DISSERTATION ON

A COMPREHENSIVE STUDY OF GENITOURINARY TRAUMA

M.S.DEGREE EXAMINATION
BRANCH – I
GENERAL SURGERY

THANJAVUR MEDICAL COLLEGE AND HOSPITAL

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

CHENNAI

MARCH - 2009

CERTIFICATE

This is to certify that dissertation entitled '**A COMPREHENSIVE STUDY OF GENITOURINARY TRAUMA'** is a bonafide record of work done by **Dr.SIVAKUMAR.V,** in the Department of General Surgery, Thanjavur Medical College, Thanjavur, during his Post Graduate Course from 2006-2009 under the guidance and supervision of **PROF. DR. T. ANANTHARAMAKRISHNAN M.S., F.I.C.S**. and **PROF. DR. G. AMBUJAM, M.S. FICS.** This is submitted in partial fulfillment for the award of **M.S. DEGREE EXAMINATION- BRANCH I (GENERAL SURGERY)** to be held in March 2009 under **The Tamilnadu Dr. M.G.R. Medical University, Chennai.**

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DECLARATION

I declare that this dissertation entitled '**A COMPREHENSIVE STUDY OF GENITOURINARY TRAUMA'** is a record of work done by me in the department of General Surgery, Thanjavur medical college, Thanjavur, during my Post Graduate Course from 2006-2009 under the guidance and supervision of my unit Chief **PROF.DR.T.ANANTHARAMAKRISHNAN, M.S.FICS.** and Professor and Head of the department **PROF. DR. G. AMBUJAM, M.S. FICS.** It is submitted in partial fulfillment for the award of **M.S. DEGREE EXAMINATION- BRANCH I (GENERAL SURGERY)** to be held in March 2009 under **The Tamilnadu Dr. M.G.R. Medical University, Chennai.** This record of work has not been submitted previously by me for the award of any degree or diploma from any other university.

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ACKNOWLEDGEMENT

I express my extreme gratitude to **Prof. Dr. G. Ambujam M.S., FICS.,**

The Senior Clinical Professor and the Head of the Department of Surgery, for her constant guidance and suggestions throughout my study period.

I express my extreme gratitude to **Prof. Dr.T.Anantharama krishnan M.S.FICS.** Associate Professor and my Unit Chief, for his valuable guidance and encouragement during my study period.

I express my profound gratitude to **Prof. Dr. G.Venkatesan.M.S.,** for his valuable help and guidance during my study.

I express my profound gratitude to **Prof. Dr. S. Mohammed Ismail M.S., Prof. Dr. T. Krishnamoorthy M.S., Prof.Dr.V.Balakrishnan M.S, and Prof. Dr. T. Swaminathan M.S., FICS.,** for their valuable guidance and encouragement.

I am extremely thankful to **Dr.G.Ravikumar M.S.Mch.DNB,** for his valuable help and guidance during my study.

I am very thankful to **Dr.S.Marimuthu M.S.Mch, Dr. M.Elangovan M.S., and Dr.R.Yeganathanan M.S,** for their valuable help and suggestions.

I thank Dean, Thanjavur Medical College for permitting me to use the hospital facilities for my study.

I express my sincere thanks to all patients, who in spite of their physical and mental sufferings have co-operated and obliged to my request for regular follow up, without whom my study would not have been possible.

CONTENTS

INTRODUCTION

Trauma is emerging as the leading cause of death world wide. In India also, it is a major killer next to coronary artery disease.

Genitourinary trauma accounts for 10% of total trauma victims due to various modes of injury like road traffic accidents, blunt injury, penetrating injury, accidental fall and others.

The initial evaluation and resuscitation is done by the trauma Surgeon. For that it is important to know about the mechanism of injury, its extent and the methods used in the initial resuscitation process and their success rates.

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

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 genitourinary Trauma patients.
3. To evaluate the genitourinary trauma patients attending our emergency department.
4. To evaluate the various associated injuries and their influence on the outcome.
5. To evaluate the value of available investigation tools for detection of Genitourinary trauma.
6. To discuss about the various treatment patterns adopted in our hospital setup.
7. Conclusions drawn as a result of this short series of study in our hospital.

REVIEW OF LITERATURE

EMBRYOLOGY

KIDNEY AND URETER

Three excretory organs develop from the intermediate mesoderm. Pronephroi are never functional and degenerate on days 24 or 25. Mesonephroi appear late in the 4th week. Mesonephroi along with portion of Pronephric duct forms Mesonephric or Wolffian duct. The medial head of Mesonephric tubules forms Bowman's capsule, lateral branches from the Aorta form capillaries that become Glomeruli forms renal corpuscles. The Mesonephric tubules open into the Mesonephric duct. Metanephric diverticulum (ureteric bud) arises on day 35. It gives rise to collecting tubules, major and minor calices, the renal pelvis and the ureters. The ureteric bud grows into the Metanephric mesoderm and enters in to the urinary bladder. The Metanephric mesoderm gives rise to the nephrons and opens into the collecting duct. During the ascend kidneys rotate medially so that the hilum faces medially.

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 paired reddish brown organ. Right kidney is 2cm lower than the left. Right kidney resides at the level of upper border of L1 to lower border of L3. Left kidney resides at the level of body of T12 to body of L3(Fig:1). Kidney is divided into outer cortex and inner medulla(Fig:2). Both the kidneys surrounded posteriorly by diaphragm, psoasmuscle, quadratus lumborum and transversus abdominis aponeurosis(Fig:3). 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:4). Gerota's fascia encompasses the perirenal fat and kidney on three sides except inferiorly.

Both the Renal arteries arises from Aorta and enters the kidney viarenal hilum which splits into 5 segmental arteries without any collaterals which further splits to form Lobar, interlobar, arcuate and afferent artery to the glomeruli(Fig:5). The venous drainage corresponds to the arterial supply and drains into the inferior vena cava. At the hilum the structures from anterior to posterior are renal vein, renal artery, and renal pelvis. Renal lymphatics follow blood vessels and drains into hilar and paraaortic lymph nodes. Sympathetic preganglionic nerve fibers originate from T8 to L1 and plexus. Parasympathetic fibers arises from the vagus and travel along the sympathetic fibers.

URETER

It is a bilateral tubular structure, 22 -30 cm of length. Its wall 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(Fig:6). 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(Fig:7). 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 inferolateral, base or posterior surfaces. Superior surface is covered by peritoneum and inferolateraly 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(Fig:8).

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 urethralmeatus. 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 (Fig:9).

PENIS

The root of the penis is composed 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 composed 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(Fig:10). 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. At the neck the skin is folded to form the prepuce of the penis.

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(Fig:11). 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 most commonly caused by road traffic accident,Penetrating injury and fall from a height. The rapid deceleration can cause damage to the renal vessels resulting in renal artery thrombosis, renal vein disruption or renal pedicle avulsion.

Penetrating injuries most often due to gun shot and stab wounds through the upper abdomen, lower chest and flank can result in renal injuries. Bullet velocity has the greatest effect on soft tissue damage.

$KE = MASS \times V \times V/ 2 \times G$

Greater the velocity larger the cavity created. Complete physical examination is a must for lower rib fracture, upper lumbar and lower thoracic vertebra.

HAEMATURIA

Presence of gross hematuria or microscopic hematuria, i.e. > 5 RBC's is an indicator for urinary tract injury. Hematuria may be absent in renal vascular injuries. when shock i.e. systolic BP < 90 mm of Hg is associated with hematuria increases the significance of renal injury. First aliquot of urine is important to determine the presence of hematuria.

CLASSIFICATION

American association for the surgery of trauma organ injury scaling committee classification is most accepted classification(Fig:12).

GRADE	TYPE	DESCRIPTION
I	Contusion	Microscopic or gross hematuria, urological studies normal
	Hematoma	Sub capsular, non expanding without parenchymal laceration
II	Hematoma	Non expanding perirenal hematoma confined to renal retro peritoneum
	Laceration	< 1cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	> 1cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through renal cortex, medulla and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum, devascularizing the kidney.

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 RENAL IMAGING

1. Hematuria is used as a sole indicator of renal injury.
2. Blunt injury patients with gross hematuria and microscopic hematuria with shock should undergo renal imaging by IV contrast CT.
3. Penetrating injury patients with any degree of hematuria should be imaged by IV contrast CT.
4. Shock is not a useful parameter in children because they have high catecholamine output which maintains BP and hence imaging should be performed.

IMAGING STUDIES

COMPUTED TOMOGRAPHY

Contrast enhanced CT is the best imaging study, which provides staging information, along with other associated abdominal organ injuries. One major limitation of the study is inability to define renal venous injury.

CT FINDINGS

I	Medial hematoma	Renal pedicle injury.
II	Medial extravasation	Renal pelvic injury or uretero pelvic 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

It is largely replaced by contrast CT with the exception of single short intraoperative IVP when there is an retro peritoneal hematoma surrounding the kidney. Single film taken ten minutes after IV injection of 2ml/kg of 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 renal bleeding.
2. Expanding perirenal hematoma.
3. Pulsatile perirenal hematoma.

RELATIVE INDICATION

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

RENAL EXPLORATION

Trans abdominal approach allows complete inspection of intra abdominal organs along with renal exploration. Identification of renal vessels before exploration improves renal salvage rate. Transverse colon and small bowel is lifted superiorly and it exposes the midretroperitoneum. An incision made over the Aorta superior to inferior mesenteric artery and extend up to the ligament of Treitz exposes the anterior surface of aorta. Left renal vein crosses anteriorly over the Aorta is dissected and secured. Right renal vein is secured by reflecting the second portion of duodenum. If hematoma obscure the landmarks then inferior mesenteric vein can be used as an anatomic guide. Incision made medial to inferior mesenteric vein and anterior surface of aorta is made out. Kidney is exposed by incising the peritoneum lateral to the colon followed by Gerota's fascia which requires release of splenic and hepatic flexure attachments of colon.

PRINCIPLES OF RENAL RECONSTRUCTION

1. Complete renal exposure.
2. Debridement of non viable tissues.
3. Perfect hemostasis.
4. Water tight closure of collecting system.
5. Approximation of parenchymal defect.
6. Omental interposition.
7. Retroperitoneal drain.

Renorrhaphy denotes repair of parenchymal laceration. When reconstruction of polar injuries are not possible then partial nephrectomy should be done. Delayed diagnosis of renal vascular injury >8 hrs cannot salvage the kidney. Reno vascular injuries repaired with 5-0 nonabsorbable suture along with endovascular stents or replacement graft by usinghypo 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. In unstable patients with low body temperature and poor coagulation cannot risk an attempt at renal repair if the normally functioning contralateral kidney is present.

2. In extensive renal injury when the patients life is threatened by renal repair.

COMPLICATIONS

1. Urinary extravasation can result in urinoma, perinephric infection and renal loss, which is managed by systemic antibiotics, internal ureteral stenting and placement of retroperitoneal drain.

2. Delayed renal bleeding usually occurs within 21 days, 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 AV fistula.

URETERAL INJURIES

Ureteral injuries are rare 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. Hydration and diuretic administration can visualize ureteral injury intraoperatively. Preoperative intra ureteral stenting in high risk cases avoids ureteral injury. Injection of 5 – 10 ml of IV Indigo carmine dye followed by cystoscopy after laparoscopic procedure ensures the patency of ureters.

Fever, flank pain, abdominal distention, peritonitis, urinary fistula and leukocytosis herald 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 recognition of urinary leak.
3. Retrograde ureterography.
4. Intraoperative 1- 2 ml 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	Type	Description
I	Hematoma	Contusion or hematoma without devascularization
II	Laceration	< 50 % transaction
III	Laceration	> 50 % transaction
IV	Laceration	Complete transaction with < 2 cm devascularization
V	Laceration	Avulsion with > 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 delineate the extent of injury in missed ureteral injuries and simultaneous placement of ureteral stent.

ANTEGRADE URETEROGRAPHY

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

MANAGEMENT

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

PRINCIPLES OF URETERAL REPAIR

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

UPPER AND MID URETERAL INJURIES URETEROURETEROSTOMY

For upper ⅔ of ureteral injury and large areas of contusion which leads to micro vascular injury results in ureteral necrosis can be managed by ureteroureterostomy i.e. end to end repair. For stable patients primary repair with stenting for 8 weeks. For unstable patients planned staged repair, tie off the damaged ureter using long silk to aid in dissection during second stage

operation. Otherwise percutaneous placement of nephrostomy tube or placement of 8-f 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 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.

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 SPC 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

It is useful in bridging long gaps in ureteral continuity. The bladder is swung cephalad and tabularized to bridge the gap of injured ureter.

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. 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. Incase of blunt injury lower abdominal pain, tenderness, bruising are present and urinary catheter does not drain urine in bladder injury.

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 indication for cystography.

It provides a 95% accurate results. Retrograde filling of bladder with 350 ml of 30% contrast material diluted with the saline, AP and oblique 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 CYSTOGRAPHY

It involves retrograde placement of contrast material through the urethral catheter followed by CT scan of the pelvis (Fig:13).

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 cystography before removal of catheter.

II. EXTRAPERITONEAL RUPTURE

It is most commonly managed by catheter drainage alone.

CONTRAINDICATIONS FOR CONSERVATIVE MANAGEMENT

1. Bone fragment projecting into the bladder.
2. Open pelvic fracture.
3. Rectal perforation

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 inside 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.

III INTRAPERITONEAL RUPTURE

Intraperitoneal rupture requires open repair with two layered closure by using absorbable sutures and placement of perivesical drain.

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 (Fig: 14), 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 extravasates both into 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 cm 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

One gentle attempt to place a Foley's catheter, if not possible Supra pubic 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 after 4 – 6 weeks. If the patient voids through urethra satisfactorily SPC can be removed 7 – 14 days later.

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 three months, scar tissue at the urethral disruption site is stable enough to do posterior urethroplasty provided that the associated injuries are stable and the patient is ambulant. SPC tube is maintained until the associated injuries become stable.

PREOPERATIVE EVALUATION

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

ENDOSCOPIC TREATMENT

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

SURGICAL RECONSTRUCTION

Open posterior urethroplasty through perineal approach is the treatment of choice without the need for multiple procedures. 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 anastomosis is made without tension over the Foley's catheter. Other maneuvers

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

COMPLICATIONS

1. Impotence.
2. Incontinence.
3. Stricture.

ANTERIOR URETHRA

It is often occurs as isolated injuries after straddle injury which involves bulbar urethra. It also occurs in penile fracture, foreign body injuries and iatrogenic injuries.

DIAGNOSIS

1. Blood at the meatus.
2. Perineal hematoma.
3. Urinary retention.

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 with absent filling of proximal urethra.

MANAGEMENT

1. Contusion and incomplete disruption can be treated with catheterization.
2. SPC is the treatment of choice for complete disruption.
3. Primary surgical repair – With limited debridement.
4. Delayed reconstruction – proximal and distal urethra can be mobilized and tension free end to end anastomosis.
5. 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 esisting 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 < 2 cm
IV	Partial penectomy or cavernosal or urethral defect ≥ 2cm
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 with in 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. wever when nephrons or glomeruli are destroyed, degeneration doesn't occurs. ealing 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 – 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.

MATERIALS AND METHODS OF STUDY

This is a retrospective study of various aspects of Genitourinary Trauma encountered in Thanjavur medical college during the period of August 2006 – November 2008. 48 numbers of cases have been recorded in the study. The age varied from 12 – 70 years.

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 Genitourinary 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 Genitourinary 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 urea, sugar, 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.

OBSERVATION AND CORRELATION

In our study of 48 cases of Genitourinary Trauma, 43 patients were Males and 5 patients were Females. Among these 4 patients met with upper urinary tract injury, 36 patients met with lower urinary tract injuries and 8 Patients met with genital injury.

INCIDENCE AND SEX DISTRIBUTION OF GENITOURINAERY TRAUMA

ORGAN	MALE	FEMALE	TOTAL	PERCENTAGE
Kidney	1	2	3	6.2%
Ureter	-	1	1	2.1%
Bladder	1	1	2	4.2%
Urethra	33	1	34	70.8%
Genitalia	8	-	8	16.7%
Total	43	5	48	100%
Percentage	89.6%	10.4%		

RENAL INJURY

In our study 3 patients had renal injury, of all the 3 patients' one patient had isolated renal injury, one patient had associated splenic and bowel injury and the other patient had associated liver injury. The mode of injury to this organ is blunt injury, penetrating injury and road traffic accident.

CAUSES OF RENAL INJURY

MODE OF INJURY	NUMBER OF CASES
Penetrating injury	1
Road traffic accident	1
Bull hit injury	1
Total	3

All the three cases were received in our Emergency department within 24 hrs of sustaining injury. All the cases were presented with severe abdominal pain and hematuria.

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 contrast CT taken. Ultrasound showed contusion in the upper pole of right kidney along with free fluid in the abdomen, contrast CT shows right kidney contusion with perinephric collection (Fig:15), collection in the peritoneal cavity and hence emergency laparotomy done, found to be liver lacerated and non expanding

retroperitoneal hematoma. Liver laceration sutured, kidneys not explored and abdomen closed.

The case due to penetrating injury also received in unstable condition. The entry wound through the left hypochondrium and left loin. Patient resuscitated and contrastCT taken. It shows lacerated left Kidney (Fig:17) with fluid collection in the peritoneal cavity and hence patient 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. There is also small bowel tear in the ileum. Then we proceed with splenic artery ligation, splenectomy, left renal artery and vein clapped and ligated followed by Nephrectomy and two layered closure of the small bowel tear. DT kept and abdomen closed.

The other patient admitted with history of bull hit injury. Emergency Ultrasound shows perinephric collection in the right kidney, contrastCT shows right kidney contusion with perinephric collection(Fig:16) and normal left kidney. Since the patient is stable, this case is managed conservatively.

Both the surgically managed patients managed postoperatively with IV fluids, Ryle's tube aspiration, antibiotics. The conservatively managed patient followed up with CT, it shows 1cm size of nonexpanding perinephric hematoma. Hematuria resolved after 8 days of injury. Then he allowed to walk and observed. Clear urine drained.

URETERIC INJURY

In our study one patient had ureteric injury along with associated bladder injury during vaginal hysterectomy done at private hospital. During this procedure bladder injury happened, to repair that abdomen opened by Pfannenstiel incision bladder injury made out and closed with difficulty and referred to our hospital.

On admission catheter drainage shows gross hematuria, emergency ultrasound shows free fluid in Morrison pouch and around the left kidney. In retrograde cystogram bladder contour not made out and hence patient taken up for emergency laparotomy. During laparotomy 500 ml of urine in the peritoneum sucked out and found to be dilated left ureter(Fig:18) along with rent in the posterior wall of the bladder (Fig:19)and sutured wound extending from the bladder trigone to the dome of the bladder.

Previous sutures removed. Both the ureteric orifice could not be identified, both the ureters are dissected, ureteric catheter passed into the bladder through ureterostomy. Infant feeding tube passed into the ureter through ureteric orifice by railroad technique. The remaining bladder dissected out bivalved. Two layered closure done (Fig: 20,21) after the distal end of the infant feeding tube is delivered out through the anterior wall of

the bladder along with SPC and urethral Foley's catheter(Fig:22). Abdomen closed in layers. Postoperatively both the ureteric tubes function well and draining clear urine. Ureteric infant feeding tube removed on the tenth POD. Foley's catheter removed on the 21'st POD. SPC removed on the 30'th POD. Postoperatively patient voids clear urine without difficulty.

BLADDER INJURY

In our study, three patients had bladder injury. Two patients are due to iatrogenic injury, among them one case associated with ureteric injury which is already discussed and another case during medical termination of pregnancy. One patient is due to road traffic accident.

CAUSES OF BLADDER INJURY

ORGAN INJURED	MODE OF INJURY	NUMBER OF CASES
Bladder	Road traffic accident	1
Bladder	Iatrogenic	1
Bladder with ureter	Iatrogenic	1

On admission the case due to medical termination of pregnancy had severe abdominal pain, plain X ray abdomen shows pneumo peritoneum, emergency ultra sound shows hypo echoic collection in the pelvis and peritoneal cavity. Emergency laparotomy shows fluid collection in the peritoneal cavity, adherent bowel loops, ruptured bladder dome and anterior surface of the bladder. SPC along with Foley's catheter drainage and two layered closure of bladder injury done. Postoperative clear urine drained. On

the tenth POD retrograde cystogram done SPC removed on the 21'st POD and Foley's catheter removed on the 30'th POD. On discharge patient voids without difficulty.

Another case due to road traffic accident associated with pelvic bone fracture had abdominal distension, guarding, rigidity and hemodynamic instability. Patient resuscitated with blood transfusion and IV fluids. Emergency ultrasound shows hyper echoic collection in the bladder and peritoneal cavity. During emergency laparotomy, blood in the peritoneal cavity aspirated and found 4cm tear in the posterior wall 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, 34 patients had urethral injury. Of these, 30 cases are due to road traffic accident, 2 cases are due to accidental fall and 2 cases are due to iatrogenic injury. Among these 34 cases, 33 cases of male and 1 case of female patients are encountered.

CAUSE OF URETHRAL INJURY

MODE OF INJURY	NUMBER OF CASES	PERCENTAGE
Road traffic accident	30	88.2%
Accidental fall	2	5.9%
Iatrogenic	2	5.9%
Total	34	100%

Although injury to the female urethra is uncommon one case of female patient had urethral injury due to road traffic accident when compared to 33 male patients. This case presented with pain in both the hip joint and hematuria. Radiological examination shows fracture pubic ramus. Patient catheterized, observed and hematuria resolves. Two cases of iatrogenic injury (Fig: 23) to the urethra are due to inexpert catheterization. One patient managed by gentle catheterization and the other patient is managed by trocar cystostomy.

Two cases of accidental fall with urethral injury. One case is due to fall from a height which is associated with pelvic bone fracture. The other case is due to accidental injury while working in a bore well. Both the cases presented with hematuria and managed by gentle catheterization. All the other cases are due to road traffic accident. Among these, 20 patients are associated with fracture of pelvic bones.

Among all these urethral injury patients, 12 patients presented with hematuria and they were managed by gentle catheterization. All the other cases presented with retention of urine and they were managed by supra pubic trocar cystostomy(Fig:24). In our study, 25 patients associated with

pelvic bone fracture which accounts for 73.5%. Following stabilization of pelvic bone injuries retrograde urethrogram(Fig:25,26) taken and they were managed accordingly. Among these 15 patients underwent delayed reconstruction of urethra with end to end anastomosis and the other patients managed by endoscopic internal urethrotomy.

GENITAL INJURY

In our study, 8 patients had genital injury. All of them are male. Female patients are not included in our study. Among these patients 2 patients had penile injury, 5 patients had scrotal injury and one patient had testicular injury.

CAUSES OF GENITAL INJURY

MODE OF INJURY	NUMBER OF CASES
Bull gore injury	5
Accidental injury	1
Assault	1
Self inflicted	1
Total	8

Among the two cases of penile injury, one was due to assault with knife over the shaft of penis. Since the buck's fascia is intact simple suturing done. The other case is due to accidental injury due to pressure over the erected penis. On admission patient had swelling and tenderness over the shaft of the penis. This case is managed by degloving of penile skin by circum coronal incision and found a defect in the left tunica albuginea and corpus cavernosum. The defect is closed by 2-0 vicryl and wound closed.

All the 5 cases of scrotal injury are due to bull gore injury. Among these, 4 cases had isolated scrotal laceration which are managed by wound wash and simple suturing(Fig:27). One case involves root of the penis, scrotum exposing both the testicles. Thorough wound wash given both the testis is placed in the respective compartments of scrotum. DT kept and wound closed in layers.

In our study, a psychiatric patient had testicular injury. He had injury by self mutilation of his scrotum by an arruval. On admission laceration of scrotum with the absence of both the testis. On exploration cord structures were surrounded by clots without testis in the scrotal sac. After a thorough wash cord structures are doubly ligated, DT kept and wound closed in layers. Postoperatively all the patients managed with antibiotics and analgesics.

DISCUSSION

The current study includes, the observation made in 48 cases of Genitourinary trauma patients admitted in our hospital.

AGE DISTRIBUTION

AGE IN YEARS	NUMBER OF CASES	PERCENTAGE
10 – 20	4	8.3%
20 – 40	36	75%
40 -60	5	10.4%
> 60	3	6.3%

In our study, 4 cases were in the age group of 10 – 20 years this accounts for 8.3% of cases, 36 cases were in the age group of 20 – 40 years this accounts for 75% of cases, 5 cases were in the age group of 40 – 60 years this accounts for 10.4% of cases, and 3 cases were in the age group of >60 years this accounts for 6.3% of cases.

The male and female ratio was 43: 5 i.e., 89.6% of cases were male and 10.4% 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 20–

40 years exhibit maximal number of cases, which is most commonly due to Road traffic accidents and accounts for 66.7% of cases. Followed by Bullgore injury this accounts for 10.3% of cases and iatrogenic injury this accounts for 8.3% of cases.

PATTERNS OF INJURY

MODE OF INJURY	NUMBER OF CASES	PERCENTAGE
Road traffic accident	32	66.7%
Bull gore injury	5	10.3%
Iatrogenic injury	4	8.3%
Accidental fall	3	6.3%
Blunt injury	2	4.2%
Penetrating injury	1	2.1%
Self inflicted injury	1	2.1%
Total	48	100%

Regarding the organs injured in the genitourinary system urethra is most commonly injured, this accounts for 70.8% of cases followed by genitals, kidney, bladder this accounts for 16.7%, 6.2%, 4.2% 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 three cases were hemodynamically unstable, this accounts for 6.3% of cases. They were managed by resuscitation and surgery. These unstable patients were associated with other visceral organ injury and vascular injury. The hemodynamically stable patients accounts for 93.7% of cases. These cases were most commonly associated with pelvic bone fractures. It accounts for 52.1% of total cases. These patient most commonly had urethral injury.

Regarding renal injuries penetrating injury is more dangerous than blunt injury. Hematuria is most common presentation along with peritonitis and hemodynamic instability. Decision to operate is mainly based on clinical signs, X rays, ultrasound and CT scan. CT scan study is most commonly used for diagnosis and contrast CT is to observe the patients those managed conservatively. Our foremost aim in surgery for renal trauma is to preserve as much as renal tissue as possible. Nephrectomy rate in our study was 33.3%.

Most of the ureteric injuries are due to iatrogenic trauma most commonly during gynecological procedures. The time of presentation of ureteric injuries varies widely. In the immediate postoperative period clear fluid ooze from the laparotomy site is very significant. In chronic cases the presenting symptom is vague dull ache pain. Intra venous urography, retrograde pyelography supplemented by ultrasound solves most of the ureteric problems in diagnosis. Good knowledge of anatomy of ureters in relation to uterus and adnexa and other retroperitoneal structures is the only solution that can reduce such iatrogenic injuries.

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 plain catgut or polyglycolic acid suture material will avoid the risk of phosphate encrustation. In urethral

injuries diagnostic catheterization is strongly condemned except single genital 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. Opinion differs on the relative merits of repeated urethral dilatation or urethroplasty in the management of urethral strictures.

Genital injuries are rare due to its mobility and are most commonly due to bull gore injury in our study. Followed by assault and psychiatric patients.

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 out door nature of work.

c. Middle aged patients are the victims when compared to either extremes of age. This shows their aggressive behavior.

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. Ureteral injuries are most commonly due to iatrogenic injury during gynecological procedures. Among which abdominal hysterectomy is the most common cause.

g. Investigations such as X rays and blood tests are only complimentary to clinical examination.

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PROFORMA

NAME **AGE** **SEX**

IP NO **DOA**

OCCUPATION **DOD**

MODE OF INJURY

COMPLAINTS

H/O HEMATURIA
H/O NOT PASSING URINE
H/O PAIN

PAST H/O

HYPERTENSION
DIABETIC
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 TENDER NES

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

SPC

POSTOPERATIVE PERIOD

FOLLOW UP

CT ABDOMEN-PLAIN/CONTRAST

AUG

COMPLICATIONS

URINARY EXTRAVASATION

DELAYED RENAL BLEEDING

HYPERTENSION

URETERAL OBSTRUCTION

VESICOCUTANEOUS FISTULA

STRICTURE URETHRA

INCONTINENCE

WOUND INFECTION

OTHERS