTION

AGE IN YEARS	NO OF CASES	PERCENTAGE
12-20	5	18.5%
21-30	5	18.5%
31-40	5	18.5%
41-50	9	33.3%
51-60	-	-
>60	3	11.2%
total	27	100%



In our study, most commonly affected were fourties of about 33.3%.Teens, twenties ,thirties were about 18.5 % affected each

The male and female ratio was 25:2 i.e., 92% of cases were male and 8% of cases were female. The increased incidence of male is probably due to the outdoor nature of their occupation and aggressive behavior in male.

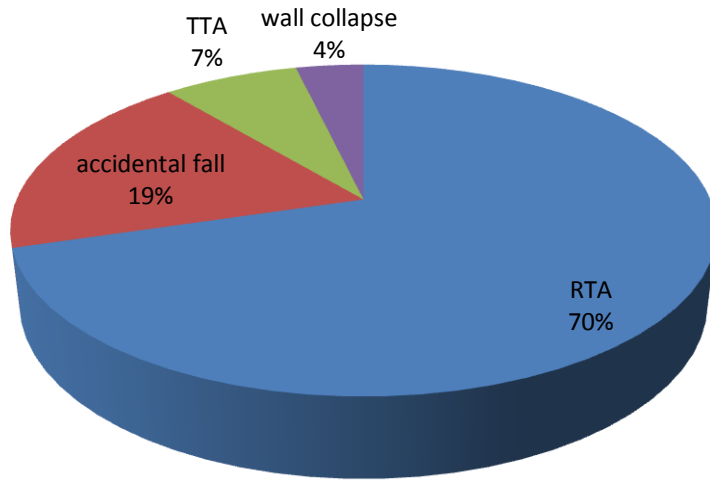
The age distribution shows that males of age between 41-50 years exhibit maximal number of cases, which is most commonly due to Road traffic accidents and accounts for 70% of cases. Followed by accidental fall

this accounts for 18.5% of cases and train traffic accident accounts for 7.5% and wall collapse accounts for 4% of cases

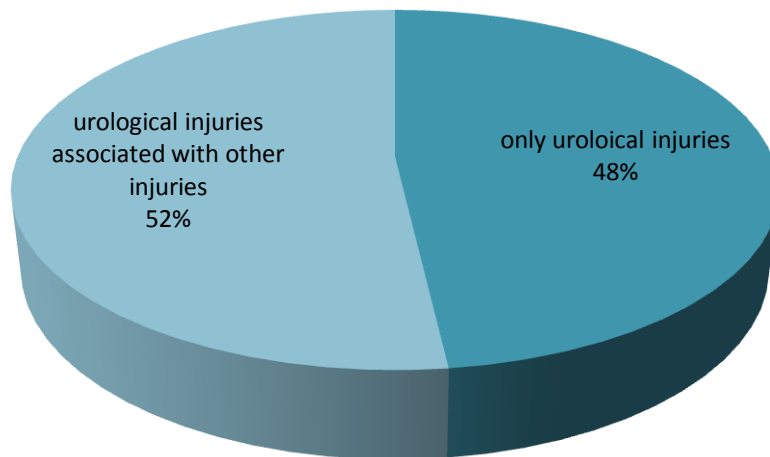
PATTERNS OF INJURY

MODE OF INJURY	NO OF CASES	PERCENTAGE
Road traffic accident	19	70%
Accidental fall	5	18.5%
Train traffic accident	2	7.5%
Wall collapse	1	4%
Total	27	100%

MODE OF INJURY



Blunt injury abdomen



Regarding the organs injured in the genitourinary system kidney is most commonly injured, this accounts for 37% of cases followed by urethral, bladder, external genitalia this accounts for 29.5%, 18.5%, 11% respectively.

In this study, all the cases were admitted in our hospital emergency ward within 24 hours of injury. At the time of admission only five cases were hemodynamically unstable, this accounts for 18.5% of cases. They were managed by resuscitation and surgery .these unstable patients were associated with visceral organ injury and vascular injury. The hemodynamically stable patients accounts for 81.5% of cases. These cases were most commonly associated with pelvic bone fractures. It accounts for 37% of total cases. These patient most commonly had urethral injury.

Regarding renal injuries blunt injury is more dangerous. Hematuria is most common presentation. Decision to operate is mainly based on CT abdomen. CECT is investigation of choice. Our foremost aim in surgery for renal trauma is to preserve as much as renal tissue as possible. Nephrectomy rate in our study was 7.5%.

When compared to upper urinary tract injuries lower urinary tract injury is most common due to road traffic accidents which are most commonly associated with pelvic bone fractures. Cystogram is most valuable in diagnosing bladder injury followed by CT cystogram which demonstrates site, size and displacement of the bladder resulting from pelvic hematoma. Closure of the bladder wall with vicryl suture material. In urethral injuries diagnostic catheterization is strongly condemned except single gentle catheterization. Retrograde urethrogram is the safest and simplest procedure to provide a diagnosis of urethral injury. With the development of end viewing endoscope, the approach to investigating rupture of urethra has been completely changed. Turner and Wardwick recommend complete excision of para urethral fibrosis in initial reconstruction procedures. Urethroplasty done in after three months.

Genital injuries are rare due to its mobility.

CONCLUSION

- a. The commonest cause of genitourinary tract injury is due to road traffic accident.
- b. Similar to many large series males are more often affected by road traffic accident than females due to their outdoor nature of work.
- c. Middle aged patients are the victims when compared to either extremes of age.
- d. Most common injury to the genitourinary system is lower urinary tract injury. Among these, urethral injury is most common and it is commonly associated with pelvic bone fracture.
- e. Hemodynamically unstable patients are most commonly associated with other intra abdominal visceral organ or vascular injury. Early resuscitation and laparotomy along with methodical exploratory technique is essential for penetrating injuries and blunt injuries.
- f. Investigations such as X ray, CT scan and blood tests are useful to diagnose urological trauma.

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PROFORMA

NAME AGE SEX

IP NO. DOA DOD

OCCUPATION

MODE OF INJURY

COMPLAINTS

H/O HEMATURIA

H/O NOT PASSING URINE

H/O PAIN

PAST HISTORY

HYPERTENSION

DIABETES

BLOOD TRANSFUSION

OTHERS

PERSONAL HISTORY

ALCOHOLIC

SMOKER

GENERAL EXAMINATION

CONSCIOUS

ORIENTATION

PALLOR

SWEATING

TACHYCARDIA

TACHYPNEA

PR

BP

RESPIRATORY SYSTEM

CARDIOVASCULAR SYSTEM

CENTRAL NERVOUS SYSTEM

EXAMINATION OF ABDOMEN

ABDOMINAL DISTENSION

GUARDING

RIGIDITY

PALPABLE BLADDER

LOIN TENDERNESS

OTHERS

EXTERNAL GENITALIA

BLOOD AT MEATUS

PENILE INJURY

SCROTAL INJURY

TESTICULAR INJURY

OTHERS

OTHER ASSOCIATED EXTERNAL INJURIES

INVESTIGATIONS

1. BLOOD
2. X-RAYS
3. USG ABDOMEN
4. CT ABDOMEN PLAIN
5. CT ABDOMEN CONTRAST

MANAGEMENT

RESUSCITATION

SURGERY

BLOOD TRANSFUSION

CATHETERISATION

SUPRA PUBIC URETHROTOMY

POST OPERATIVE PERIOD

FOLLOW UP

CT ABDOMEN PLAIN/CONTRAST

ASCENDING URETHROGRAM

COMPLICATIONS

URINARY EXTRAVASATION

DELAYED RENAL BLEEDING

HYPERTENSION

URETERAL OBSTRUCTION

VESICO CUTANEOUS FISTULA

STRICTURE URETHRA

URINARY INCONTINENCE

WOUND INFECTION

OTHERS

MASTER CHART

SI NO	NAME	AGE/SEX	IP NO.	MODE OF INJURY	HEMODYNAMIC	HEMATURIA	RETENTION	PERITONITIS	OTHER INJURIE	FINDINGS	PROCEDURE DONE	FOLLOW UP
1	MAHALINGAM	29/M	6752	Accidental Fall	Stable	Yes	Yes	Yes	No	Bladder Injury	Repair	Uneventful
2	KANTHAN	45/M	46199	RTA	Stable	Yes	No	No	No	Bladder Injury	Repair & SPC	Uneventful
3	SRINIVASAN	35/M	65750	RTA	Stable	Yes	Yes	Yes	No	Bladder Injury	Repair & SPC	Uneventful
4	KURAL MARAN	19/M	7970	TTA	Unstable	Yes	Yes	No	Pelvic bone #, RPH	Urethral Injury	Open SPC	Urethroplasty
5	MURUGANANTHAN	22/M	1828	RTA	Stable	No	No	No	No	Gr-3 Rt Renal Contusion	Conservative	Uneventful
6	KUMAR	45/M	51817	RTA	Stable	No	No	No	No	Gr-4 Lt renal contusion	Conservative	Uneventful
7	DURAI RAJ	37/M	10366	TTA	Stable	Yes	Yes	No	Pelvic bone #	Urethral Injury	SPC	Urethroplasty
8	MARAN	50/M	40848	RTA	Stable	No	No	No	B/L CHEST INJURY	Lt renal contusion	B/L ICD	Uneventful
9	RAJENDRAN	68/M	40269	Accidental Fall	Stable	No	Yes	No	No	Urethral Injury	Catheterization	Stricture/OIU
10	SEBASTHIKANNU	70/M	28850	RTA	Stable	Yes	No	No	No	Bucks fascia tear&penile hematoma	Catheterization	Stricture/OIU
11	VENKATRAMAN	34/M	27436	Accidental Fall	Stable	Yes	Yes	No	No	Contusion of Rt kidney&bladder	Catheterization	heathy
12	BALASEKAR	35/M	25846	RTA	Stable	Yes	Yes	No	No	Urethral Injury	SPC	Stricture/OIU
13	SURESH	37/M	20607	RTA	Stable	Yes	Yes	No	Pelvic bone #	Urethral Injury	SPC	Urethroplasty

14	SATHISH KUMAR	16/M	25067	RTA	Stable	No	No	No	Rt renal contusion	Rt ICD	Uneventful
15	ABIMANYAM	47/M	10166	RTA	Stable	Yes	Yes	Yes	Bladder Injury	Repair& SPC	Uneventful
16	SANTHOSH	17/M	49228	RTA	Stable	No	No	No	Gr 4lt renal contusion	Conservative	Uneventful
17	KUMARASAN	27/M	53942	RTA	Stable	No	No	No	Rt renal contusion	Conservative	Uneventful
18	GNANASEKAR	45/M	35439	Accidental Fall	Unstable	No	No	Yes	Splenic injury	Splenectomy	Uneventful
19	VASANTHA	45/F	34684	RTA	Unstable	No	No	No	Polytrauma	expired	
20	BALAIYAN	50/M	53140	RTA	Stable	Yes	Yes	No	Pelvic bone#	SPC	Stricture/OIU
21											
22	SUBRAMANIYAN	43/M	43755	RTA	Stable	Yes	No	No	Urethral Injury	Catheterization	Voids freely
23	ANANDHRAJ	45/M	63416	RTA	Stable	No	No	No	penile contusion	Catheterization	Voids freely
24	RAJESH KUMAR	26/M	33304	RTA	Stable	No	No	No	Rt Retracted testes with penile laceration	Rt Orchidopexy	Uneventful
25	ANANDH KUMAR	15/M	4482	RTA WALL COLLAPSE	Stable	No	No	Yes	Lt renal contusion	nephrectomy	Uneventful
26	BALAMURUGAN	18/M	27277	RTA COLLAPSE	Unstable	Yes	Yes	No	bladder injury	Repair& SPC	Uneventful
26	DIVYA	23/F	6006	RTA	Unstable	Yes	Yes	Yes	Renal injury	expired	

27	RAMALINGAM	71/M	3693	Accidental Fall	Stable	Yes	Yes	No	No	Urethral injury	SPC	Voids freely
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