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A Study of the Causes of Death due to Blunt Injury Abdomen with special reference to the postmortem examinations conducted at the Osmania General Hospital, Hyderabad

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(DR.L.ANANDA KUMAR)

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CERTIFICATE

This is to certify that the dissertation endtitled **"A STUDY OF CUASES OF DEATH DUE TO BLUNT INJURY ABDOMEN WITH REFERENCE TO THE POST MORTEM EXAMINATIONS CONDUCTED AT THE OSMANIA GENERAL HOSPITAL HYDERABAD"** submitted in partial fulfillment of the requirements of degree of **MASTER OF MEDICINE IN FORENSIC MEDICINE** of **N.T.R. University** of Health Sciences, Vijayawada, Andhra Pradesh by **Dr. L. ANANDA KUMAR,** under my direct supervision and that it has not formed the basis for the award of any degree of Diploma to this date.

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INTRODUCTION

Trauma is one of the leading preventable causes of death in developing countries, and is a major health and social problem.

Trauma affects generally the young people, and accounts for loss of more years of life, than lost due to cancer and heart diseases put together.

Accidents are epidemic in civilized world; and our country is not an exception to this universal trend, and has witnessed a steady increase in accidental trauma, at present ranking fourth among chief causes of death. Trauma accounts for 8% of all the deaths in India. Every year in India, about 1, 40,000 individuals die in accidental deaths, and approximately double the number are disabled. This number is on the raise.

In urban life 75% of abdominal trauma follows blunt injury. Greatest difficulty in their management lies in the timely diagnosis. This is largely due to masking of abdominal trauma by associated injuries like head injury, chest trauma and bony injury.

Often the victims are unconscious due to alcoholism, drug abuse or head injury, and shock. The problems in diagnosis are compounded by the fact that relatively trivial injury may rupture abdominal viscera. So suspicion should be very high, if the diagnosis is to be accurate.

In contrast to penetrating injury, the decision to perform laprotomy for blunt abdominal trauma is more complex and difficult, because of structural injury being less obvious and associated other injuries may necessitate more urgent action.

When laprotomy is performed, the surgeon should keep a careful record of the injuries, which he observes, for many of these are due to criminal violence and are forensically important.

In open cases of abdominal trauma the clinical manifestations, diagnosis and management will be easier. But closed cases of trauma, offers a great challenge to the treating surgeon. Sometimes it may escape detection or lead to an error in diagnosis from medico-legal point, and the same is often true with autopsy doctor, where in closed cases of abdominal trauma, the autopsy findings may some times be trivial or complex and frustrating. It may be difficult to interpret the anatomic abnormalities to understand the mechanism of death, and may require a lengthy explanation. The object of the dissertation is to make a comprehensive study of pattern of blunt abdominal injuries, which are fatal and resulting in death.

HISTORY

Most of the information about abdominal trauma has been gained through military experiences, as Sir Winston Churchill stated, “War is an epidemic of trauma”. It is only in the recent time that the automobile became more deadly than the riffle.

Since the origin of recorded history, abdominal trauma has had dire implications for survival. Like the Greek warrior of the walls of Troy, the American Marine in Vietnam War, wore body armour to minimize the effects of this dreaded event, today seat belts are to auto collisions, and bought athletic equipment to sporting events. Whatever the cause of the trauma, the results are the same. The grievously injured victims require prompt enlightened care to avoid catastrophic end results. Deaths are occurring every day, in many different settings, from injuries to the upper abdomen and lower rib cage that produce damage to the liver, spleen and pancreas. The location and severity of the blow and the position of the victim when injured determine which combination of organs is effected. These are life threatening injuries .The stakes are high for the patient, and the demands on the surgical team are great. It is an axiom that the early recognition and effective management of these injurious is essential for the survival and prevention of far reaching complications.

Deaths from blunt violence include suicides (jumps from a height) and as well as homicides, caused by a variety of lethal instrumentalities. When investigation fails to yield sufficient reliable information to establish how the injurious were incurred, some of these commonly occurring fatalities are categorized as having been caused by “ violence of undetermined origin “.

AETIOLOGY

Injuries of the abdominal viscera, caused by blunt trauma, are particularly common in civilian life. The blunt trauma differs from penetrating trauma, as the different organs are characteristically injured. The solid organs are much more likely to be damaged by compression from blunt straining than the hollow viscera. The solid organs such as spleen, liver, kidney, pancreas, etc., are the most vulnerable, while the hollow viscera like stomach, intestines and bladder are less likely to be involved.

The outstanding features of injury to solid organ are the haemorrhage and shock, while in hollow visceral injury shock follows with the development of peritonitis, as the intestinal track has certain fixed points, which are vulnerable to rupture. They include the peritoneal portion of duodenum, proximal part of jejunum, caecum, and the hepatic and splenic flexures of colon.

It should be noted that apparently very trivial trauma might produce or lead to quite serious injuries. This is especially seen with spleen, much more so if previously deceased by malaria etc. but the same is not true with hollow viscera, which do not perforate with trivial injuries. Williams and Sergeaust, both in experimental dogs and clinical practice, have studied the mechanism of intestinal injuries. They found the intraperitoneal pressures were always greater than intraluminal pressures of the gut.

One important finding is that the injuries always occurred anterior to the spine, and were always presented of the striking force, stopped short of the spine. This shearing between the two opposing surfaces is the primary cause of intestinal injury due to blunt trauma.

In further experience with explosive decompression these workers found that in dogs, there were no intestinal injuries when the gut has been previously distended or obstructed.

Blunt Injury Abdomen - Causes

- **Warfare injuries:** can lead to visceral damage by blasts, shock waves or under water concussion.
- **Road traffic accidents:** account for 75% of cases of blunt abdominal Trauma. The two main mechanisms are deceleration injury and deformation force. Ejection from the vehicle frequently results in life threatening injuries. Auto pedestrian victims, particularly the adults are also at particular risk to abdominal trauma. Seat belt restraints can cause characteristic coup and counter coup injuries.
- **Battering:** Is becoming an important, common but preventable cause of abdominal injuries, owing to increase in aggressive human behavior.
- **Fall from Heights:** Like an electric pole, ladder tree or into a well.
- **Sports accidents:** Motor car or motor bike rallies. Foot ball play due to a kick onto the abdomen of another player.
- **Marital arts:** Karate
- **Athletics:** High jump etc.
- **Mountaineering:** Due to accidental fall from a height
- **Others:** Domestic injuries; fall on to a table, or a fall from stair case. Industrial accident like collapse of buildings, stampede, animal kicks, bull gore injury, etc.

ANATOMY OF ABDOMEN

The surface markings of the boundaries of the anterior abdominal wall are readily defined. Above, centrally the xiphoid process, and then the costal margins extending from the seventh coastal cartilage at the xiphisternal joint, to the tip of the twelfth rib. The lowest part of the costal border is in the mid-axillaries Line, and is formed by the lower margin of the tenth coastal cartilage. The line joining the lower margin of the thoracic cage on each side constitutes the sub coastal plane, which transects the third lumbar vertebral body. The tip of the lower border of the ninth coastal cartilage can usually be defined as a distinct ‘step’ along the coastal margin.

The inferior boundary is formed by the iliac crest, which descends from its tubercle and ends antiriorly at the anterior superior iliac spine, from which the inguinal ligament runs downwards and forwards to the pubic tubercle. This is indicated by the obvious inguinal groove, which is readily seen when the thigh is flexed on the abdomen .The pubic tubercle is the lateral extremity of the pubic crest, about 2.5 cm from the midline, which itself marks the site of the pubic symphysis, the lower most part of the margin of the anterior abdominal wall. The tubercle can be identified by the direct palpation, even in the obese, by running the fingers along the adductor longus tendon, tensed by flexion, abduction and external rotation of the thigh, to its origin below the tubercle.

ABDOMINALPLANES

For descriptive purpose, the abdomen can be divided by a number of imaginary horizontal and vertical lines. The horizontal lines are also of value in defining approximate vertebral levels and the position of some relatively fixed intra abdominal structures.

VERTICAL PLANES:

- The midline passes from the xiphisternal process to the public symphysis.
- The mid clavicular line (also sometimes called the lateral or the mammary line) passes through the midpoint of the clavicle, crosses the coastal cartilage and passes through a point midway between the anterior superior iliac spine and the symphysis pubis. In the average sized adult, it is approximately 9 cm from the midline.

HORIZONTAL PLANES:

The horizontal planes are as follows:

The **xiphisternal plane** transverses the xiphoid at the level of the ninth thoracic vertebra. Varying with the body habitués, posture and respiration, this plane demarcates the level of the cardiac plateau on the central part of the upper border of the liver.

The **transpyloric plane** (of Addison) lies midway between the suprasternal notch of the manubrium and the upper border of the pubic symphysis. No clinician uses this cumbersome measurement, but a useful approximation is that lies midway between the umbilicus and the inferior end of the body of the sternum. More conveniently it corresponds to the hand's breadth of the subject, below the xiphisternal joint.

The plane intersects the body of the first lumbar vertebra near its lower border and meets the coastal margins at the tips of the ninth costal cartilages. This plane corresponds to where the lateral edge of the rectus sheath crosses the costal margin and this can be demonstrated in a thin and muscular subject when the abdominal wall is fixed. This point also makes on the right side, the position of the fundus of the gallbladder.

Other structures, which are demarcated by this plane, are:

- The hilae of both kidneys.
- The origin of the superior mesenteric artery from the aorta.
- The termination of spinal cord.
- The neck and adjacent body and head of the pancreas.
- The confluence of the superior mesenteric and splenic veins, forming the hepatic portal vein.

Despite the name, the plane does not constantly transect transpyloric plane, which is deeply ingrained in both clinical and anatomical literature, the pylorus. To account for the name, however, it is frequently so transected in the fixed cadaver of classical anatomy, and also in some normal subjects.

When the stomach is empty and the person lying supine. There is however, much variation between subjects of different body types, with their degree of gastric filling, and posture. The pylorus descends some one to three vertebral levels below this plane in the erect position and when the stomach is full.

- The **sub costal plane** joins the lower margin of the thoracic cage, formed by the tenth Coastal cartilage on each side. It transects the body of the lumbar vertebra. It also indicates the level

of origin of the inferior mesenteric artery from the aorta, and the horizontal (third) part of the duodenum, although the latter varies with posture.

- The **supracostal plane** joins the highest points of the iliac crest on each side. It passes through the body of the fourth lumbar vertebra, marks the level of bifurcation of the abdominal aorta, and dorsally is used in clinical practice as a landmark in performing a lumbar puncture. If this procedure is carried out distal to this level, puncture will take place through either the L4-L5 or L5-S1 intervertebral level, safely below the termination of the spinal cord.
- The **transtubercular plane** corresponding to a line joining the tubercles of the iliac crests. It passes through the fifth lumbar vertebral body near its upper border. It indicates, or is just above, the confluence of the common iliac veins and marks the origin of the inferior vena cava.
- The **interspinous plane** includes the line joining the center of the anterior superior spines of the iliac crests. It passes through either the lumbosacral disc, the sacral promontory, or just below, depending on the degree of lumbar lordosis, sacral inclination and curvature.
- The **plane of the pubic crest** passes through the end of the sacrum of part off the coccyx, again, depending on the degree of lumbar lordosis, sacral inclination and curvature.

ABDOMINAL REGIONS:

The abdomen can be divided into nine regions by two horizontal and two parasagittal planes, projected to the surface of the body. These regions are used in practice for descriptive localization of the position of a mass or the localization of a patient's pain. They may also be used in the description of the location of the abdominal viscera.

The two vertical lines are the midclavicular lines on either side. Classically, the two horizontal lines are the transpyloric and the transtubercular planes. In practice, it is common to use two horizontal lines, found by dividing the distance from the xiphisternal joint to the symphysis pubis into thirds.

The nine regions thus formed are

- The epigastrium.
- The right and left hypochondrium.
- The umbilical region.
- The right and left lumbar region.
- The hypogastrium (or suprapubic region).
- The right and left iliac fossa.

Abdominal Boundaries:

The abdomen extends from the diaphragm to the base of the pelvis, comprising the abdomen proper and the lesser pelvis continuous with each other at the plane of the inlet into the lesser pelvis, which is bounded by the sacral promontory, arcuate lines of the in nominate bones, pubic crests and the border of the symphysis pubic. Muscles, its shape and size varying with the degrees

of distension of the contained hollow organs and the phases of respiration largely enclose the abdomen.

Abdomen Proper

This is bounded front by the rectus abdominal muscles, the pyramidalis and the aponeurotic parts of the oblique externus, internus and transverses abdominus; laterally by the flesh parts of these flat muscles, the iliac muscles and iliac bonds, behind by the lumbar vertebral column, diaphragmatic crura, paired psoas and quadratus lumborum muscles and the posterior parts of the iliac bones; above by the diaphragm, while below it is Continuous with the lesser pelvis through its superior aperture. Since the diaphragm, the domed roof of the abdominal cavity is convex upward, part of the cavity lies within the skeletal framework of the thorax. The abdomen proper contains most of the digestive tube, liver, pancreas, spleen kidneys, ureters (in part), suprarenal gland and numerous blood and lymph vessels, lymph nodes and nerves.

Lesser Pelvis

Approximately funnel-shaped, like an inverted, truncated cone, this region extends, postero-inferiorly from the abdominal cavity proper and is bounded: antero-laterrally by the (hip) bones below their pubic crests and arcuate lines, and by the obturatores interni; postero-superiorly by the sacrum, coccyx piriformes and coccygei; interiorly by the levator anii, which with their covering fasciae, from the pelvic diaphragm, and by the transverses perineii profundi and sphincter urethra which, with their fascial covering's, constitute the sphincter urethra which with their fascial covering , constitute the urogential diaphrgm. The lesser pelvis contains the urinary bladder, terminal parts of the ureters, the sigmoid colon, rectum, some ileal coils, internal genitalia, blood and lymph vessels, lymph nodes and nerves.

PERITONEAL CAVITY

The peritoneal cavity was mentioned in the papyrus Ebers some 3,500 years ago. But it was not thoroughly described until 1730, when James Douglas of Edinburgh published a lucid account that has not been appreciably improved upon this day.

Peritoneum is a serous cavity, and invests a number of abdominal organs, except for the openings of fallopian tubes. Peritoneum is a completely closed sac. In a strict sense, the peritoneal cavity does not contain any organs. However it is customary to speak of those structures that are almost completely enfolded by peritoneum such as stomach, jejunum, ileum, transverse colon, appendix, caecum, liver, gall bladder and spleen as being intraperitoneal.

The peritoneal cavity is divided into greater sac and lesser sac, which communicate with each other by Foramen of Winslow.

The surface area of peritoneum is about 2 square meters and approximates that of skin. Unlike the skin peritoneal cavity contains 75-100ml of clear, sterile straw-colored fluid. The fluid contains 2000-2500 cell / cu.mm. Majority of these are macrophages with some desquamated mesothelial cells and lymphocytes. It also contains few polymorphonuclear neutrophils and eosinophils.

OMENTA

Lesser omentum

The lesser omentum is the fold of peritoneum that extends to the liver from the lesser gastric curvature and the commencements of the duodenum.

Stomach

The stomach (ventriculus or preferably gaster) is the most dilated part of the alimentary canal, situated between the esophagus and the small intestine. It lies in the epigastric, umbilical and left hypochondriac areas of the abdomen, occupying a recess bounded by the upper abdomen wall and diaphragm. It's safe and position is modified by changes with in itself and by the surrounding viscera. Its mean capacity varies from about 30 ml at birth, increasing to 1000 ml at puberty and about 1500 ml in adults. It has two openings and described as if it had two borders as curvatures and two surfaces.

Small Intestine

The small intestine, a coiled tube, extends from the pylorus to the ileocaecal valve, where it joins the large intestine. It is usually said to be 6 to 7 mts long, gradually diminishing in diameter towards its termination.

The small intestine occupies the central and lower part of the abdominal cavity, usually within the colonic loop; it is related in front to the greater omentum and abdominal valve a portion may reach the pelvis in front of the rectum .It consists of a short, curved sessile section and duodenum and a long greatly coiled part attached to the posterior abdominal valve by the mesentery the proximal two- fifth being the jejunum, the distal three-fifths the ileum.

Large Intestine

The large intestine extending from the distal end of the ileum to the anus is about 1.5 meters long; its caliber is greatest near the caecum and gradually diminishes to the rectum, where it enlarges just above the anal canal.

The large intestine curves around the coils of the small intestine, commencing in the right ileac region as a dilated caecum (intestinium crassum caecum). The caecum leads to the vermiform appendix and colon, and the later ascending in the right lumbar and hypochondriac regions to the inferior aspect of the liver; here it bends to the left and, with an antero – inferior convexity, loops across the abdomen as the transverse colon to the left hypochondriac region, where it curves again to distant through the left lumbar an ileac regions, to the lesser pelvis . Here it forms a sinus loop, the sigmoid colon continuing along the lower posterior pelvic wall as the rectum and anal canal.

Pancreas

The pancreas is a soft, lobulated, grayish – pink gland, 12-15 cm long, extending nearly transversely across the posterior abdominal wall from the duodenum to the spleen, behind the stomach. Its broad right extremity, the head, is connected to the body by a slightly constricted neck. Its narrow, left extremity is the tail. It ascends slightly to the left in the epigastric and left hypochondriac regions.

LIVER

The liver lies in the upper right part of the abdominal cavity, occupying most of the right hypochondrium and epigastrium and extending into the left hypochondrium, as for as the left lateral line. In male it generally weights 1.4 – 1.8kg, and in females 1.2- 1.4kg, with a range of 1.0 – 2.5 kegs. It is somewhat cuneiform, is reddish brown in color in the fresh state, and though firm and pliant, is easily lacerated. Wounds cannot rightly be tutu red. Bleeding may be severe, due to the organ's great vascularity. Its position is not maintained by peritoneal or fibrous attachments, but mainly by intra abdominal pressure due to the tones in the abdominal muscles.

Spleen

It is wedge shaped organ, lying mainly in the left hypochondrium. It is wedged in between the fundus of the stomach and the diaphragm. The spleen is soft, highly vascular and dark purple in color. On an average the spleen is 1 inch thick, 3 inch broad, 5 inches long, 7 ounces in weight and is related to the 9^{th}, 10th, 11th left side of the ribs.

Kidneys

Each kidney is bean shaped. The lateral border is convex and medial border is concave. The following structures are seen in the hilum .1) Renal vein 2) Renal artery 3) Renal pelvis. The kidney occupies the epigastric, hypochondrium, lumbar and umbilical border of T12 vertebra to the center of the body L3 vertebra. Each kidney is about 11 cms long, 6 cms broad and 3 cms thick. On an average the kidney weighs 150 Gms in males and 135 grams in females.

Urinary Bladder

The urinary bladder is tetrahedral in shape. Capacity of the bladder in an adult male is 420 ml. The main arterial supply comes from the superior and inferior vesical arteries, and branches of the internal ileac artery.

MECHANISM OF INJURY IN BLUNT TRAUMA

Modes of wounding in (fatal) violent incidents include:

1. Impacts delivered personally (hands, fists, elbows, feet and knees) or by such instruments as clubs rods, lengths of pipe, rocks, hammers, baseball bats, lamps, table and chair legs, hand guns (pistol whipping), brass knuckles and the like.
2. Forceful contact of part of the entire body against and an unyielding surface for example falls in which head or trunk strikes the floor, curb or pavement.
3. Combinations of impact and forceful contact. Thus a pedestrian knocked on the pavement by moving motor vehicle sustains two sets of injuries. One results on auto victim impact and the second from victim pavement impact. Another example a person struck on the chin by assailant's fist and is there by propelled down several stairs or out of an open window or to a cement sidewalk, again two sets of injuries can result.

The initial contact is the direct traumatizing event, and its sequel is the indirect injurious phase of the incident. The gravity of the injuries produced by the direct trauma (fist strikes jaw) may be considerable less than the injuries sustained from the indirect result (head strikes pavement). The former may be biologically insignificant from the standpoint of causing the death, although in law it is the crucial factor in the fatal assault. The ensuing indirect injury (skull facture and brain

contusion) is the biologically lethal facet of the incident. Wounds produced by blunt violence are classified as "**Mechanical injuries** ".

ENERGY FACTORS IN BLUNT VIOLENCE

Blunt traumata are caused by the force, a form of energy, in which changes are tending to change the state of rest or uniform motion of a body or of some part of it. Force may be defined as the time ratio of change of momentum and is equated by the formula F=MA, where F is force, M is mass A is acceleration (or deceleration).

WOUND PRODUCTION BY BLUNT VIOLENCE

A mechanical injury may be defined as disruption of a tissue or an organ, created by change in its state of rest or uniform motion. The most common cause of these injuries is collision between the moving object and a relatively stationery part of the victim (his swinging fist strikes the nose, a hammer strikes the forehead) or collision between a stationary object and a moving part of the victim (the nose of the falling victim strikes the ground or his occiput comes into forceful contact with the edge of the curb).

However, the foregoing types of mechanism are not the sole means by which mechanical injuries are created. Violent, uncoordinated muscular contractions can produce disruptive tissue stresses with resultant fractures, and lacerations of tendons and muscles. Internal forces and hydrostatic pressures created by the convulsive seizers can cause mural lacerations in hollow viscera.

Rate and Area Factors

The wounding potential of an impact depends on the amount of energy liberated or transferred by the blow. The rate at which energy is liberated and the size of the impact are critical in determining the degree of injury. The speedier the energy is liberated and the smaller the area over which it is distributed, the more severe are the tissue disturbances (wounds).

Target Factors

Energy, liberated by an impact, may be transferred through tissues without creating significant local damage and yet be capable of producing serious injury at a site comparatively remote from the point of contact between victim and instrument or traumatizing surface. Violent displacement of gas or fluid within hollow viscera can result in injuries from explosive pneumatic or hydrostatic forces set into motion by transmitted energy.

OVERT AND CONCEALED INJURIES

Although most victims of fatal blunt violence present visible surface injuries e.g.; scratches abrasions, laceration and contusions, some deaths from this modality of trauma occur with little or no external indications, of what actually killed the victim. Fatal visceral contusions and laceration, associated with or independent of bony injuries, can be present beneath an intact skin, thanks to the cohesive force between epidermal cells, and dermal elasticity and toughness.

Homicides from blunt violence can be "bloodless crimes in so far as their external manifestations are concerned. Such fatalities stand in sharp contrast with the great majority of deaths from gunshot wounds, and cutting and stabbing in which there are usually obvious external signs, that (lethal) trauma was operative.

This is not to again to say the fact that small caliber gunshot wounds and stab wounds made by slender instruments (e.g. ice picks) through a bushy head of hair can be missed unless or until the undersurface of the scalp and the interior of the cranium are visualized. However, these varieties of concealed trauma are relatively infrequent.

Sufficiently important to justify repetition is the generalization that **the absence of external traumata does not preclude the presence of grave internal injuries.** The most common from of "concealed" fatal trauma, whether it involves the head, neck, chest or abdomen, is that caused by blunt force. A "minor" scalp laceration or abrasion may be the sole external abnormality in the victim of fatal cranio cerebral injury. Fractures of ribs, vertebrae or pelvis, with accompanying lethal visceral injuries,

can occur without external indications off serious violence. Blows to or squeezes of the abdomen can lead to massive intra-peritoneal bleeding from lacerations of the spleen, liver, mesentery or omentum, and yet leave little or no visible injuries. A fading ecchymosis on thigh may be the sole indication of a kick responsible for traumatic venous thrombosis, which eventuated in fatal pulmonary embolism.

Thus, ab initio, in dealing with fatalities known, alleged, or unsuspected as having resulted from blunt violence, the pathologist must be aware of the frequently encountered combination of minor or absent external injuries associated with internal trauma of sufficient gravity to be fatal.

The converse of the foregoing dictum is equally true. A person dead from natural causes may present multiple incidental external injuries. Chronic alcoholics who die from such varied causes as lobar pneumonia, ruptured esophageal varices or cirrhotic hepatic insufficiency frequently present prominent recent and remote ecchymosis and abrasions on their heads, trunks and extremities, indicative of repeated stumbling and fallings in the presence of capillary fragility, subclinical scurvy and avitaminosis K. Persons with hemorrhagic diathesis or blood dyscrasisas have prominent intracutaneous bleeding following minor external traumata.

EXTERNAL STIGMATA OF BLUNT VIOLENCE-ORIGIN,

INTERPRETATION AND SIGNIFICANCE

Application of blunt force to human target, create a variety of injuries ranging in severity from trivial to massively destructive. These heterogeneous lesions fall into two major groups.

1. "Closed" includes bruises (or contusions), hematomas, simple fracture and visceral lacerations.
2. "Open" includes scratches, abrasions, lacerations and avulsions, and compound fractures

BLUNT ABDOMINAL INJURIES

Two sets of factors, endogenous and exogenous, determine the types and degree of visceral damage sustained when blunt force traumataizes the abdomen.

ENDOGENOUS DETERMINANT IN BLUNT ABDOMINAL TRAUMA:

Significant intrinsic factors, which help to determine the outcome of blunt abdominal injury, reside in the viscera and their vasculature. The former comprises organs and tissues, whose morphology,

configuration, location and supporting structures confer on them widely differing degrees of vulnerability to this modality of violence.

Organ Consistency

Organ consistency and mass are important in determining extents and type of injuries following application of blunt force. The firmer and denser a viscus, the greater is its friability. Solid organs (e.g. liver and spleen) are more readily lacerated by blows than are such hollow organs as the (empty) stomach, intestines, and (empty) urinary bladder.

Organ Mobility

Readily moveable or displaceable organs have considerable capacity to absorb the force of a blow, without serious injury, because of their ability to 'ride with the punch'. Thus a blow to the abdomen or compression less readily damages normally attached ileum and jejunum than the fixed retroperitoneal duodenum.

The duodenum, closed proximally by the pylorus and distally by acute angulation at the ligament of Treitz, is vulnerable to disruption by extrinsic pressure acting on the closed loop. The dudenojejunal flexure is the commonest site of small intestinal rupture, because it is the area of union between fixed and freely movable portions of the gut. If jejunum or ileum is firmly fixed to the abdominal wall or to other immovable structures by adhesions from previous injury or surgery, they, too, can be torn by trauma which they might otherwise have withstood uneventfully.

Organ Distension

The more distended a hollow viscus, the greater is its vulnerability to externally applied blunt force. A stomach filled with food and drink or a urinary bladder bulging with urine are more readily torn by a blow to the epigastrium or suprapubic region respectively than that when either is empty or only partially filled.

EXOGENOUS FACTORS:

Exogenous factors which influence severity and nature of visceral lesions resulting from violence includes:

1. Size and consistency of the traumatizing object, e.g. first (punching), head (butting), foot (kicking), knee (stomping), hands (squeezing), club (jamming), steering wheel etc.
2. Site of impact, e.g. epigastrium, hypochondrium, inferior rib cage, suprapubic area, costovertebral angle, flack, etc.
3. Speed and weight (force or energy) of the traumatizing mechanism.
4. Nature of the traumatizing force, e.g., sharp impact or slow compression.
5. Strength of the abdominal wall.
6. Degree of abdominal "guarding" i.e., extent of protective contraction of abdominal musculature.
7. Pre-existing visceral status.

The more sudden and forceful a blow to the abdomen, the more likely is the trauma to be serious and to involve solid viscera. A lax abdominal wall, especially in elderly or intoxicated person,

provides little or no effective protection against internal injury. When an impact is powerful and unexpected, the rectus musculature may press the organ against the posterior body walls. The presence of unyielding lumbar vertebrae can result in visceral lacerations or fragmentation. In addition to being crushed in this fashion, organ can be torn by shearing force or burst from intolerably rapid increases in intraluminal pressure.

Different varieties of blunt violence produce different kinds of abdominal injuries.

Blunt force applied to the abdomen usually result in contusions or lacerations of solid viscera (spleen, liver, adrenals, kidneys) or ruptures of hollow viscera (fixed portions of the gastrointestinal tract or urinary bladder). Though seen less often, lacerations of the diaphragm, mesentery, mesenteric vessels, gall bladder and bile ducts do occur. Diaphragmatic lacerations range from tiny defects to large gaping opening through which stomach, liver and other upper abdominal viscera herniated into the adjacent hemithorax.

ESOPHAGOMALACIA AND GASTROMALACIA

Esophagomalacia and gastromalacia deserve brief mention at this point. Some persons who die hours or days after sustaining severe cerebral damage, natural or traumatic present disintegration or dissolution of their distal esophagus or gastric fundus or both, with escape of gastric content into left pleural cavity or left upper abdominal quadrant and subphrenic space. Although some older texts state that these lesions originate postmortem, recent experimental and clinical observations demonstrate that they develop during the agonal period, probably from abnormal neurogenic stimuli originating in a parasympathetic center in the diencephalons, most likely in the tuber cinereum.

Regardless of time or etiology, these esophageal and gastric changes should not be confused with those produced by antemortem disease or injury. The characteristic gross appearance of the involved areas, their extreme friability as they are manipulated and palpated and absence of accompanying inflammatory response help differentiate these process from those which result from local antermortem diseases or injury.

Abdominal injuries

The abdominal viscera are injured by the same types off violence, which injuries the viscera in the chest, that is by (1) Contusion of crushing, (2) tearing of parenchyma, (3) Rupture by a bursting force due to a rise of pressure inside the organ (4) Tearing of attachments and (5) laceration of the organ by break bones.

The blunt force injuries of the abdominal organs are divided into (1) Injuries of the parenchymatous viscera and (2) injuries of the hollow abdominal viscera and their attachments.

The Parenchymatous Viscera

The most important organs in this group are the liver, spleen, kidneys, and pancreas. Since ordinarily their consistency is firm, they are not easily ruptured by blunt force. They are also protected by bones like the ribs or are located deep in the abdomen, so that theu are not easily reached except by sever violence. The principal complication, which causes death in injuries of the parenchymatous organ is hemorrhage into the abdominal cavity.

The Hollow Abdominal Viscera

The hallow abdominal viscera, including the gastrointestinal tract, the urinary bladder and the pregnant uterus, are injured by the same types of blunt forces as are the parenchymatous abdominal viscera, but the traumatic lesions which are produced and the complication which ensure, are characteristic and dependent on their anatomic structure and exposed position in the abdomen. The stomach, duodenum and contracted urinary bladder are fairly well shielded by the skeleton or by their position in relation to other structures, but the intestine and the distended urinary bladder are protected only by the anterior abdominal wall and are therefore vulnerable to violence applied to the lower abdomen. The structure of the hollow viscera is much more fragile than that of the parenchymatous organ and serious injury may be inflicted on them by a comparatively slight degree of violence. In spite of these facts, the traumatic injuries of the solid abdominal organs outnumber the injuries of the hollow organs in ratio of 10 to 1. The hallow viscera are more mobile and may elude the traumatizing force more easily than the solid viscera, which are anchored and less able to escape the effects of violence, a consideration which may be the difference in the incidence of blunt force injuries of the two different types of abdominal organs.

Stomach

The left lower ribs protect the greater part of the stomach, but a portion of the pylorus is exposed in the epigastrium. A sever thrust, especially a localized violence, in the region of the epigastrium of left hypochondrium, may produce contusion, tearing and bursting rupture of the stomach wall. Laceration by broken bones is rare, and tears of the stomach ligament or omentum are not common lesions of great importance. The types of blunt force which produce traumatic injuries of the stomach are encountered in run-over highways accidents, falls from a height, or the severe localized impacts applied to the epigastrium such as might be caused by kicks or trampling.

Contusion of the stomach is caused when an object with a limited area of impact strikes the epigastrium and violently compresses the stomach between the anterior and posterior abdominal walls. This type of injury may be associated with laceration of the liver near the suspensory ligament, which was the source of the fatal intra-abdominal hemorrhage. In addition there were two separate stellate lacerations of the same size and type on the mucous membrane of opposite walls of the stomach. There may be contusion of the adjacent muscular coats, but no injury of the serous surface. The stomach injuries play a minor role in causing death, but important as characteristic example of gastric contusions and as indicates of the type of violence, which was applied against the abdomen. In cases in which the victim lives long enough, the stomach may undergo perforation by action of the gastric juice which digests and erodes contused areas, in which the vitality of the tissues has been impaired by the trauma. In such cases death results from a rapid septic peritonitis.

Tearing of the stomach is more common and may be produced by the grinding action of automobile wheel or any other severe tangential force with experts a traction from right to lift, on the pylorus in the longitudinal axis of the stomach. Partial transverse tears of the anterior wall or complete transverse tears of the pylorus may result.

A violent force impinging upon the epigastrium causes bursting ruptures, while the stomach is full of contents in such a way that the viscus is compressed and the internal pressure is increased. The stomach wall ruptures at the most dependent portion of the great curvature, or near the cardiac

end of the great curvature, producing a circular perforation. The edges of the rupture are ecchymotic and the lesions are to be distinguished from the reactionless postmortem digestion, which may cause a perforation of the stomach wall in the cardiac area. . The traumatic rupture can be readily differentiated from perforation due to an ulcerative disease process like peptic ulcer or gastric carcinoma.

The complications, which cause death in traumatic gastric perforations, are either shock or hemorrhage resulting from lesions of other viscera or from sever peritonitis caused by escape gastric contents and virulent bacteria into the abdominal cavity.

Duodenum

The duodenum is a curved piece of intestine, the lower end of which crosses the vertebral column at the of the second lumbar vertebra. Practically all-traumatic lesions due to blunt force are located at this point. A severe localized violence may compress the duodenum against the vertebral column and cause a contusion or perforation of its anterior and posterior walls, just as it does in the case of the stomach.

The digestive fluid in addition may erode the traumatized area and convert a contusion into a fatal perforation.

Partial and complete transverse tears of the duodenum also occur at this point, and are due to a severe localized violence acting on the abdomen in a tangential fashion, so that the dependant portion of the loop is subjected to traction either to the right or left. Bursting rupture occur whenever the duodenum is compressed by violence applied to the epigastrium, while its lumen is distended with fluid. The pressure inside viscus is increased, so that it bursts at its most dependent portion, producing a circular perforation 5 to 10mm in diameter.

The perforations of the duodenum allow gas-forming bacteria to enter the retroperitoneal tissues, and gaseous gangrenous cellulites of the right lumbar fosse results, which causes death by sepsis. Occasionally pancreatic secretion escapes through the rupture and produces multiple areas of fat necrosis.

The clinical indications of duodenal rupture are pain and rigidity in the upper part of the abdomen and other well-marked signs of septic peritoneal inflammation. An exploratory laparotomy is sometimes performed on these cases, and the surgeon is not always be able to find the injury, because of the posterior retroperitoneal location of the duodenum in the abdomen which makes investigation of it difficult at operation. The only treatment for these injuries is early operation, and suture of the rupture before the retroperitoneal cellulites has a chance to develop, for if it is established, it is usually fatal.

Intestines

The small intestine lies in the abdomen below the epigastrium and in front of the lumbar spine. It is easily injured by the violence applied to the abdominal wall in the region of the navel. The large intestine or colon is also located in the anterior part of the abdomen, but is effectively cushioned posteriorly, except in such places as where the transverse colon crosses the spinal column of where the cecum and the descending colon are in just apposition to the iliac bones. The small intestine is more exposed to trauma, and consequently its blunt force injuries out number those of the large intestine, by a ratio of over 11to1. The intestinal injuries include contusions, tears bursting ruptures, lacerations by broken pelvic bones and contusions and lacerations of the mesentery and

mesocolon to which the intestine re attached. The intestines and mesenteries can be injured during diagnostic and surgical procedures.

A contusion of the intestine, which may result in a perforation, can be produced by a severe localized violence like kick or by impact of the abdomen against a projecting object, the affected intestinal coil being bruised between the anterior and posterior abdominal walls. This injury my occur at any level in the intestine, but in the large intestine, it is most often found in the middle of the transverse colon or in the cecum or descending colon, where the bowel is in close relationship to underlying bones. Extravasation of blood may occur in the intestinal wall, which may be perforated directly by the violence. The perforation is usually single with ragged edges about 1 to 5 cm in diameter, and surrounded by sever ecchymosis. It may involve any portion of the circumference of the bowel and even the mesentery. It is not a common lesion. In cases in which the intestinal wall is contused near the duodenum, it may erode the devitalized injured area into the abdominal cavity.

Tears of the intestine may be partial or complete and are caused by a tangential force acting on the abdomen and exerting traction on the intestinal wall. The complete tear is usually the result of a grinding action like that produced by the wheel of an automobile, and occurs most often at the upper end of the jejunum, where the intestine is anchored by the ligament to Traits. The intestine is put under tension longitudinally and torn at somewhat distal to its upper attachment, the tear extending into the adjacent mesentery. The circular muscle in the injured segment of bowel contracts and prevents excessive leakage, but later the muscle relaxes and the intestinal contents escape into the peritoneal abscesses among the intestinal coils. A partial tear is the result of a severe force which crushes portion of the intestinal wall by a tangential action and rips some of it way leaving an ovoid opening with ragged edges about 3 to5 cm in diameter, usually in that portion of the intestinal circumference opposite the mesenteric attachment.

Bursting ruptures of the intestine are encountered most often in the lower ileum, but can occur in any part of the bowel. The intestine is usually distended by fluid at the time of injury. The rupture is produced by an impact against the lower abdomen, which increased the pressure with in the intestinal lumen and causes the intestine wall to give way at its weakest point. If the intestines are in a hernial sac, the chances of bursting are increased, because the fluid and gas cannot escape from the relatively fixed intestinal loops and also became of the exposed, poorly protected position of the hernial sac. There have been cases in which sever straining at stool was sufficient to rupture a coil of small intestine or a portion of the colon which was included in the contents of inguinal hernia. When a bursting rupture of the intestine is encountered with in a hernial sac the possibility of its being caused by a slight trauma or by non-traumatic action has to be consider. Intestinal ruptures are small single or multiple, circular or ovoid perforations about 5 to10mm in diameter, located usually in the wall of the bowel opposite the mesenteric attachment. The edges of intestinal ruptures are ecchymotic, a finding which serves to distinguish the lesions from perforations due to disease or artifact.

Sudden distention and bursting ruptures of the large intestine have resulted from the introduction of compressed air, which was allowed to escape from an air jet placed near the anal orifice as a practical joke. Auster and Williard have describe similar bursting ruptures of the large intestine, among other lesions in person floating in water resulting from the near by explosion of death of depth charges.

The appendix is rarely injured. Contusion can result from a severe localized violence which compresses the viscus against the pelvic brim. There was one example of contusion of the appendix and it was associated with other sever blunt force injuries with in the abdomen which were rapidly fatal. An appendix in a retrocecal position is cushioned against injury by the cecum, which is anterior to it.

The clinical picture, when there are blunt force injuries of the intestine, is variable. In some case there are signs of immediate shock and hemorrhage usually from associated injuries in other viscera. In others the violence producing the rupture is not severe enough to cause, and the victim does not experience immediate ill effects, the initial symptoms and signs often being obscured by alcoholism; but in a few hours signs of peritoneal irritation, such as pain, tenderness, abdominal rigidity and tympanites, make their appearance. If an exploratory laprotomy is performed promptly and the intestinal lesion repaired, the patient may recover, if the operation is delayed, the intestinal contents, which escape into the abdominal cavity through the rupture, will cause acute suppurative peritonitis, which is usually fatal.

Laceration of the intestine by broken bones is rare. In one case the sharp fragment of a separated sacroiliac tore the lower end of the sigmoid joint. Death was the resulting of a suppurative peritonitis, caused by the leakage of fetal material into the abdominal cavity through this tear.

MESENTERY:

The structures most often affected by injury are the mesentery of small intestine and the mesosigmoid. The other mesenteric subdivision and the omentum are rarely involved. The injuries are classified ‘’s (1) tears and (2) contusions.

1. The mesentery may be torn by a grinding force like that generated by an automobile wheel, or by a severe localized violence, which strikes the abdominal wall as a tangent traction, is exerted on the mesentery, causing circular and ovoid result of varying size, either single or multiple.
2. The mesentery, especially one which contains much fat, may be contused and perforated by a severe local force which compressed and crushed it between the anterior and posterior walls of the abdomen, the perforation corresponding roughly to that of the impact surface. If several folds of the mesentery are involved, the one nearest the violence shows the severe effect, the severity of the injury diminishing successively in the fold beneath the perforations may take the from of ragged excavations near the roof of the mesentery. Some of the injuries are caused by trampling or kicking the abdomen and are homicidal. In one such case the relaxed abdomen of the victim was probably repeatedly trampled on, with the production

of two large ragged tears about 12 and 18 inches in diameter in the iliac portion of the mesentery.

The most common complication of a mesenteric tear or perforation is severe and often fatal intraabdominal hemorrhage from torn mesenteric vessels. In some intestine where there are end arteries and the victim survives the immediate effects of the injury only to develop a local gangrene of the segment of intestine adjacent to the lacerated mesentery as the result of the interruption of its blood supply. Death may occur from septic peritonitis or from toxic and obstructive ileus as illustrated.

The clinical signs of a lacerated mesentery are those of severe intra-abdominal hemorrhage and shock. If the patient survives a few days, there may be abdominal distention, pain and rigidity due to toxic and constrictive ileum or peritonitis. The treatment for mesenteric laceration is prompt exploratory laparotomy and ligation of torn blood vessels. It may be necessary to resect a portion of the intestine, especially if the adjacent mesentery is lacerated in order to forestall the development of gangrene in the segment of bowel deprived of its blood supply by the mesenteric injury.

The intestines and mesentery may be lacerated in cases of criminal abortion and occasionally during a therapeutic abortion by instruments, which have performed the uterus. Martland has described patterned hemorrhage extravasations in the intestinal wall produced by manipulation of the intestine with sponges holding forceps and Babcock tissue forceps. In one case the intestinal injury produced by the sponge - holding forceps resulted in a fatal intestinal hemorrhage. The sigmoid colon has been perforated during sigmoidoscopic examination with the development of fatal peritonitis.

LIVER

The size of the liver and its solid (non-compressible) consistency, combined, renders it vulnerable to blunt forces, applied either to the upper abdominal or lower thoracic regions, especially on the right. It is the most frequently damaged abdominal organ, and is second only to the brain in overall visceral susceptibility to this modality of violence.

The liver can be contused, lacerated or crushed without concomitant damage to overlying or adjacent ribs. However, injuries to the liver from pressure or impact to the overlying chest wall in older persons are usually accompanied by costal fractures.

Varieties and locations of blunt liver injuries

Blunt liver traumata comprise such varied lesions as lacerations, subcapsular hematomas, and central ruptures, bursting disruptions, fragmentation avulsion and tearing of ligamentous supports to the right diaphragm.

The right hepatic lobe is injured more frequently than the left, and the liver lacerations are located most often on its anterior aspect. The hilus, located on the posterior is infrequently involved.

Pre-existing hepatic disease (example fatty infiltration, malaria, hepatitis, and passive hyperemia) increases its fragility so that major injury can result from comparatively minor violence.

Pathogenesis of Blunt Injuries of Liver

The physical dimension of liver traumata from blunt violence is frequently larger than that of the areas of external impact. Compression of the liver between the inferior costal margin and posterior body wall can result in deep lacerations or even fragmentation.

Extensive parenchymal injury can occur without simultaneous capsular laceration, a situation comparable to that observed with pulmonary parenchymal laceration in the presence of intact overlying visceral pleura. Should the victim of such an injury survive for hours or days, bile and blood accumulate beneath the undamaged impervious capsule.

Crushing impact to the lower rib cage, which results in the broken ends of fractured ribs being driven into the adjacent liver, create ragged capsular and parenchymal laceration.

Physiological Effects of Blunt Liver injuries

Clinical responses to non-penetrating liver injuries depend on their size and character. Massive ruptures can lead to prompt death from traumatic and hypovolemic shock secondary to profuse interaperitoneal bleeding.

The gravity of lacerations and ruptures can be appreciated by considering its portal venous supply which furnishes large volume of blood. A rich network of valve less intrahepatic veins, which do not retract provides an excellent source for exsanguinating hemorrhage. Once the liver and its parenchymal venous channels have been torn, persistent bleeding is the rule. Spontaneous cessation of hepatic bleeding is uncommon, if any, but the smallest vessels have been damaged. Sub lethal liver injuries aggravate shock produced by other traumatized organs, hastening the fatal end. Sub capsular tears may permit survival for hours or days, before mounting pressure in the intrahepatic hematoma ruptures the capsule with subsequent massive intraperitoneal bleeding.

An additional danger created by the liver lacerations, which are not immediately or rapidly fatal from hemorrhage, is bile peritonitis resulting from its intraperitoneal accumulation. The peritoneal venules and capillaries exposed (bather) to bile in this fashion lose their tone and become abnormally permeable, permitting intraperitoneal leakage of comparatively large volumes of plasma and thus provide a potent acceleration for the appearance of hypovolemic shock.

Traumatic Liver Infarcts and Liver Repair

Should the victim of a liver laceration or contusion survive for hours or days, the cells at and adjacent to the sites of trauma undergo ischemic necrosis. The basis for the prompt appearance of ischemic hepatocellular infarction derives, amongst other factors, the nature and distribution of the hepatic blood supply.

Unlike other glandular organs whose structural pattern derives from their duct distribution, the architectural patter of the liver is based on its vascular scaffolding. Contusions and lacerations of the liver inevitably result in disruption of portions of its arterial and venous supply and of its venous drainage pathways. Intrahepatic arterioles are end arteries, each vessel being functionally essential. So too damage to venous inflow (portal vessel) and venous drainage (hepatic veins) systems creates superimposed insult for actively functional hepatic cells with their high metabolic rate. The result is prompt cell death.

The liver possesses excellent capacity for recuperation and repair, and victims of parenchymal liver laceration or contusion, who survive for weeks, demonstrate active hepatocellular regeneration with multiple mitoses as well as vigorous fibroblastic proliferation.

SPLEEN

The spleen can be injured by blunt force applied to the left hypochondrium or left inferio-lateral thoracic wall. Weakness in its supporting tissues, delicacy of its capsule, and friability of its parenchyma condition splenic vulnerability to blunt trauma. The latter aspect is magnified when the pulp is hyperplasic, congested or otherwise abnormal, comparatively small lacerations of the splenic parenchyma and capsule overlying the site of injury can lead to prompt copious bleeding with speedy onset of hypovolemic shock.

Spontaneous Splenic Rupture

Whenever a splenic laceration causes or contributes to death, microscopic examination of the spleen should be carried out to establish or exclude the presence of pre-existing natural diseases, which can either render the spleen excessively vulnerable to comparatively minor trauma or be responsible for 'spontaneous' (i.e., non-traumatic splenic rupture). Infectious mononucleosis, malaria, typhoid fever, hemophilia and leukemia can produce 'spontaneous' ruptures of this type. Normal spleens do not rupture spontaneously.

Varieties of Splenic Injury

Splenic injuries from blunt violence range from small capsular lacerations with resultant minor intraperitoneal hemorrhage, or explosive lacerations of bursting disruptions with subtotal fragmentation of the organ. With sufficiently severe violence, the spleen may be morsel zed. An additional variety of splenic injury is laceration or avulsion of its vascular pedicle.

The initial effect of blunt splenic injury may be laceration of its pulp beneath an intact capsule with subsequent accumulation of an intrasplenic hematoma. Should blood continue to collect, thus giving rise to delayed, or secondary splenic rupture, with resultant intraperitoneal hemorrhage occurs. Microscopic examination of spleen, responsible for delayed hemorrhage, reveals cellular response to injury and organization of the hematoma, thus providing objective evidence that the lethal injury with sustained hours or days prior to death.

PANCREAS

Pancreas injuries from blunt violence are not in-frequent, thanks its impact, such as those sustained in high speed steering wheel injuries, i.e., where the steering wheel of a motor vehicle is jammed into the abdomen of a driver involved in a collision with a second car, or a solid obstruction can result in pancreatic contusion with fat necrosis and retroperitoneal hemorrhage, a combination of responses which lead to sever shock.

A seriously contused or lacerated pancreas usually represents only a fraction of widespread injury involving other thoracic and abdominal structures. Should the pancreas and the overlying posterior parietal peritoneum be lacerated, hemorrhage is usually profuse with intraperitoneal and retroperitoneal bleeding. Escape of pancreatic secretions into the peritoneal cavity along with the blood produces omental and mesenteric fat necrosis and chemical peritonitis.

Pancreatic contusion can result in splenic artery or vein thrombosis.

KIDNEYS

Although their small size, relative toughness and protected location combine to render the kidneys relatively immune from mechanical injury, blunt force can damage them either by direct application of violence by a fall from a height with the victim landing on his feet or buttocks.

Anatomic and physical factors in blunt injuries

Both kidneys ordinarily move slightly with changes in body position and respiration, the left being somewhat more mobile than the right. The main sites of renal fixation are the aorta, by way of the renal artery, and inferior vena cava, by way of the renal vein.

One fourth to one fifth of each kidney ordinarily lies below the level of the coastal margin. With deep inspiration, as much as one half of both kidneys may be exposed below the lowest rib

especially on the right. It is this portion of the organ which is most susceptible to direct force, injury transmitted through the soft tissues of flank or abdomen.

Renal mobility permits injury to be produced when great force is suddenly applied, which exaggerates normal degree of renal excursion. Injuries of this type are observed when the victim falls from a considerable height and strikes an unyielding surface. Such sudden deceleration can cause not only burst of the renal parenchyma but also a sudden jerk on the renal. The latter can lead to abnormal hyper mobility, laceration of the renal pedicle or separation of the kidney from its vascular attachments.

Although the vertebral columns offers some protection to the kidneys vertebral processes and lower ribs can be instrumental in aggravating renal injury when a hard blow is delivered to the flank or anterior abdomen. A sharp impact from behind can drive the lower ribs inward against the kidney, producing a contusion. If the blow broke them, the sharp fractured ends may penetrate or lacerate the kidney.

The fact that the right kidney is somewhat more firmly fixed than that the left, is partially responsible for the higher incidence of right-sided renal injuries. Although perinephric fat affords some protection, it may be scanty in young and slender persons that it offers little effective cushioning of a blow.

Physiologic Factors in Blunt Renal Injury

It is virtually impossible to disrupt a normal kidney in a cadaver by blunt force applied to the body surface. Turgor imparted by blood and urine intra vitam is essential for the occurrence of renal lacerations from non penetrating injuries.

Because the kidney is encapsulated and filled with blood and urine during life, a vigorous blow initiates forces, which act in accordance with **Pascal's law**, which states that the force exerted upon any violent blows to a kidney can result in bursting injuries with fragmentation or multiple bisections. Blows of lesser force produce minor lacerations of capsule or cortex.

Age and Pre-existing Renal Diseases in Blunt Renal Trauma

Children and young adults are more vulnerable to kidney injury than older persons. Younger person tend to have more renal ptosis, their peritoneal fascia (which acts as buffer) is not well developed, perirenal fat is comparatively scanty, and their kidneys lie directly under a tense posterior parietal peritoneum which is readily ruptured by blunt force.

Pre-existing diseases increase kidney's vulnerability to blunt injury. Obstruction in the ureteropelvic region (strictures, blockage by aberrant blood vessels, pelvic stones with ensuing hydronephrosis or phyonephrosis) enhances the probability of renal lacerations from mechanical trauma. Spontaneous rupture of normal kidneys does not occur. In those rare instances, where a kidney does rupture spontaneously, the involved organ is invariably the seat of far advanced renal parenchymal disease.

Renal pedicle Injuries

Blunt trauma to the kidney can result in kinking, contusion or laceration of its pedicle. Ordinarily, kidney fixation is sufficiently elastic, so that it returns to its original position after it has been displaced momentarily by an impact. However, if it's facial, ligamentous or peritoneal supports are

ruptured by a direct blow or transmitted stress; permanent dislocation can result with ensuring urethral obstruction and consequent intermittent or chronic hydronephrosis.

Concomitant interference with blood flow through renal artery or vein can led to complete parenchymal infraction or atrophy. Trauma to the renal vessels can lead to ensuring thrombosis. Violent kidney displacement by non-penetrating trauma can lacerate with rapidly fatal intra peritoneal bleeding, retroperitoneal bleeding, or both.

Renal Parenchymal Injuries

Non-penetrating kidney injuries comprise contusions and lacerations, occurring either single or together. Contusions range in severity from simple sub capsular ecchmoses to complete disruption.

Lacerations can occur beneath intact capsule with ensuring minor hemorrhages. Disruption of parenchymal vessels incidence to laceration causes infraction of adjacent uninjured cortex. Comminution or fragmentation of a kidney can occur as a result of a violent blow over the thoracolumbar area, an injury observed most often in pedestrians struck by motor vehicles. Intraparenchymal and perinepheric hemorrhages are important sequelae of such injuries. Superimposed infection adds additional damage, danger to those already present.

Blunt Injuries to Preinephric Fat

A forcible blow over the flank may injure perrinephric fat while sparing the kidney. Laceration of fat with perinrphric hemorrhage is more common than traumatic fat necrosis. Kidney displacement within its fatty capsule or the force of the blow against the perinephric fat can lacerate small or even relatively large vessels with ensuring hemorrhage. The amount of bleeding may be so small as to be clinically insignificant or so large as to result in the formation of a massive perirenal hematoma .Perirenal apoplexy can occur spontaneously i.e., independent of trauma. Systemic disorders in which hemorrhagic diatheses and consequent purpura are prominent features can give rise to perinephric bleeding which may be indistinguishable from that produced by trauma.

ADRENALS**:**

Blunt flank injuries, which damage the kidney, its vascular or adjacent perirenal fibrofatty supporting tissues, can also traumatize the nearby adrenal gland and its arterial and venous channels. Lacerations, hemorrhage and traumatic infarcts of cortex and medulla are the most common adrenal responses to blunt trauma.

URINARY BLADDER

The bladder is a distensible muscular sac, which lies in the pelvis. It receives the urine from the kidneys through ureters, and after collecting a sufficient amount discharges it through the urethra voluntarily. The bladder when empty lies in the pelvis, and is protected by the surrounding bone. As it fill with urine the bladder rises above the pelvic brim and impinges against the promontory of the sacrum.

Injuries to the urinary bladder from blunt force are usually associated with fractures of the bony pelvis. The vesical injury may involve merely its mucosa or it may extend completely through the wall (transmural). Bladder injuries are less common in women because of its lower, better protected position in the female pelvis.

Two types of ruptures of the bladder and produced by the blunt force: (1) the extra peritoneal and (2) the intraperitoneal.

1. Extra peritoneal rupture

The extra peritoneal ruptures of the bladder are caused by fractures of the pelvis, especially of the pubic rami and the sacro-iliac joints. The bone fragments project inward, lacerating the bladder wall and occasionally tearing the membranous urethra across below the prostate. As a result urine is

Extraveasated on tissues around the bladder, and they infiltrate the subcutaneous tissues of the scrotum, abdomen or thighs. Death may occur from shock because of the pelvic fractures, or from sepsis referable to the gangrenous phelgmon and abscesses, which develop in the areas where the urine is extravagated.

Occasionally an extra peritoneal rupture occurs in the absence of a pelvic fracture, the violence may act on a partly filled bladder from above, forcing it towards the pelvic floor, increasing the internal pressure and causing a rupture near the trigonium, which communicates with the perivesicle connective tissues.

2. Intraperitoneal fractures

The intraperitoneal rupture is not necessarily associated with fractures of the pelvis. The bladder is easily injured when it is distended by urine and rises above the brim of the pelvis until it rests against the promontory of the sacrum. In this state, especially in a relaxed alcoholic person, a slight force against the lower abdomen may cause the bladder to rupture, because sudden increase in intravesical pressure. The rupture is a bursting one and is located at the fundus, appearing as an ovoid opening with slightly ecchymotic edges. Urine usually escapes into the peritoneal cavity and may give rise to a fatal peritonitis or toxemia from absorption of toxic products into the circulation. A distended bladder may also rupture spontaneously or after slight trauma especially in case of a urinary obstruction from stricture, enlarged prostrate or neoplasm.

The symptoms and signs of an intraperitoneal rupture of the bladder may be indefinite immediately after the trauma, and the victim may not realize that he has been dangerously injured, especially, if he is intoxicated at that time. Within a few hours, peritonitis sets in, and the patient if conscious complaints of pain and tenderness in the lower abdomen, rigidity, tympanites and vomiting.

The treatment is prompt exploratory laparotomy and repair of the rupture. With early operation there is a good chance of recovery, but if the procedure is delayed or out, death will occur from peritonitis.

Rupture of the gastrointestinal tract and urinary bladder will not only if the edges of the wound are approximated by suture.

Bladder Distension and Rupture

Bladder vulnerability to rupture from blunt trauma is related directly to its degree of distension at the moment of impact. Indeed, it is questionable whether an empty bladder can be truly ruptured. A hard kick or a solid blow to the suprapubic retention in which there is a markedly distended

bladder creates stress force, which affects all portions of its wall equally. Ruptures occur at the sites of least resistance.

Bladder distension leads to tightening of the peritoneum over its dome. Because the peritoneum is the least elastic elements in the vesicle wall, it tears first. Ruptures produced by hydraulic force operating in urine-distended bladders usually occur in their superior or portions.

Spontaneous Bladder Rupture

True spontaneous rupture of a normal urinary bladder probably never occurs. Where there appears to have been a spontaneous rent, there is usually a predisposing factor such as chronic over distension, infection or ulceration. A diseased bladder may rupture due to a minor fall, straining at stool, a sneeze, or sudden exertion incident to lifting a heavy weight. Such ruptures are usually extra peritoneal.

Pelvic Fractures and Bladder injury

The most common direct cause of mechanical injury to the urinary bladder is fracture of the bony pelvis. Under such circumstance, bladder injury is probably caused by a combination of the explosive hydraulic effects of compression and the lacerating effect of the broken bones. The most common location for injuries, from this constellation of forces, is near the vesicle neck with resulting extra peritoneal urine extravasations.

Bladder injuries range from superficial laceration to intraperitoneal rupture in which there is free communication between bladder lumen and peritoneal cavity, and extra peritoneal rupture in which the bladder is lacerated in areas not covered with visceral peritoneum. The latter injury is commonly encountered with comminuted pelvic fractures.

Hemorrhage or primary shock following bladder laceration can be quickly fatal. Should the victim survive these initial threats, he may develop extravasations of urine with superimposed sepsis and peritonitis, ascending renal infections being an additional threat.

ABDOMINAL AORTA

The abdominal aorta and iliac vessels are injured some times by a severe impact against lower abdomen, especially if the force is localized. The arterial tears are transverse and involve usually a portion of the anterior surface of the vessel. The principal complication is retroperitoneal hemorrhage. In one instance such a rupture of the abdominal aorta was caused by plaster falling upon the exposed abdominal wall of the person lying in bed in the supine position.

UTERUS:

Blunt force injuries of the pregnant uterus are rare. In one case 39 year old white woman, five months pregnant was run over by an automobile sustaining fractures of both pubic rami of the left side, a partial separation of the sacro-iliac joint, a fracture of the left humorous and small lacerations of the mesentery. The violence had exerted pressure on the lower portion of the pregnant uterus, rupturing the fundus and amniotic sac by an opening three and a half inches in diameter through which the fetus still attached to the placental site had been forced into the abdominal cavity. Death occurred as a result of a profuse intraabdominal hemorrhage.

In another case a pregnant women committed suicide by jumping from a height she was killed outright. There were multiple injuries including fractures of the pelvis and the ribs. The uterus was

enlarged with pregnancy but appeared collapsed though not ruptured. There was a traumatic rupture of the amniotic sac and a partial separation of the placenta. A fetus of three and one half months gestation was found in the uterine cavity.

Injuries of the non pregnant uterus due to blunt force are extremely rate unless the violence is exceptionally severe.

PELVIS

The pelvic girdle which surrounds the bladder, rectum and genital organs is composed of two innominate bones, which are joined together in front by cartilaginous disc at the symphysis and in back by articulation with the sacral bone at the sacro-iliac joints. The pelvis is a bowl-shaped structure of great

Strength absorbing the shock of the upward thrusts of the thighbones on each side and at the same time supporting the entire trunk above the hips.

The pelvis may be broken by a severe impact as in a fall from a height. If the victim happens to land on the greater trochanter of the femur, the head of the bone is forced violently into the socket of the hip joint, splitting the pelvis transversely through the acetabulum, or producing a Y-shaped fracture in that fossa; these fractures gape widely and the head of the femur can usually be palpated through the fracture from the inside of the pelvis. If the impact acts on the pubis external to the obturator foramen, oblique fractures of the pubic rami may occur adjacent to the fractures across the pubic rami, the sacrum is occasionally broken transversely by the application of direct violence.

A severe crushing or grinding force, such as might be produced by the wheels of an automobile may cause extensive luxations of the sacro-iliac joints, a wide separation of the symphysis pubis, fractures of the pubic rami and of the sacram. In some cases there is extensive tearing of the peritoneum, scrotum, urethra, vagina and anus. Death usually result from immediate shock, but if the victim lives for a few hours the hemorrhage which follows such injuries may be a factor in producing delayed shock. In a few instances, the victim survives the immediate effects of the trauma and later develops a supportive or gaseous gangrenous inflammation in the region of the lacerations. In some cases bladder injuries produced by the fractures are responsible for the fatal complications.

Complications of Abdominal Injury

The most common fatal sequel to intra-abdominal trauma is hemorrhage from any of the contained organs. The spleen and mesentery tend to bleed most copiously and quickly, though even here there can be a delay of many hours before serious symptoms are obvious, and in the case of sub capsular lacerations of the spleen the time can be far longer. The liver tends to ooze more slowly unless a major injury opens a large vessels or an extensive area of hepatic tissue.

The mesentery contains numerous blood vessels that are not covered by parenchymatous tissue as in the liver or spleen, so bleeding is usually brisk from tears.

Because all bleeding is in the abdomen, unless it be from a wound of the aorta, takes time to accumulate, restriction of the victim's activity immediately after the injury need by minimal or absent unless there are other factors involved. It is never safe for a pathologist to declare that rapid immobility must have ensued unless there are other gross injuries.

In spite of common surgical experience, even severe intra-abdominal injuries leading to bleeding need not necessarily be painful, especially in the commonly associated circumstance of the victim being under the influence of alcohol.

Perforation of the gastrointestinal canal is another serious complication of trauma. As in natural perforated peptic ulcer, penetration of the stomach or duodenum will cause a chemical peritonitis that can be cause of severe and immediate shock, perhaps a major factor in a rapid death.

Rupture of the small or large intestine is less damaging. But if survival continuous, will inevitably lead to generalized peritonitis, unless, vigorously treated. Open wound of the abdomen, including stabbing, will introduce organisms from the outside into the peritoneal cavity. In addition to infection, trauma to the intestines may cause an intractable ileus; if the pancreas is damaged there may be widespread fat necrosis in the mesentery and omentum.

AIMS OF THE STUDY

1. To analyze the deaths due to blunt injury abdomen brought to the mortuary (Both dead on arrival and dead after hospitalization) during calendar year 2005.
2. To make a comprehensive and detailed study to recognize the pattern of the abdominal viscera commonly involved in relation to blunt trauma.
3. To identify the commonest complications leading to death in abdominal trauma.
4. To arrive at the nature and mechanism of death.

MATERIALS AND METHODS

A total of 50 cases of deaths from blunt abdominal trauma from 1st January 2005 to 31st December 2005 were taken up for study. Routine information like age, sex, occupation brief facts of the cases collected from the inquest report.

Clinical history like time of admission, and deaths and other relevant data was collected from the hospital case sheets and death summaries.

Pattern, nature of injuries, complications, cause of death and mechanism of death were obtained from a detailed follow up and study of the autopsy cases and reports.

The detailed proforma format adopted for the above details and information was as follows:

Cr.No PME No: Date:

1. Preliminary Data:

Age: Sex: Area: Urban ||Rural

Marital status:

1. Police Station:
2. Place of Incidence:
3. Date and Time of Incidence:
4. Date and Time of Death:

5. Whether Admitted to Hospital: Yes|No

6. Total period of survival:

7. Manner of Death: Accidental|Homicidal

8. Details of the incident:

A. FROM RELATIVES:

B. FROM INVESIGATING OFFICER:

C. FROM THE CASE SHEET:

(In case of Hospital deaths)

11. Post Mortem Examination:

1. External Examinations:

Post Mortem Staining:

Rigor Mortis:

Any decomposed changes:

Injuries:

1. Internal Examination:

1. Stomach & Small intestine:

2. Liver:

3. Spleen:

4. Pancreas:

5. Mesenteric arteries:

6. Large intestine:

7. Bladder:

1. Uterus|Fallopian tubes:

2. Prostate

3. Pelvic bones|Spinal cord:

4. Peritoneal fluid: Quality: Quantity:

5. Cause of the death:



PME NO. 248/05.

CASE REPORT – 1

PME NO. 248/05 P.S.SANATH NAGAR

Crime No. 21/05 Dated: 25/01/2005.

The deceased was a male aged about 40 years working as a laborer. He sustained injuries due to the collapse of the wall on which he was working on 25-01-2005 at about 12:30pm. He was admitted in the hospital the same day at 1:55pm and died under treatment at 3:30pm on the same day.

POST MARTEM FINDINGS

EXTERNAL: 1. Abrasion of 15 X 4 c.m obliquely placed on the front of right side of chest and abdomen.

INTERNAL: 1) Both the kidneys were contusion

2) Multiple contusion present in the intestines and omentum.

3) Fracture of left sacroilliac joint.

4) About 1Ltr of partially clotted present in peritoneal and pelvic cavities.

PME NO. 370/05

CASE REPORT – 2

PME NO. 370/05 P.S.: NARSINGI

Crime No. 30/05 Dated: 05/02/2005.

A 60 Years old man sustained injuries on the evening of 30-01-2005 due to a fight with his neighbor. After the fight he left his home. Four days later his dead body was found on the road side in a decomposed state.

POST MARTEM FINDINGS

EXTERNAL: No external Injuries

INTERNAL: 1) Right lob of liver lacerated

2) Spleen Lacerated

3) Right Kidney Lacerated.

CASE REPORT – 3

PME NO. 768/05 P.S.: AFZALGUNJ

Crime No. 248/05 Dated: 12/03/2005.

A Two Wheeler hit a female aged about 40 years, on 08-03-2005, while she was crossing the road at a village. She was treated at a Local P.H.C. and was later shifted to Osmania General Hospital on 09-03-2005 at 4:10 PM. The patient was operated upon. She died on 12-03-2005 at 8:30AM. There was an incidental finding of ovarian cyst on right side.

POST MARTEM FINDINGS

EXTERNAL: No external Injuries

INTERNAL: 1) Perforation of Jejunum

2) Peritonitis.

CASE REPORT – 4

PME NO. 907/05 P.S.: JADCHARLA

Crime No. 79/05 Dated: 23/03/2005.

IP NO. 10578

MLC NO.7796.

A 27 year old man met with an accident when the van which he was driving was hit by a lorry at about 8:00am on 22-03-2005 near Jadcherla. He was shifted to the head quarter Hospital at Mahaboob Nagar and then to the osmania general hospital. He died under treatment the same day at 5:45pm. The clinical cause of death was hypovolemic shock associated with blunt injury abdomen.

POST MARTEM FINDINGS

EXTERNAL: No external Injuries were found

INTERNAL: 1. multiple contusions present in mesentery and small intestines.

2. Rupture of mesenteric blood vessels with two liters of partially clotted blood in peritoneal cavity.

CASE REPORT – 5

PME NO. 950/05 P.S.: SHAMSHA BAD

Crime No. 78/05 Dated: 27/03/2005.

A male aged about 32 years, alleged to have sustained injuries due to road traffic accident due to hit by bike, while he was traveling by auto on 25-03-2005 at 8:30PM. Immediately he was shifted to Osmania General Hospital. While under going treatment died on 27-03-2005 at 1:40PM.

POST MARTEM FINDINGS

EXTERNAL: 1) Multiple contusions and abrasions measuring 3X2 centimeters to 2X1 centimeters present over chest and abdomen.

INTERNAL: 1) Ileocaecal perforations.

2) About 500 cc of blood stained fluid in peritoneal cavity.

3) Lacerated wound measuring 5X2X0.5 centimeters on inferior surface of right lob of liver.

CASE REPORT – 6

PME NO. 1021/05 P.S.: DEVARAKONDA

Crime No.53/05 Dated: 03/04/2005.

IP NO. 11895.

MLC NO.9233.

A male aged about 22 years, alleged to have sustained injuries due to road traffic accident due to hit by jeep, while he was traveling by auto at Devarakonda Mahaboob Nagar District 31-03-2005. Patient was shifted to Devarakonda Hospital. Later he was shifted to Osmania General Hospital. While undergoing treatment he died on 03/04/2005 at 5:45AM.

POST MARTEM FINDINGS

EXTERNAL: No external injuries

INTERNAL: 1) perforation of jejunum.

2) About 800 cc of blood stained fluid in peritoneal cavity.

CASE REPORT – 7

PME NO. 1514/05 P.S.: NAMPALLY

Crime No.92/05 Dated: 15/05/2005.

A Female child aged about 2 years, with alleged history of road traffic accident due to hit by a Jeep, while going on a bike with her parents at Gollapally on 13-05-2005. Immediately she was shifted to Niloufer Hospital. While undergoing treatment she died on 14-05-2005 at 5:30AM

POST MARTEM FINDINGS

EXTERNAL: No External injuries.

INTERNAL: 1) Perforation of the anterior wall of stomach.

2) About 200 cc of blood stained fluid in peritoneal cavity.

PME NO. 1517/2005

CASE REPORT – 8

PME NO. 1517/05 P.S.: TIRUMALA GIRI

Crime No.29/05 Dated: 15/05/2005.

IP NO. 17666.

MLC NO. 14112.

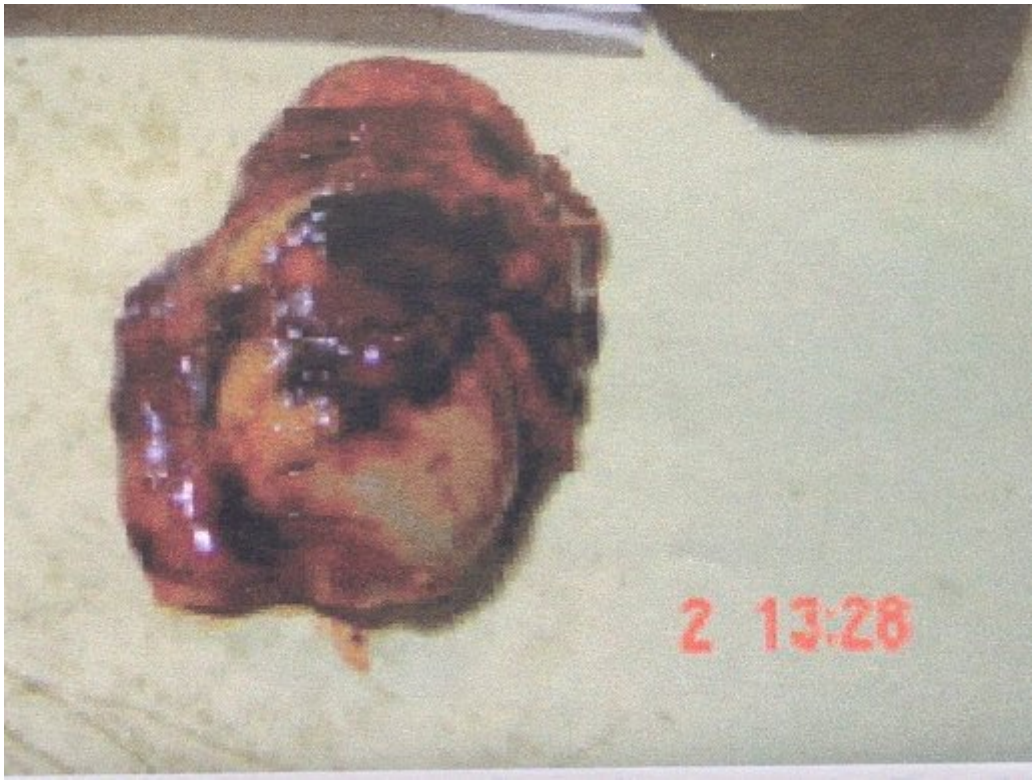
A male aged about 9 years alleged to have sustained injuries due to road traffic accident due to hit by Jeep while he was crossing the road. Immediately patient was shifted to Private Hospital at Surya Pet, and then was shifted to Osmania General Hospital on 15-05-2005 at 7:00AM.

POST MARTEM FINDINGS

EXTERNAL: 1) Grazed abraded contusion of 10X2 centimeter over the left lower chest and upper abdomen.

INTERNAL: 1) Spleen lacerated

2) About 800 cc of partially clotted blood in peritoneal cavity.



PME NO: 1705/05

CASE REPORT – 9

PME NO. 1705/05 P.S.: MAHABOOB NAGAR (RURAL)

Crime No.178/05 Dated: 30/05/2005.

OP: NO.50510819.

A male aged abut 15 years alleged to have sustained injuries due to road traffic accident while going in Auto at around 9:00PM on 23-05-2006 Three Kilometers from Kodur. Patient was immediately shifted Nizams Hospital Hyderabad. While undergoing treatment died on 29-05-2005 9:15AM.

POST MARTEM FINDINGS

EXTERNAL: No external injuries

INTERNAL: 1) Right side of the liver lacerated over the anterior surface with irregular margins.

2) About 1000 cc of partially blood t in peritoneal cavity.

3) Small intestine, large intestine and mesentery were contused.

4) Contusion of both kidneys on posterior aspect.

CASE REPORT – 10

PME NO. 2026/05 P.S.: CHADARGHAT

Crime No. 274/05 Dated: 24/06/2005.

IP NO.: 22979

MLC NO. 18507

A male patient aged about 56 years met with road traffic accident about 10 days back, and later on 23-06-2005 got admitted to Osmania General Hospital with complaint of fever, and pain abdomen. He expired on 24-06-2005 at 8:50AM.

POST MARTEM FINDINGS

EXTERNAL: No external injuries

INTERNAL: 1) Contusion of small intestines and mesentery. Surgical resection of small intestine, and end-to-end anastomosis done.

2) About 200cc of blood stained fluid in peritoneal cavity.

PME NO. 2890/05

CASE REPORT – 11

PME NO. 2890/05 P.S.: MAKTHAL

Crime No. 105/05 Dated: 25/07/2005.

The victim a 40 years old male tried to separate his younger brothers, who were quarreling, and in the process suffered an unintentional blow to the abdomen. The person collapsed on the spot, and on being shifted to the hospital, was declared ‘brought death’

On autopsy he was found to be suffering with spleenomegly and the enlarged spleen ruptured due to the fist blow received by him.

POST MARTEM FINDINGS

EXTERNAL: No external injuries

INTERNAL: 1) spleen ruptured.

2) About 200cc of blood stained fluid in peritoneal cavity.

PME NO. 2895/05

CASE-REPORT – 12

PME NO: 2895/05 P.S.: SAROOR NAGAR

CRIME NO: 174/05 DATED: 30-08-2005.

The Deceased 62 years old male alleged to have sustained injuries due to road traffic accident while he was crossing the road near Chaitanyapuri on 29-08-2005 at 7:00PM hit by R.T.C bus patient was spot death.

THE VICTIM SUSTAINED FOLLOWING INJURIES.

EXTERNAL: 1) Grazed abraded contusion 10X2 centimeters over the right lower chest and upper abdomen.

2) Grazed abraded contusion 7X2 centimeters over the left lower chest.

INTERNAL

1. Liver ruptured.
2. Spleen lacerated.
3. About 1000 cc of partially clotted blood present in

Peritoneal cavity.

CASE-REPORT – 13

PME NO: 3418/05 P.S.: CHATRINAKA.

CRIME NO: 268/05 DATED: 06-11-2005.

The dead body of a male aged about 35 years was found dead on 05-11-2005 at about 5:00 pm near road side chatrinaka.

THE VICTIM SUSTAINED FOLLOWING INJURIES.

EXTERNAL: 1) Grazed abrasion of 10X8 centimeters on the front and outer aspect of right hypochondriac region.

INTERNAL: 1) The sternum was fracture in between the 3^{rd} & 4^{th}

Pieces of the body.

2) Multiple lacerations present in the right lobe of liver.

1. 3) The anterior wall of the stomach was contused about

1liter of partially clotted blood present in peritoneal cavity

CASE-REPORT – 14

PME NO: 3563/05 P.S.: AFZALGUNJ.

CRIME NO: 979/05 DATED: 21-11-2005.

A male aged about 60 years was admitted in Osmania general Hospital on 18-11-2005 with history that he was gored by a bull about 12 days back. After the incident he complained the pain in chest and abdomen was treated in private Hospital. He suffered with quadriplegia and was refer to Osmania general hospital.

On examinations the abdomen was found distended with guarding and rigidity and shifting dullness. An emergency laprotomy operation was done

THE VICTIM SUSTAINED FOLLOWING INJURIES.

EXTERNAL: No external injuries

INTERNAL: 1) Two liters of thick purulent bile stained fluid in

Peritoneal cavity

2) 2x2 centimeters perforation in 1st part of duodenum.

CASE-REPORT – 15

PME NO: 3663/05 P.S.: FALAkNUMA.

CRIME NO: 204/05 DATED: 02-12-2005.

A male aged about 60 years with alleged history of assaulted by known persons beat him with hands and legs and also gave fist blows on chest and abdomen. The deceased fell unconscious. The deceased was shifted to private hospital at Falaknuma first and from there to Osmania general hospital where the duty doctor declared that the deceased was brought death.

THE VICTIM SUSTAINED FOLLOWING INJURIES.

EXTERNAL: No external injuries.

INTERNAL: 1) Mesentery attached to the large intestine and contused.

2) Hemorrhagic contusion, reddish in color on the tail end

Of pancreas with the about 30cc of clotted blood around it.

3) Left kidney contused, about 50cc of clotted blood on and around left renal area mostly on the posterior surface.

4) Left posterior abdominal muscles are grossly contused.

ADDITIONAL COLOR PLATES

[THESE ADDITIONAL COLOR PLATES ARE SUPPLIED BY THE AUTHOR ESPECIALLY FOR THE WEB EDITION OF THIS THESIS - EDITOR]

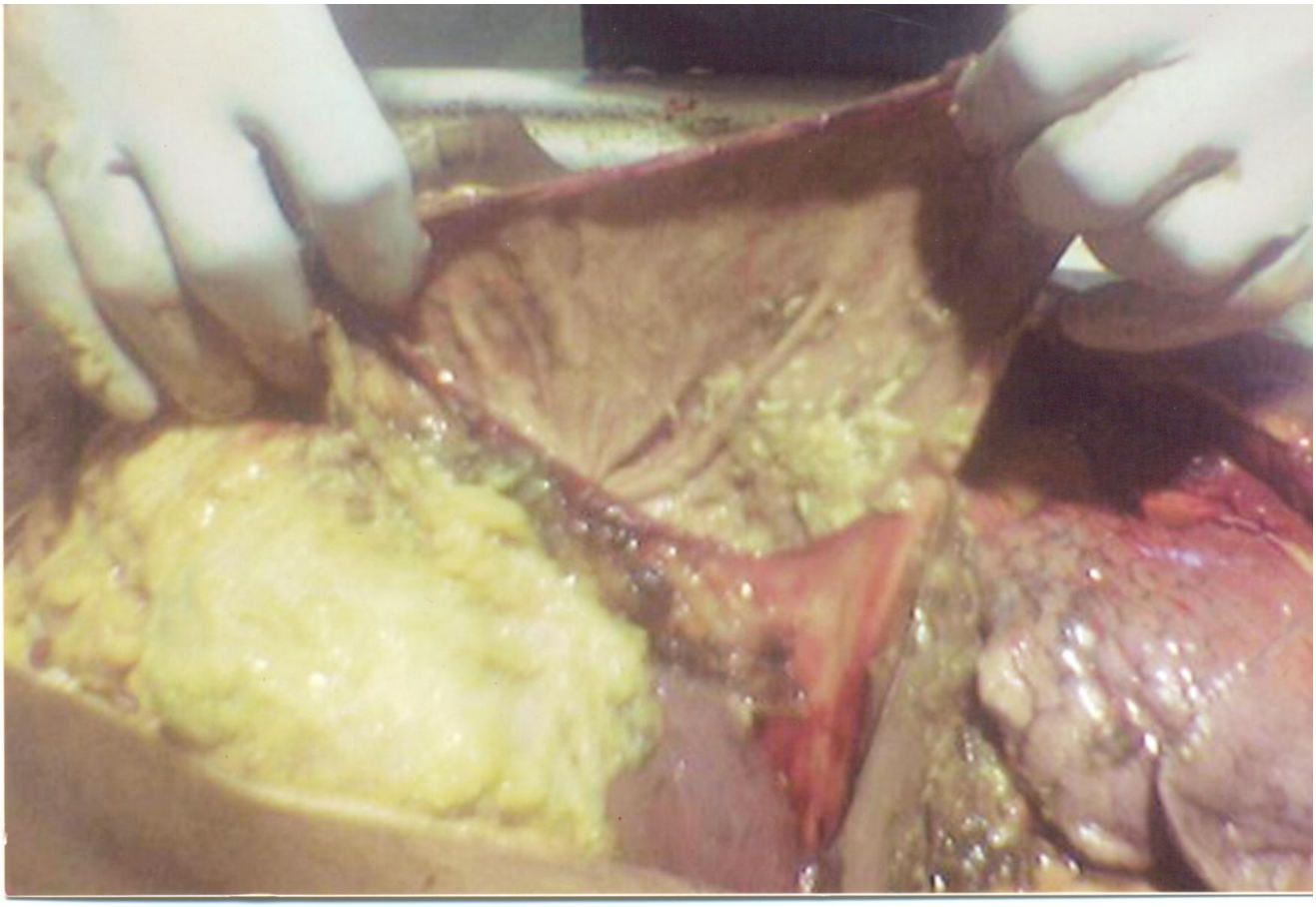


Fig.01. RUPTURE OF STOMACH

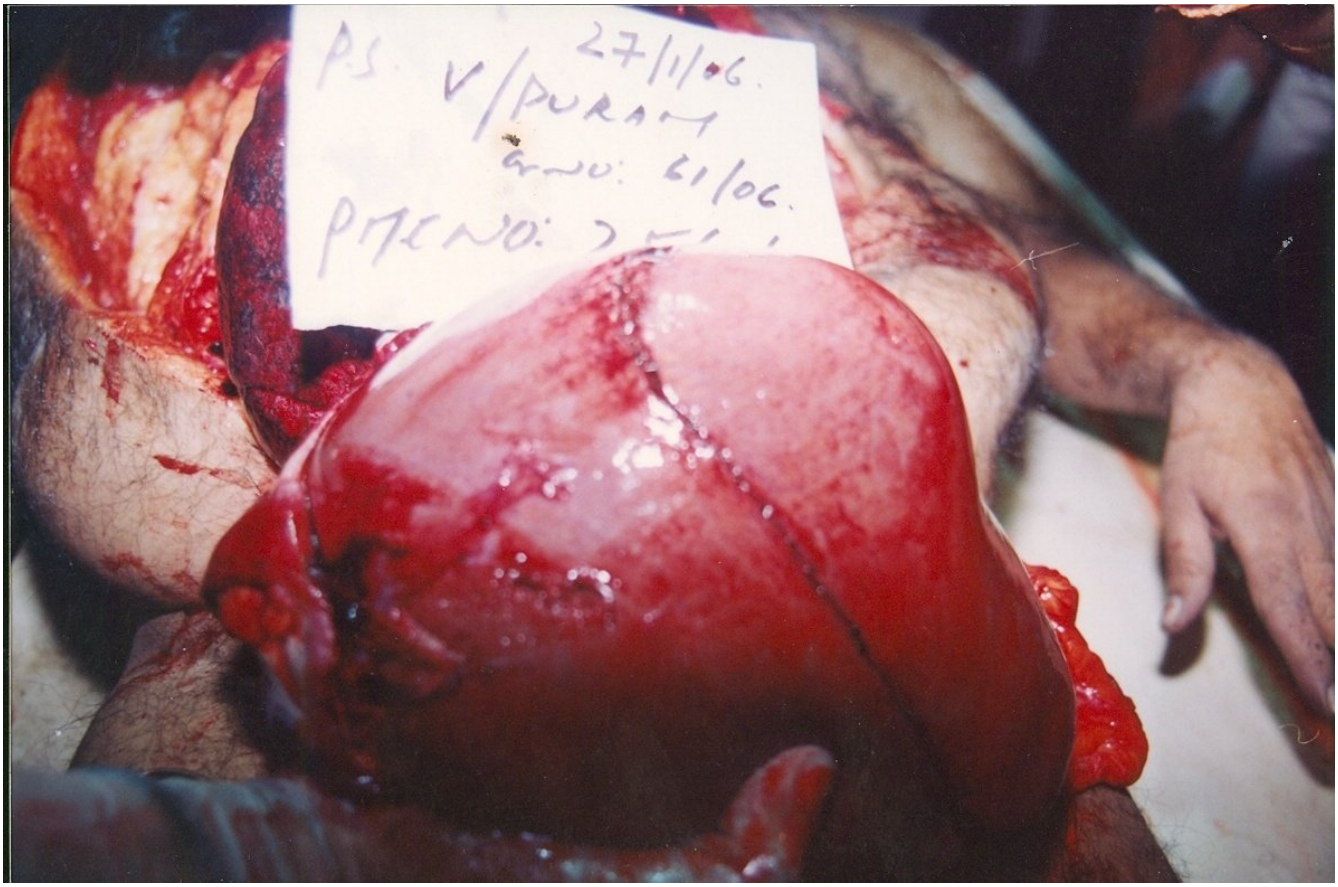


Fig.02. RUPTURE OF LIVER

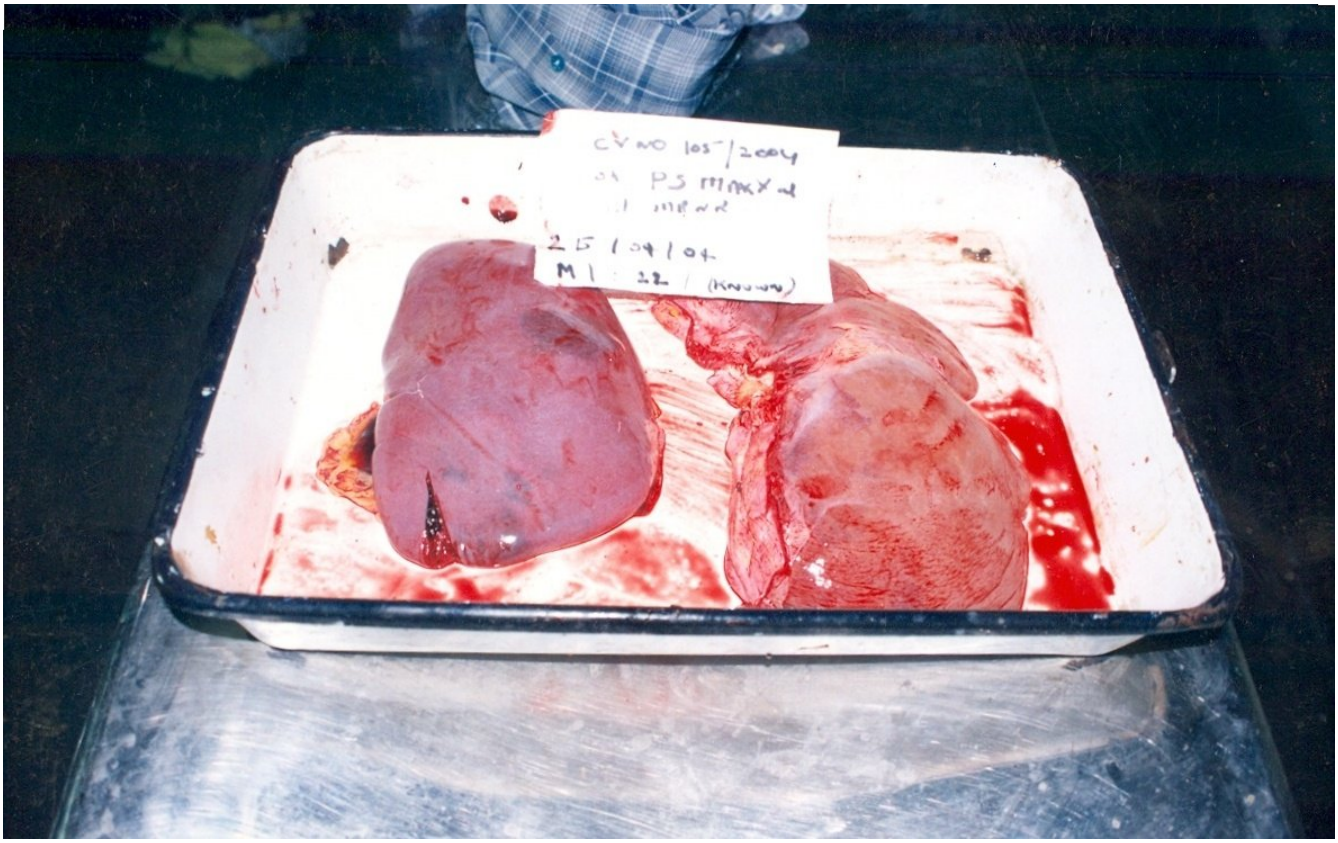


Fig.03. SPLEEN LACERATION (SPLEENONEGALY)



Fig.04. RUPTURE SPLEEN



Fig.05. LIVER LACERATION

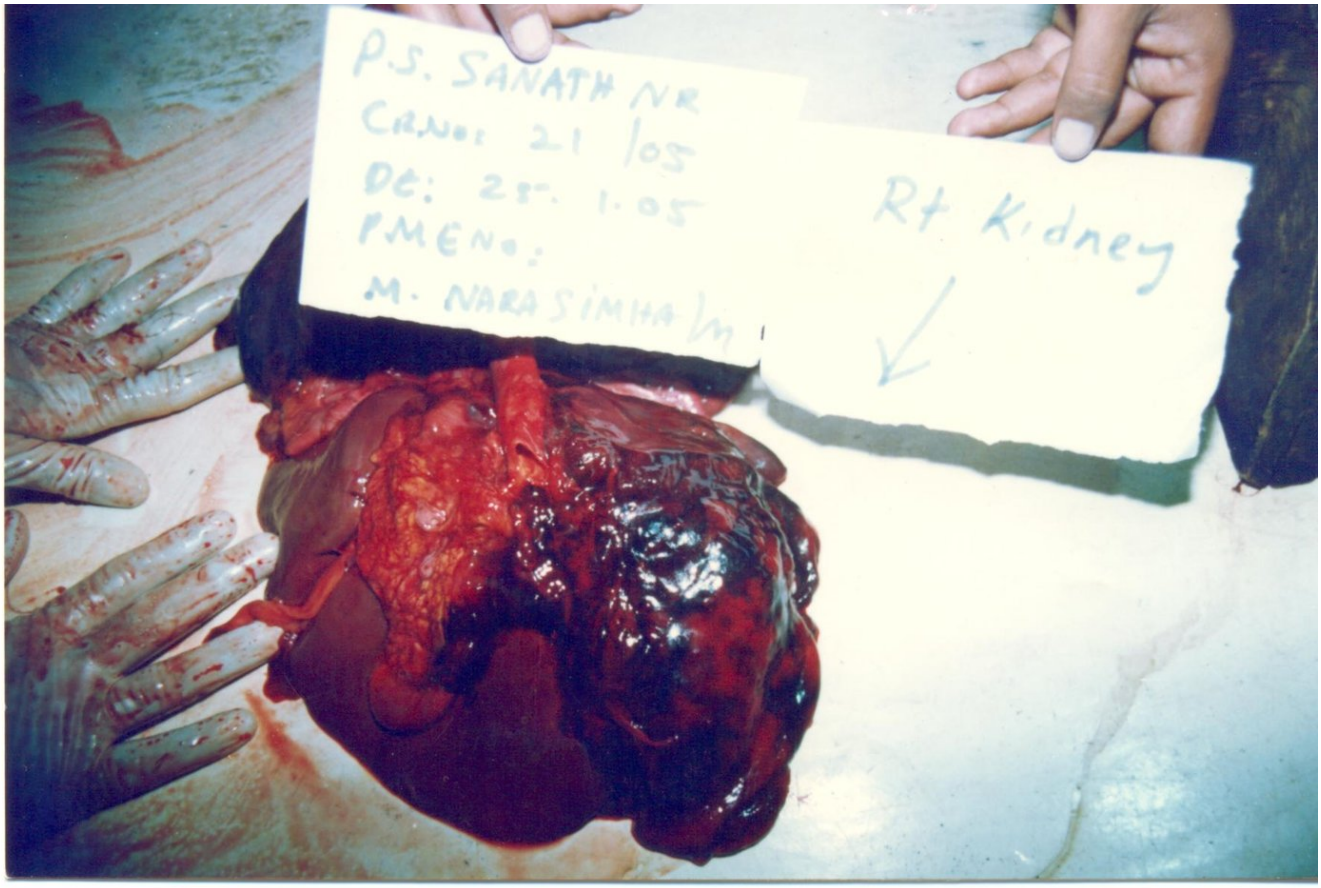


Fig.06. CONTUSION OF RIGHT KIDNEY

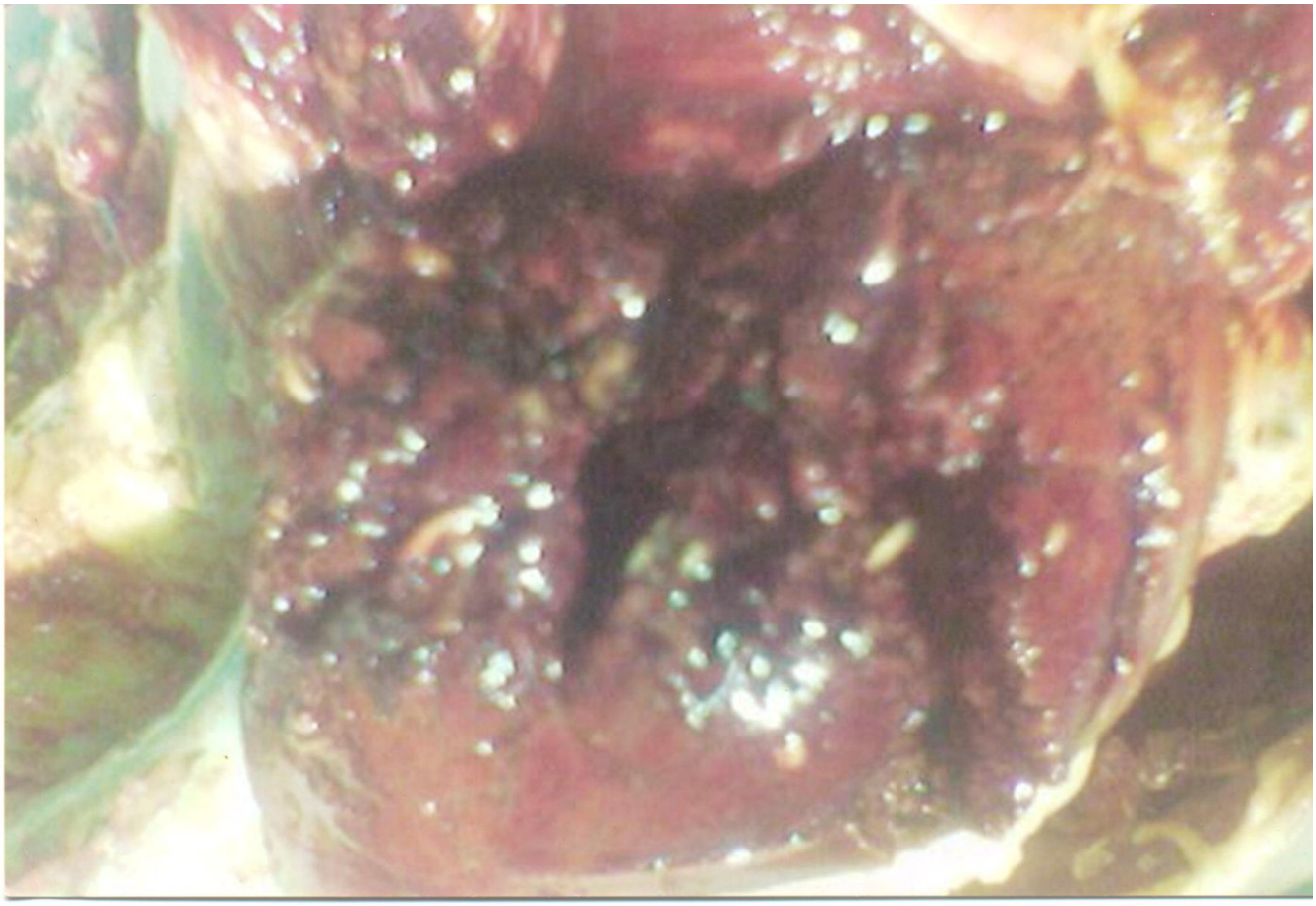


Fig.07. RUPTURE OF LIVER

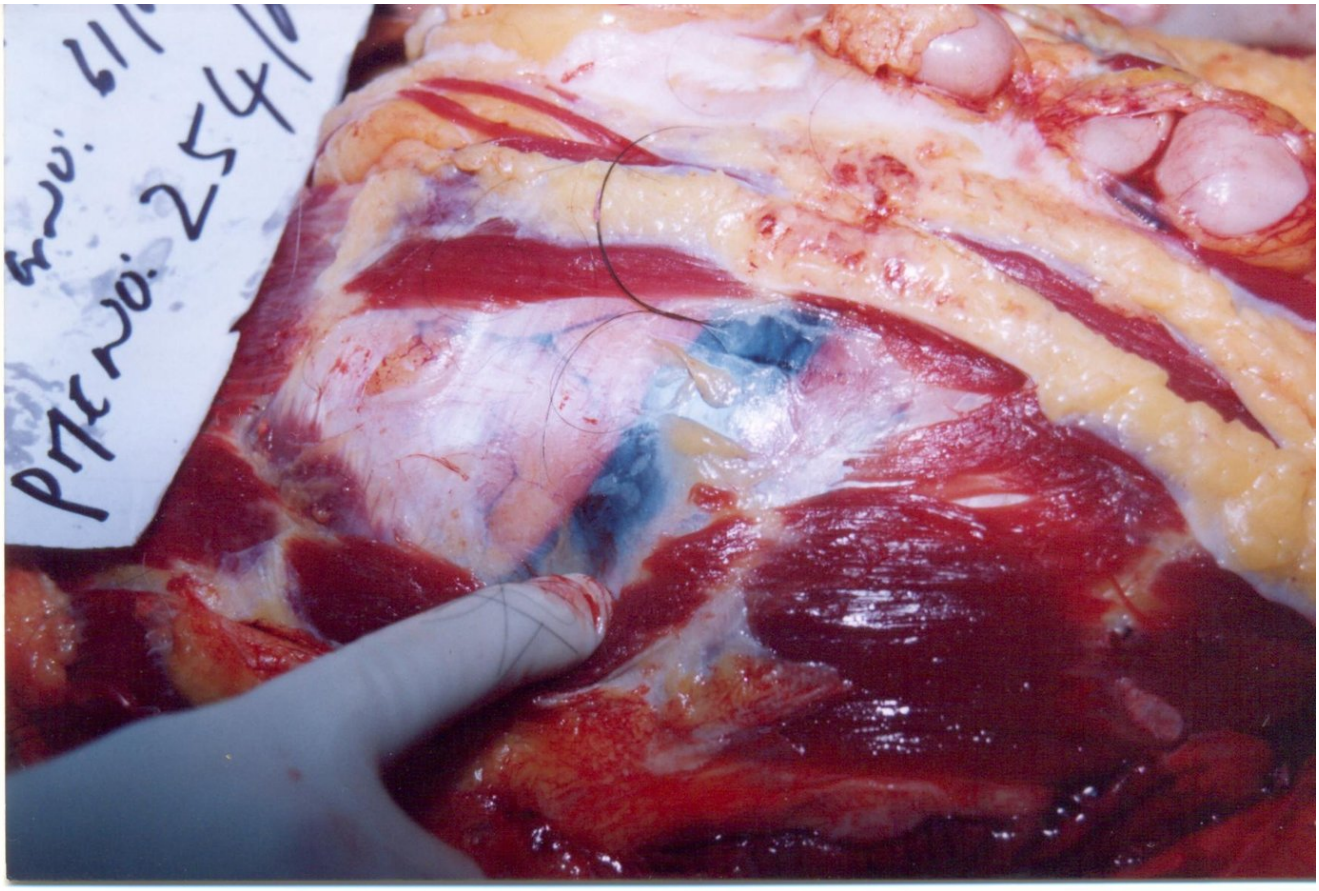


Fig.08. CONTUSION OF CHEST AND ABDOMEN MUSCLES



FiG.09. CONTUSION OF KIDNEY



Fig.10. CONTUSION OF KIDNEY



Fig.11. SPLEEN LACERATION



Fig.12. BULLGORE INJURY OF THE ABDOMEN

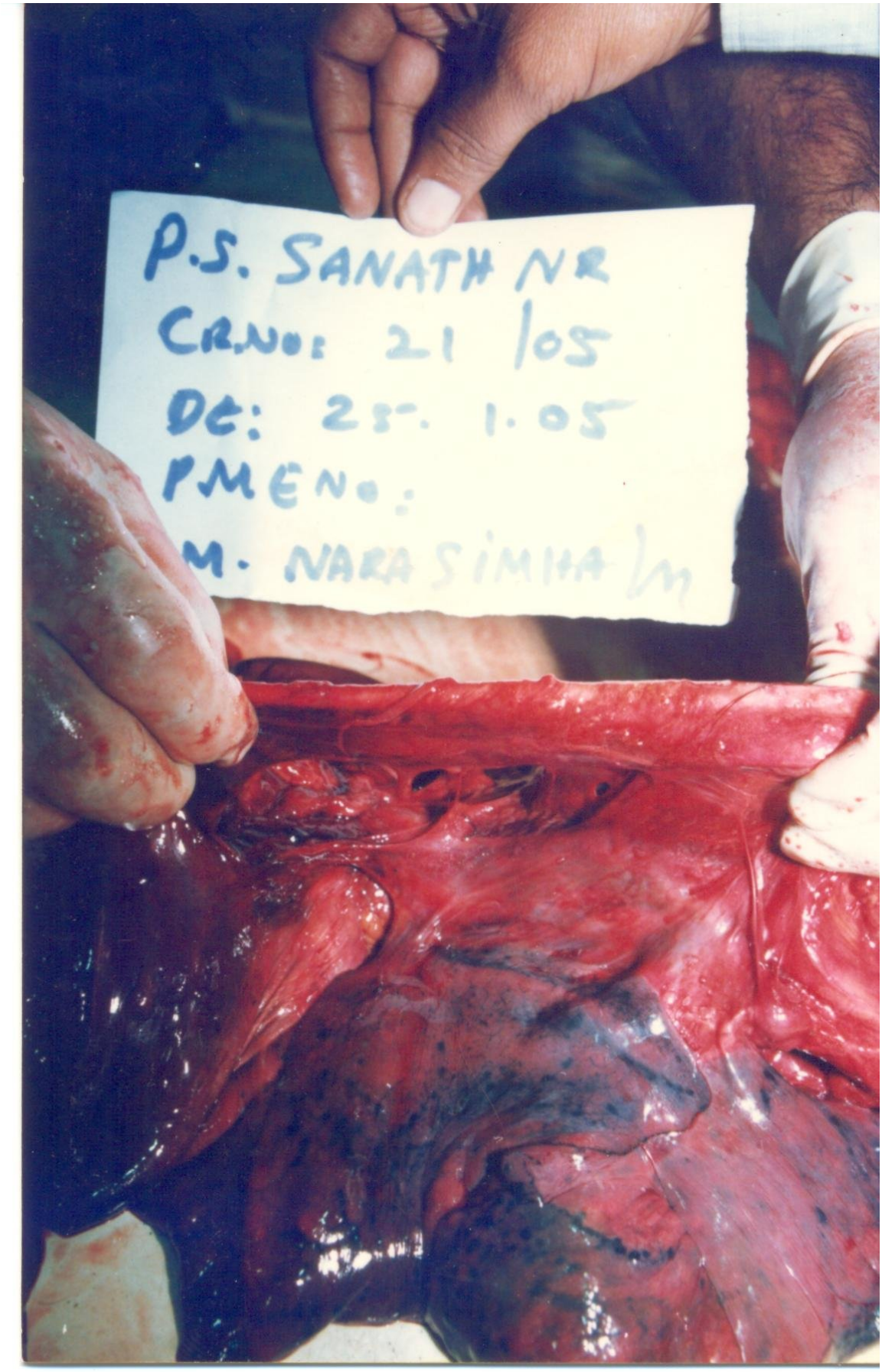


Fig.13. RUPTURE OF THE STOMACH



Fig.14. BLUNT INJURY ABDOMEN OF PREGNANT WOMEN FOETUS AGE IS SIX MONTHS

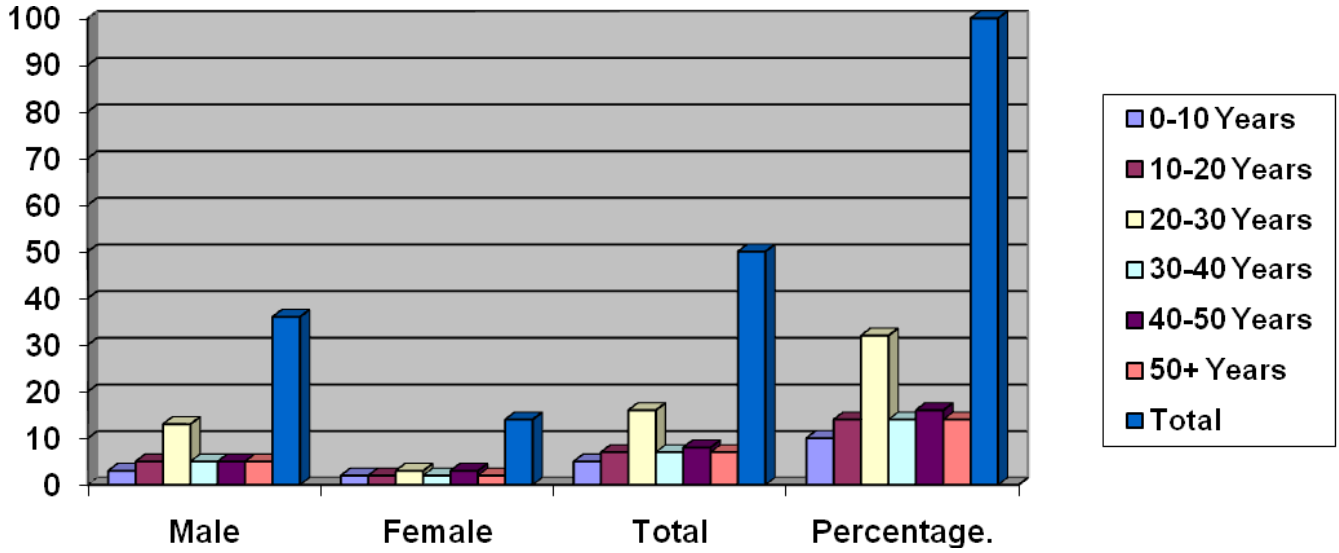
ANALYSIS AND DISCUSSION.

A total of 50 cases of Blunt Injury Abdomen brought to the mortuary during period from 01/01/2005 to 31/12/2005 at Osmania General Hospital, Hyderabad.

TABLE – 1.

AGE WISE DISTRIBUTION.

Age Group	Male	Female	Total	Percentage.
0-10 Years	3	2	5	10
10-20 Years	5	2	7	14
20-30 Years	13	3	16	32
30-40 Years	5	2	7	14
40-50 Years	5	3	8	16
50+ Years	5	2	7	14
Total	36	14	50	100

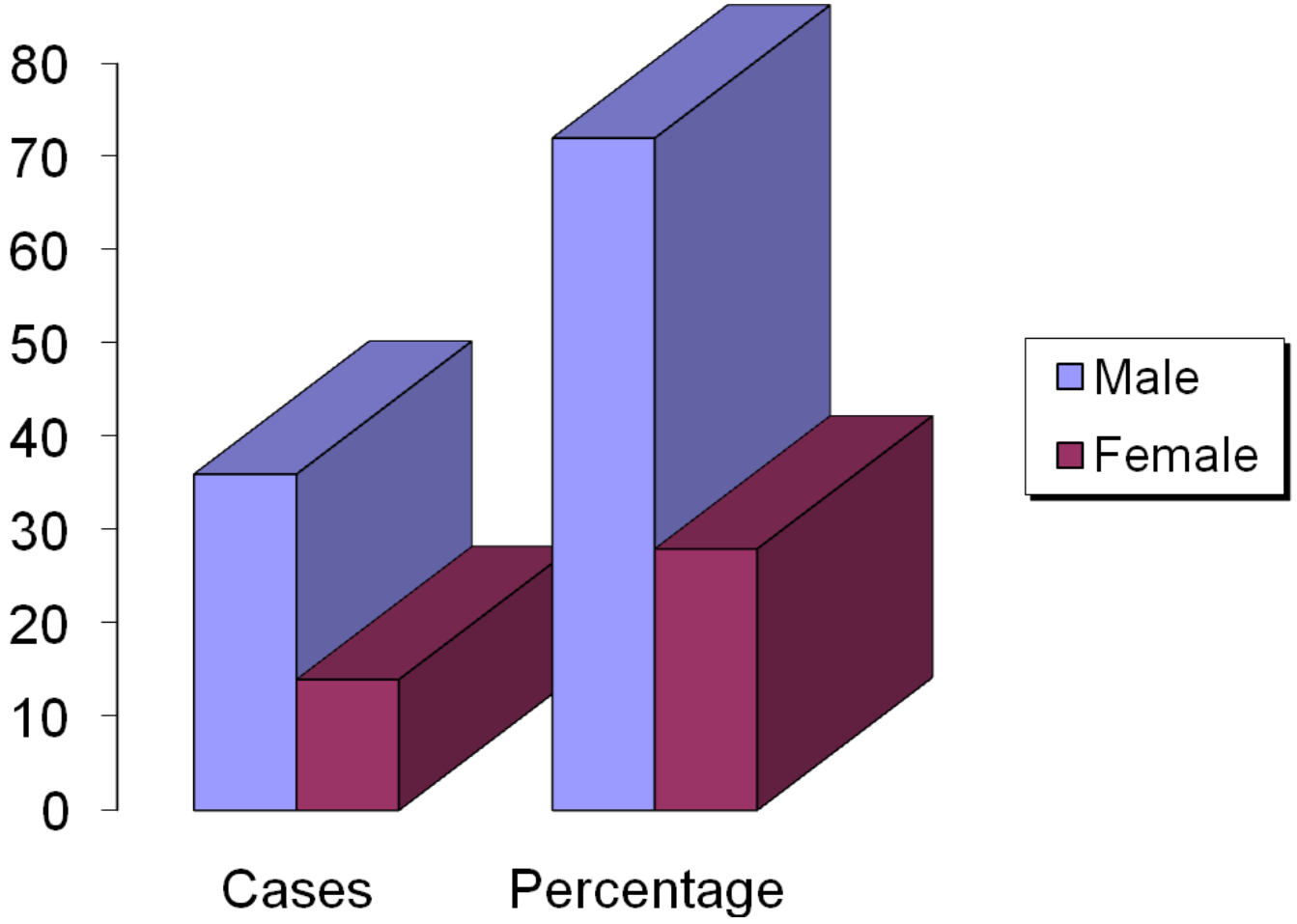


The Most likely person to have an abdominal trauma is a healthy young adult. Out of 50 cases 23 cases were in age group of 20-40 years that is above nearly 46% there were only 12 cases below 20 years and 15 cases above 40 years.

TABLE – 2.

SEX WISE DISTRIBUTION.

Sex	Cases	Percentage
Male	36	72
Female	14	28



The Male out numbered Females only 14 cases out of 50 cases were females.

TABLE–3.

NATURE OF VIOLENCE.

Type	Male	Female	Total	Percentage.
Assault	4	0	4	8
Road Traffic Accidents.	20	10	30	60
Fall from Height	6	4	10	20
Industrial	3	0	3	6
Others	3	0	3	6
Total	36	14	50	100

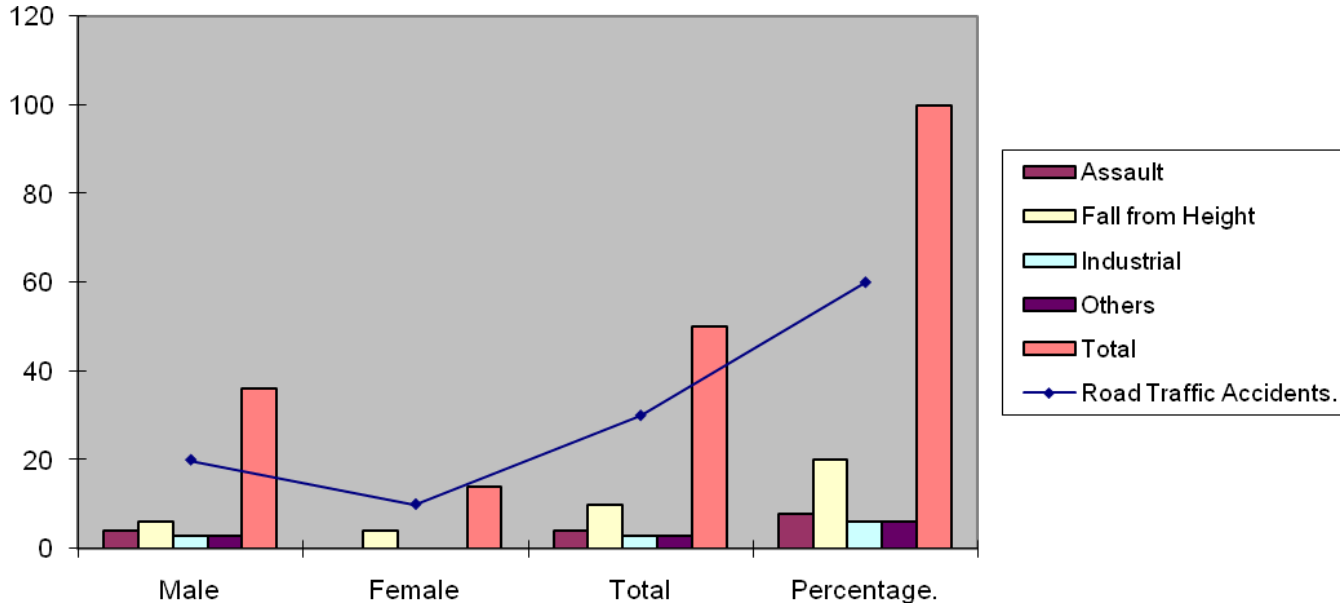


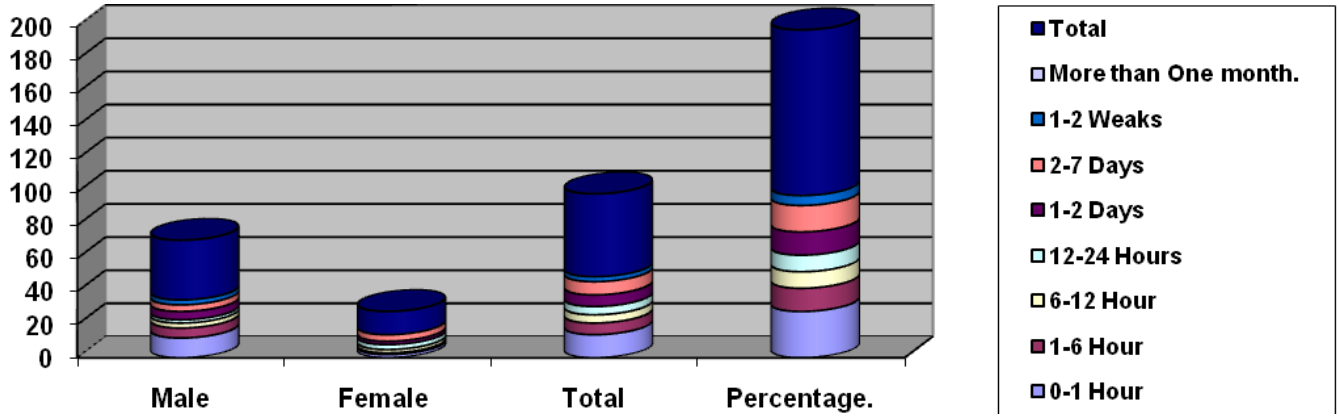
Table 3 shows that most of the injuries were due to road traffic accidents. 30 cases were involved in road traffic accident accounting to 60%. The next comes accidental fall from height like from trees, roof tops, and accidental falls during walking particularly in aged group more so under the influence of alcohol. These constituted 16% of the total deaths from blunt injury abdomen.

Assault occupies a back seat. Only 4 cases are reported i.e. 8% of the total cases. The most out sanding future is the absence of female victims in Assault Group. In most of the assault cases the trauma was inflicted mostly with hands and feet. In other group 3 cases were sustained due to accidental falls from bullock's carts and being run over by the bullock cartwheel over the abdomen and bull gored injuries.

TABLE – 4

PERIOD OF SURVIVAL

Period of Survival	Male	Female	Total	Percentage.
0-1 Hour	12	2	14	28
1-6 Hour	6	1	7	14
6-12 Hour	3	2	5	10
12-24 Hours	2	3	5	10
1-2 Days	5	2	7	14
2-7 Days	4	4	8	16
1-2 Weaks	3	0	3	6
More than One month.	0	0	0	0
Total	36	14	50	100

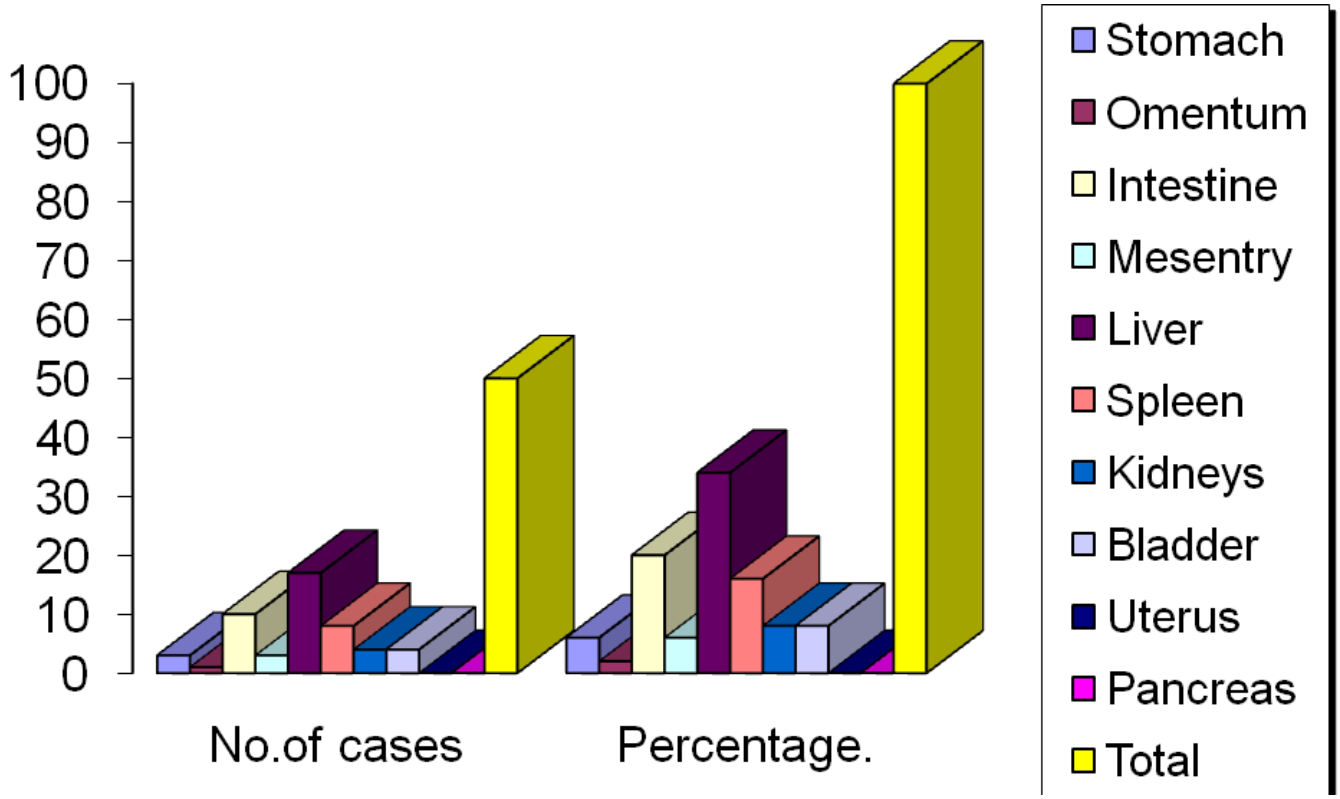


On perusal of table – 4 most of the deaths have occurred on spot or with in 6 hours after sustaining abdominal trauma. In 21 cases, that is about 42% cases death occurred with in 6 hours. Out of 45% cases again in 50% cases death occurred on the spot only with in a few minutes after sustaining injury. In 80% cases death has occurred with in 2 days after sustaining trauma and remaining 20% cases again 50% cases died with in the week. So this indicates out of danger zone for hospital admitted cases is about 1-2 days and safety zone about one week.

TABLE – 5.

ABDOMINAL VISERA INVOLVED.

Viscera	No. of cases	Percentage.
Stomach	3	6
Omentum	1	2
Intestine	10	20
Mesentery	3	6
Liver	17	34
Spleen	8	16
Kidneys	4	8
Bladder	4	8
Uterus	0	0
Pancreas	0	0
Total	50	100

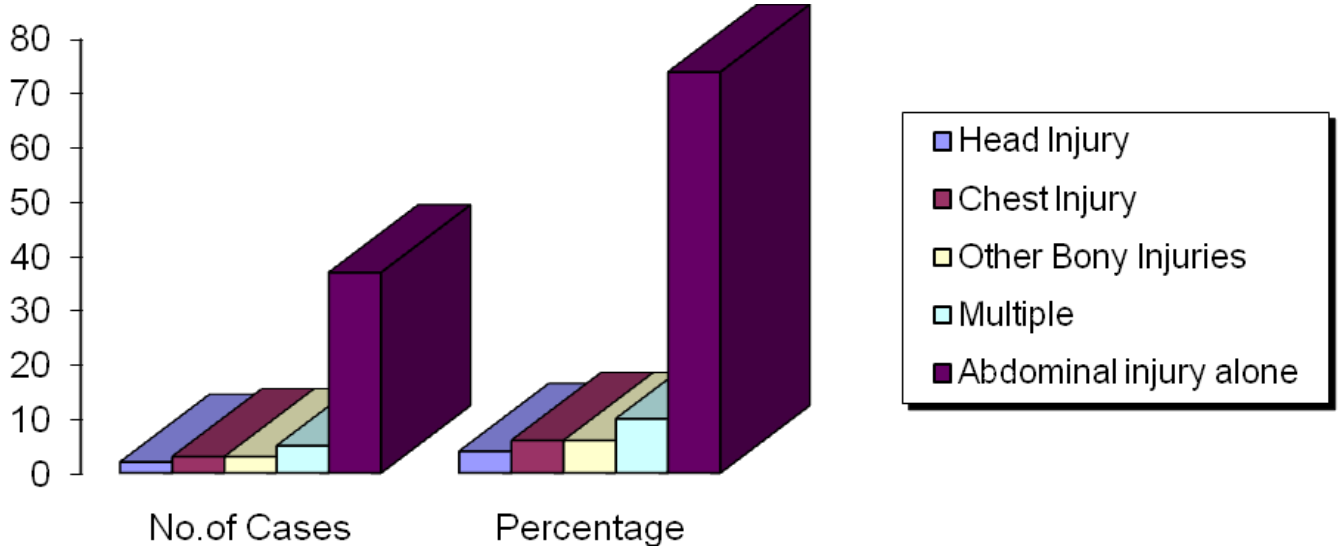


Perusal of table 5 shows that out of 50 cases with significant intra abdominal injury, the commonest organ injured was liver with 34%, intestine 20% and spleen 16% kidney and bladder 16% with relatively low accounting for stomach and omentum, that is about 8%. In most of the cases multiple organ involvement was very common. Involvement of uterus in female cases was a rare phenomenon as it is strongly protected by pelvic cage. In all cases bladder involvement is associated with fracture pubic symphysis. Compared to hollow viscera involvement of parenchymatus organs is more common in both sexes. The ratio being roughly 2:1.

TABLE – 6

ASSOCIATED INJURIES.

Associated injuries	No. of Cases	Percentage
Head Injury	2	4
Chest Injury	3	6
Other Bony Injuries	3	6
Multiple	5	10
Abdominal injury alone	37	74

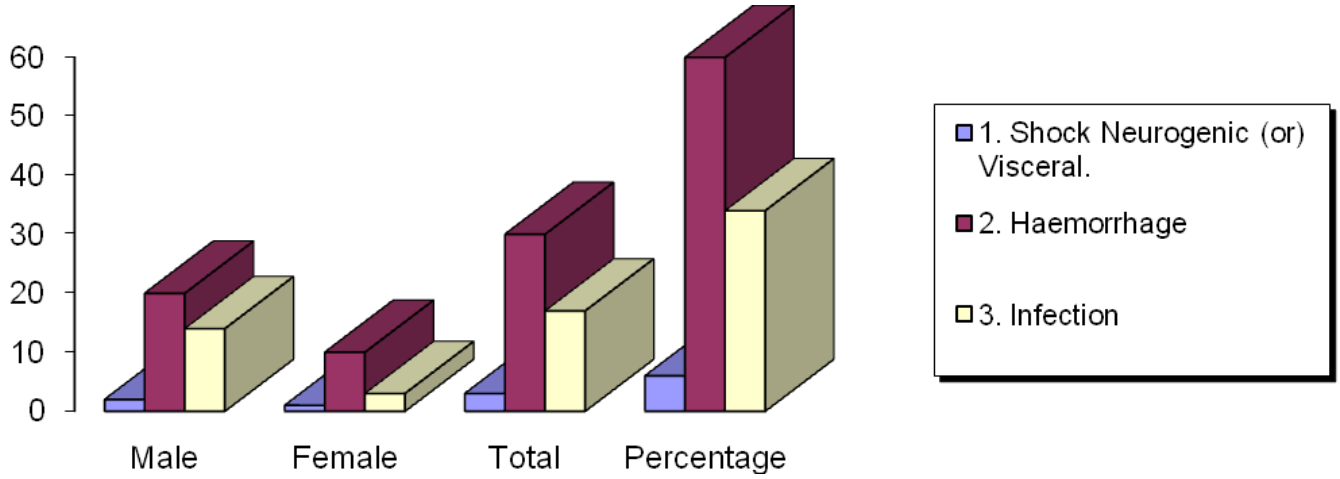


37 cases out of 50 cases had only abdominal injury that is about 74%. Associated head injury was present in about 4% cases, chest in 6% cases, and fracture of extremities in 6% cases. The most commonly associated part along with abdomen involved is chest due to its proximity with abdomen, in the form of rib fractures and lung injuries. It was noticed that in 5 cases i.e. about 10% had more then two system injury.

TABLE – 7

MECHANISM OF DEATH

Type	Male	Female	Total	Percentage
1. Shock Neurogenic (or) Visceral.	2	1	3	6
2. Hemorrhage	20	10	30	60
3. Infection	14	3	17	34



Perusal of table 7 shows hemorrhage (Internal) was most common cause of death from visceral injuries. 30 out of 50 cases that in about 60% cases death has occurred from hemorrhage followed by infection in 34% cases. Hemorrhage is more common with parenchymatus injury where death has occurred with in 12 hours after sustaining trauma that is about 58% cases infection is more common with hollow visceral injury where death is delayed. The ratio of incidence between

hemorrhage and infection is more or less common in both males and females. In males out of 36 cases hemorrhage seen is 20 cases on in females 10 cases where as in infection cases 14 cases are of males and 3 cases of females. Death due to shock for neurogenic shock or multiorgan failure in seen in 3 cases out of 50 cases i.e. about 6% this type of death is a rare phenomenon in females may be due to thick abdominal wall and in case of males mostly the victims were under the influence of alcohol.

SUMMARY AND CONCLUSIONS.

The present study was under taken to focus light upon the pattern of blunt abdominal injuries in relation to various factors in the Hyderabad. A total No. of 50 cases was studied from 1st January 2005 to 31st December 2005. The result of the present study is summarized as follows.

1. Majority of the Victims were Male (72%)
2. Youngsters in the age group of 20-30 Years (32%) were most commonly involved in trauma cases.
3. Road Traffic Accidents are most frequently noted as the cause of blunt injury abdomen (60%)
4. Very high incidents of death are seen within 1-6 hours after sustaining trauma.
5. Abdominal injury is alone the cause of death in the majority of causes (74%)
6. A very high incidence of associated injuries in the form of thoracic injuries to the extremities and cranio cerebral injuries were noted. Thoracic injury is the most commonly associated injury (6%)
7. Hemorrhage is the commonest cause of death (60%). Followed by infection (34%)
8. The manner of injury cannot be ascertained from the distribution of visceral injuries, as they are deep seated without corresponding external injuries in most cases.
9. As infection is a major cause of mortality, sustained effort to prevent infection in these cases can reduce half of the mortality.

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