DISSERTATION ON

THE VARIOUS FACTORS WHICH INFLUENCE THE OUTCOME OF PATIENTS WITH BLUNT INJURY CHEST

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CERTIFICATE

This is to certify that dissertation entitled **THE VARIOUS FACTORS WHICH INFLUENCE THE OUTCOME OF PATIENTS WITH BLUNT INJURY CHEST** is a bonafide record of work done by **Dr. K.JAHIR HUSSAIN** in the Department of General Surgery, Thanjavur Medical College, Thanjavur, during his Post Graduate Course from 2006-2009 under the guidance and supervision of **PROF. DR. G. AMBUJAM, M.S. FICS.** This is submitted in partial fulfillment for the award of **M.S. DEGREE EXAMINATION- BRANCH I (GENERAL SURGERY)** to be held in March 2009 under the Tamilnadu Dr. M.G.R. Medical University, Chennai.

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DECLARATION

I declare that this dissertation entitled **THE VARIOUS FACTORS WHICH INFLUENCE THE OUTCOME OF PATIENTS WITH BLUNT INJURY CHEST** is a record of work done by me in the department of General Surgery, Thanjavur medical college, Thanjavur, during my Post Graduate Course from 2006-2009 under the guidance and supervision of my unit chief and professor and head of the department **PROF.DR.G.AMBUJAM, M.S.FICS.** It is submitted in partial fulfillment for the award of **M.S. DEGREE EXAMINATION - BRANCH I (GENERAL SURGERY)** to be held in March 2009 under the **Tamilnadu Dr. M.G.R. Medical University, Chennai.** This record of work has not been submitted previously by me for the award of any degree or diploma from any other university.

Dr. K.JAHIR HUSSAIN

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CONTENTS

INTRODUCTION

Injury is the commonest cause of death among people aged 1-34 years. A leading cause of disability and a major contributor to health costs. WHO data suggest that 1 in 10 deaths worldwide is the result of an injury.

Blunt trauma to chest is fatal in 10% of patients in isolation rising to 30% if other injures are present. Although less than 15% of patients with chest trauma require surgical intervention, many needless deaths occur through inadequate or delayed treatment of an easily remediable injury.

The majority of chest injuries are confined to the thoracic cage. These consist of rib fractures with underlying pulmonary contusion. Hemothorax or pneumothorax which can usually be dealt with simply and effectively by chest drain insertion and fluid restriction.

When ignored, underestimated or inadequately treated chest injuries may cause death of patient during surgical intervention for seemingly more pressing intracranial or abdominal hemorrhage.

AIM OF THE STUDY

1. To evaluate the various causes for blunt injury chest.
2. To evaluate the various presentations of blunt injury chest.
3. To evaluate the various factors which influence the outcome of patients with blunt injury chest Namely,

   a) Age

   b) Sex

   c) Site and number of Ribs fractured.

      i) First and second Ribs

      ii) Fracture of 6 or more Ribs (multiple rib fractures)

      iii) Flail chest

      iv) Lower ribs fractures (9-12)

   d) Pre existing lung disease, like COPD

   e) Associated other injuries
4. To evaluate the various investigations used for evaluating a blunt injury chest patient.
5. To evaluate the various treatment modalities used for blunt injury chest.
6. To evaluate the various outcomes of blunt injury chest patients.

REVIEW OF LITERATURE

EPIDEMIOLOGY OF TRAUMA

The majority of deaths from injury occur in economically productive persons aged 14-44 years and the male to female ratio for deaths from violence is 2:1 deaths from injury are predicted to rise by 65% by the year 2020. By which time road traffic accidents will be the third most important cause of death worldwide and the second most important in developing nations.

BLUNT TRUMA: PATTERNS OF INJURY:

The most common cause of Blunt Trauma is the motor vehicle. Speed is a critical factor. A 10% increase in impact speed translates into 40% rise in the case fatality risk for both restrained and unrestrained occupants. Use of seat belt reduces the risk of death or serious injury for front-seat occupants by approximately 45%. Although seat belts reduce mortality overall, patients with seatbelt marks have been found to have a fourfold increase in thoracic trauma and an eightfold increase in intra abdominal trauma compared with those without seatbelt marks. Motor cyclists experience a death rate 35 times greater than the occupants of cars. Helmets reduce the risk of fatal head injury by about one-third and reduce the risk of facial injury by two-thirds. Injuries to the pedestrians occur disproportionately among school aged children, the elderly and the intoxicated.

ALCOHOL AND DRUGS:

Alcohol and other forms of substance abuse are major associated factors in all forms of trauma.Less than 10% of drivers with illegal blood alcohol levels account for nearly one-third of non-fatal and half of fatal, driver deaths. There is a strong association between problem drinking and high risk behavior such as dangerous driving and violent aggressive behavior.

ADVANCED TRAUMA LIFE SUPPORT (ATLS)

It is a structured trauma management programme, adopted by the American College of Surgeons.

THE STEPS IN THE ATLS PHILOSOPHY

a) Primary survey with simultaneous resuscitation to identify and treat what is killing the patient.
b) Secondary survey to proceed to identify all other injuries.
c) Definitive care and tertiary survey to develop a definitive management plan.

PRIMARY SURVEY AND RESUSCITAION

1.AIRWAY WITH CERVICAL SPINE PROTECTION

In the initial assessment the airway must be evaluated first. If a patient can speak, the airway is not immediately threatened. If the patient does not reply to a simple question, then rapid assessment for signs of airway obstruction should include inspection for foreign bodies, maxillo facial or tracheal/laryngeal fractures. Measures to establish a patent airway must be taken while protecting the cervical spine. Injury to cervical spine should be assumed in the

presence of multisystem injury especially with alteration of conscious level.

Early cervical spine assessment is integral to airway management. A fractured cervical spine is usually tender to direct palpation in alert patients. A good quality cross-table lateral cervical spine (CTLCS) X-ray will delineate 98% unstable factures. A cervical collar is left in place until the cervical spine has been radiologically evaluated for bony integrity.

The initial measures to clear the airway involve anterior displacement of the mandible. This pulls the tongue musculature from the posterior pharyngeal wall. While either a chin lift or jaw thrust is acceptable, care must be taken that neck remains unmoved and protected. The opportunity should be taken to look inside the oral cavity and suction applied if there is evidence of blood or gastric contents. If there is doubt about the patients ability to maintain a clear unsoiled airway or if there is an absent gag reflex. then a definitive airway should be secured. This is achieved by endotracheal intubation.

2. BREATHING AND PROVISION OF OXYGEN

All trauma patients should receive high flow oxygen using a reservoir mask. The patients neck and chest must be inspected for surgical emphysema, wounds and evidence of tracheal deviation. The condition of the neck veins, symmetry of the chest, respiratory effort and respiratory rate should be recorded. Percussion and auscultation are performed and the auscultation should be repeated on the back of the chest when the patient is log-rolled. The objective is to identify and treat immediate threats to life.

Tension pneumothorax is a clinical diagnosis: There is no time for radiographs. Treatment is immediate decompression with insertion of a needle into the pleural space in the midclavicular line two finger breadths below the clavicle, followed by insertion of a chest drain. A massive hemothorax (> 1.5 liters of blood) causes shift of the mediastinum, compression of the lung on the affected side, with reduction in breath sounds and hypovolemic shock. This is a surgical emergency and thoracotmy for control of bleeding is likely to be required.

CIRCULATION AND HEMORRHAGE CONTROL

An assessment of the patients skin colour and feel and the capillary refill time should be carried out while monitoring is being attached to provide information on cardiac rate and rhythm, blood pressure and arterial oxygen saturation. If there is an identified source of bleeding this should be controlled by direct pressure. As a general rule, the carotid pulse is palapable at a systolic blood pressure of 60mm hg. The femoral pulse at 70mm hg and the radial pulse at 80mm hg.

There are five places that a patient can lose a large volume of blood. The chest, the abdomen, the retro peritoneum and into muscle compartments. This can be summarized by the aphorism “Blood on the floor and four more”.The more subtle signs of blood loss such as pallor prolonged capillary refill and decreased pulse pressure must be sought at the earliest so that early correction of blood loss can be guided.

Two large bore cannuale should be inserted in large veins, the obvious site for these

being the ante cubital fossae. Also available is the femoral vein just below the inguinal ligament with the femoral artery as a palpable landmark just lateral. When vascular access is obtained blood is drawn for routine analysis and cross-matching of blood. In the hypovolemic patients upto 2 liters of warmed intravenous fluids (either colloids of crystralloids) are given while the patient is continuously monitored and reassessed. If needed type specific or O negative blood is transfused.

While hypovolemia is the commonest type of shock encountered in trauma patients,other causes of shock such as cardiogenic shock due to blunt or penetrating chest injury or myocardial infarction, neurogenic shock due to spinal cord injury or even anaphylaxis should also be considered.

DISABILITY

A basic assessment of neurological status is carried out as part of primary survey. Level of consciousness is assessed by the Glasgow coma scale and the pupils are assessed. There is no purpose in carrying out this basic neurological examination before hypoxia and hypovolemia are corrected as any sub optimal response may be misinterpreted as a primary intracranial event rather than inadequate cerebral oxygenation.

EXPOSURE

Before the primary survey is complete. The patient must be fully exposed and viewed from both front and back. Once this inspection is carried out, the patient should be covered to prevent heat loss. At this stage consideration is given to insertion of a urinary catheter and a

gastric tube. Gastric tube should not be placed via the nose in the presence of maxillofacial injury or suspected base of skull fracture. Inspection of genitalia and rectum always precedes urinary catheterization. Urinary catheter should not be placed if urethral injury is suspected. At the end of primary survey x-rays of chest, pelvis and lateral cervical spine are routinely obtained.

SECONDARY SURVEY

During this phase of initial assessment a head to toe examination is carried out. Unless this is done in a methodical fashion injuries will be missed. A full neurological examination is a necessity and the Glasgow coma scale should be determined and sequentially recorded. If during the secondary survey there is any deterioration in the patients clinical condition the priority is to revert to the primary survey and reassess airway, breathing and circulation. The patient should not be moved or subjected to diagnostic procedures outside the resuscitation room until stabilized.

DEFINITIVE CARE AND TERTIARY SURVEY

After identifying the injuries, initiating resuscitation and obtaining diagnostic studies definitive care should begin when the dust has settled after major trauma and the patient is stable. The tertiary survey consists of another head to toe examination and a review of all available laboratory and imaging results.

BLUNT INJURY CHEST

SURGICAL ANATOMY

Effective treatment of thoracic trauma demands an in-depth knowledge of both anatomy

and radiological imaging of the chest.

THE THORACIC CAGE

The form of the thorax is that of a truncated cone flattened in front and behind but rounded at sides. The skeletal framework of the chest is formed anteriorly by the sternum and the costal cartilages, posteriorly by the bodies of the 12 thoracic. Vertebrae and the corresponding intervertebral discs and by the ribs from their heads to their angles. The sternum is made of three parts. The manubrium, body and xiphoid process. The sternal angle is an important landmark at which the second costal cartilage articulates with the sternum. The costal cartilages of the first seven ribs articulate with the sternum whereas the costal cartilages of the eighth to tenth ribs usually attach to the cartilage of the rib above. The ventral ends of the cartilages of ribs 11, 12 have no direct skeletal attachment.

The inlet of thorax is a narrow opening bounded by the body of the first thoracic vertebra, the first pair of ribs and the upper border of the manubrium sterni. The plane of the inlet slopes very obliquely downwards and forwards, so that the anterior part of the apex of the lung is above the level of the anterior boundary of the inlet. Though its posterior part only attains the level of the neck of the first rib. Patients with wound at the root of the neck are therefore susceptible to pneumothorax. The structures that enter or leave the thorax through this inlet are the trachea,the esophagus, the vagus and phrenic nerves on each side,the left recurrent laryngeal nerve,the thoracic duct and the right innominate artery and vein,the left subclavian artery,the left common carotid artery and left innominate vein. The outlet of thorax is bounded by the xiphisternal joint,the lower six costal cartilages,the twelfth rib and the

twelfth thoracic vertebra.

THE THORACIC CAVITY

The cavity of the thorax is completely divided into right and left lateral parts by a thick median partition, the mediastinum. The mediastinum is made up of the large number of important structures embedded in connective tissue extending from the sternum anteriorly to the vertebral column posteriorly. The prinicipal structures are the heart within the pericardium, the aorta and great vessels, the oesophagus and trachea, the vagus and phrenic nerves, the remains of the thymus gland and numerous lymph nodes. The connective tissue ensheaths these structures but is both yielding and elastic, to accommodate the relaxation and contraction of the heart and blood vessels. Anatomically, the mdiastinum is described in four parts; (a) the superior mediastinum above the plane passing from the lower border of the manubrium sterni to the lower border of the fourth thoracic vertebrae. The mediastinum below that plane is subdivided into (b) the middle mediastinum occupied by the pericardium and its contents with the phrenic nerves on either side, (c) the anterior mediastinum in front of the pericardium, and (d) the posterior mediastinum behind the pericardium and diaphragm.

The lateral parts of the thoracic cavity are lined with a thin layer of pleura and are almost completely filled by the lung, which evaginates the pleural sac from the mediastinal side. Each lung lies freely within its pleural cavity, except along the medial surface where it is attached to the mediastinum by the root, consisting of the bronchus coming from the bifurcation of the trachea and the pulmonary artery and two pulmonary veins passing to and from the heart. When air is squeezed out of the lung, its bulk is not nearly sufficient to fill this space which it

normally occupies. Under normal conditions the lung remains distended by atmospheric pressure, but when air is admitted into the pleural cavity the atmospheric pressure on the outer surface of the lung is made equal to that on the interior, so that the elasticity of the lung substance forces air out. The lung then shrinks to about one-third of its previous bulk. Similar shrinkage also occurs when blood or other types of fluid accumulate in the pleural sac.

TOPOGRAPHY OF THE LUNGS

The apex of each lung reaches as far superiorly as the vertebral end of the first rib and usually extends about 2.5cm above the medial one-third of the clavicle (Figs 2 and 5). The anterior border of the right lung descends behind the sternoclavicular joint and almost reaches the midline at sternal angle. It then continues downwards behind the sternum to the level of the sixth chondrosternal junction. Here the inferior border curves laterally and inferiorly, crossing the sixth rib in the midclavicular line and the eighth rib in the midaxillary line. It then passes posteriorly towards the midline at the level of the spinous process of the tenth thoracic vertebra. These levels apply to the lung in expiration. On inspiration the levels for the inferior border are usually two ribs lower as the expanding lung descends into the costodiaphragmatic recess of the pleura.

The position of the anterior border of the left lung is similar to that of the right; though at the level of the fourth costal cartilage it deviates laterally in front of the heart, causing a cardiac notch in this border of the lung. The inferior border of the left lung is similar in

position to that of the right, though it usually extends a little more inferiorly.

BLUNT INJURY TO CHEST

Approximately 25% of all trauma related deaths are attributed to thoracic injuries. Essentially most lung and pleural injuries cause physiologic problems through one of the three mechanisms

1. Pleural space problems that interfere with lung function.
2. Hemorrhage from the chest wall or lung.
3. Pulmonary parenchymal problems that impair the lungs ability to ventilate and exchange oxygen and carbon dioxide.

If there is profound hypotension as a result of cardiac tamponade, **needle aspiration of the pericardium** is life saving and may hold the situation long enough for more controlled surgery to be formed. The primary survey of the ATLS course concentrates on the six immediately life-threatening injuries related to the airway and the chest. An additional six thoracic injuries constitute the potential threats to life. Together they are “the deadly dozen” of blunt thoracic trauma that should be considered during the secondary survey.

IMMEDIATELY LIFE THREATENING INJURIES

1. Airway obstruction.
2. Tension pneumo thorax.
3. Open pneumo thorax.
4. Massive hemothorax.
5. Flail chest.
6. Cardiac tamponade.

POTENTIALLY LIFE-THREATENING INJURIES

1. Simple pneumo / hemothorax
2. Aortic rupture
3. Tracheobronchial rupture
4. Pulmonary contusion
5. Blunt cardiac injury
6. Diaphragmatic rupture

THE COMPONENTS OF CHEST INJURY IN BLUNT TRAUMA

Any combination of structures may be involved in injuries in varying degrees of severity. If the skeletal injuries are severe, underlying parenchymal injuries are likely to be in proportion; however, in young flexible chests, or those restrained by seat belts, there may be little external evidence of the severity of internal damage.

CHEST WALL

A simple rib fracture may be serious in elderly people or in those with chronic lung

disease who have little pulmonary reserve. Uncomplicated fractures require sufficient analgesia to encourage a normal respiratory pattern and effective coughing. Oral analgesia may suffice but intercostal nerve blockade with local anaesthesia may be very helpful. Chest strapping or bed rest is no longer advised and early ambulation with vigorous physiotherapy (and oral antibiotics if necessary) is encouraged. A chest radiograph is always taken to exclude an underlying pneumothorax. It is useful to confirm the skeletal injuries, but routine chest radiography may miss rib fractures. However, once a pneumothorax and major skeletal injuries are excluded, the management is the same, the local control of chest pain.

FIRST RIB FRACTURE

Fracture of the first rib should alert the clinician to a potential serious chest injury. This rib is well protected and requires a considerable force to fracture, and associated injuries to the great vessels, abdomen, head and neck are common. The mortality associated with a fracture of the first rib exceeds 30%. Similar suspicions are raised when fractures of the sternum and scapula are seen. Fractures of the lower ribs may involve underlying abdominal viscera (spleen on the left and liver on the right). Intercostal artery bleeding may still be severe, resulting in haemothorax.

FRACTURES OF THE STERNUM

This injury is now seen as a result of deceleration injuries on to seat belt . Steering wheel injuries are now much less common. The injury is very painful, even in the mild case in which only the external plate of the sternum is fractured. However, there is a risk of underlying myocardial damage, and the patient should observed in hospital with constant

electrocardiogram monitoring, analgesia and serial cardiac enzymes preferable in intensive care setup.

FLAIL CHEST

Flail chest is the most serious of the blunt chest wall injuries. It is common after any form of blunt thoracic trauma, and though it may occur as an isolated finding, it is usually associated with other significant injuries. Flail chest represents a disruption of the stability and normal respiratory mechanics of the rib cage. It involves fractures of adjacent ribs, each of which is fractured in two or more places, so that a panel of chest wall moves independently of , and in the opposite direction to, the remainder of the chest. When it occurs in conjunction with separation of the costochondral or costosternal joints, the sternum can also be part of the flail segment, and the condition is termed a sternal flail chest and this is a most serious condition.

The following are the three components of the pathophysiology of flail chest:

1.Alteration of chest wall mechanics. The paradoxical motion of a large flail segment occasionally impairs the patients ability to achieve an adequate tidal volume or an effective cough.

2. Underlying pulmonary contusion. In the vast majority of serious flail chest injuries, this is the most significant physiologic aberration. In the contused portion of the lung, there is extravasation and accumulation of blood and fluid in the alveolar air space, which

results in sufficient shunting to produce hypoxemia.

3. Pain.The extreme pain of multiple rib fractures leads to profound splinting and diminution of tidal volume and prevents adequate coughing and pulmonary toilet in most alert patients. The combination of reduced tidal volume and inadequate coughing leads to hypoventilation, atelectasis, and often pneumonia.

The diagnosis is typically suspected on the basis of the presence of numerous adjacent rib fractures on a chest radiograph, but it can be conclusively confirmed only by the presence of a paradoxical motion observed in the involved segment in a spontaneously breathing patient. A flail segment may be overlooked in a patient undergoing positive pressure ventilation because there may be no paradoxical motion without inspiratory effort. Therefore, in an intubated patient, the diagnosis must be sought through careful examination and palpation of rib cage for instability.

Management: Proper management of flail chest hinges on the recognition that the injury is not a static condition but, rather, an evolving process. Frequent reevaluation and timely, appropriate intervention are essential. During the initial assessment, the patency of the airway and the adequacy of ventilation must be established or confirmed. Immediate intubation is rarely required for patients with isolated flail chest injuries. When early intubation is indicated, it is usually for associated injuries, most commonly to the central nervous system.

In virtually all awake and alert patients, management without intubation should be

attempted. To this end, early and aggressive pain management is essential. Pain cannot be eliminated entirely, but it usually can be diminished sufficiently to allow an adequate tidal volume and a forceful cough. Oral analgesics rarely suffice for patients with even a small flail segment; stronger agents are required for all the patients. Parenteral narcotics are effective, especially when administered in a patient-controlled analgesia (PCA) device. Intercostal nerve blocks occasionally provide dramatic pain relief, but only for short periods. If the patient is encouraged to cough vigorously during pain relief, intermittent nerve blocks may be helpful, despite the inherent risk of pneumothorax.

The mainstay of pain control in patients with flail chest is thoracic epidural anesthesia, in which a solution containing 0.002% to 0.005% morphine sulfate and 0.075% to 0.2% bupivacaine is infused through a small catheter in the thoracic epidural space at a constant rate of 0.15 to 0.75mg morphine/hr. At this low dosage, bupivacaine acts synergistically with morphine and does not exert a local anesthetic effect on the spinal cord; in addition, it generally does not give rise to the respiratory depression frequently observed with systemic narcotics. Epidural anesthesia provides immediate comfort, dramatically improves vital capacvity and tidal volume, and most important, enables the patient to produce a forceful cough.

The most common serious adverse effect of epidural anesthesia is transient hypotension at the time of insertion. This complication can be prevented by providing adequate volume resuscitation before creating the chemical sympathectomy. Urinary retention occurs in 30% to 50% of cases; in practical terms, this means that most flail chest patients should not have their urinary catheters removed until the epidural analgesics are no longer required. Patients who have head injuries and are thus at risk for increased intracranial pressure should not undergo

epidural catheterization, because an unintentional dural puncture could alter cerebrospinal pressure sufficiently to induce or contribute to cerebral herniation. Relative contraindications to epidural catheter placement include spine fractures and infection; however, fever may be a relative indication if it is thought to be secondary to splinting with atelectasis or pneumonia.

The decision-making process for management of flail chest should begin with assessment of the patients ability to cough.If the patient is able to clear tracheal secretions-that is, actually cough them up into the oropharynx-then observation in an acute care setting, in conjunction with small, infrequent doses of narcotics, is appropriate. If the patient has no cough or has a very truncated cough that moves secretions but does not propel them into the orophyarynx, an aggressive program to promote pulmonary toilet, including chest physiotherapy and postural drainage, should be instituted. If a sufficiently vigorous cough cannot be achieved and there is no specific contraindication, an epidural catheter is inserted and the patient followed closely with frequent physical examinations in the intensive care unit. Ambulation is encouraged and frequent coughing is required.

There is no role for antibiotic prophylaxis in the management of flail chest or pulmonary contusion. Pneumonia is common in this setting, occurring in 25% to 50% of flail chest victims, but prophylactic antibiotics do not reduce the incidence of this complication: they simply shift the spectrum of offending organisms to favor drug-resistant bacteria and fungi. Routine administration of steroids also has no role in the treatment of flail chest.

VERTEBRAE

The thoracic spine may be injured as one component of multiple injury or in isolation. It is more usual for the cervical spine to be injured and this must be excluded before any

manipulations or movements take place. Damage to the thoracic spine is likely to be associated with injuries to other thoracic viscera. However, the thoracic spine injury is a reminder that, in whom the chest injury predominates, a quick screening neurological examination should be performed and documented to confirm the integrity of the nerve supply to the lower limbs.

PLEURA

If the visceral pleura is breached (most commonly by a rib fracture), pneumothorax follows. Generation of positive pressure in the airways by coughing, straining, groaning or positive pressure ventilation will result in tension pneumothorsx. The pleural space may also fill with blood as a result of injury anywhere in its vicinity. It should be remembered that an erect chest radiograph is the only sure way to confirm or exclude the diagnosis of pneumothorax and should be obtrained if at all possible. Early management of tension pneumothorax is life saving. Good management of the pleural space pre-empts many later complications from clotted haemothorax, constriction of the lung and empyema.

TRAUMATIC PNEUMOTHORAX

Blunt trauma to the chest wall may result in a lung laceration from a rib fracture. All traumatic pneumothoraces require drainage through an underwater seal drain because of the possibility that they may become a tension pneumothorax with mediastinal shift and circulatory collapse. There is decreased air entry on the affected side and the trachea may be pushed over to the opposite side. There is an increased percussion note and reduced breath sounds. If a tension pneumothorax is suspected on clinical grounds treatment is necessary before

radiographs can be taken. A wide bore needle in traduced into the affected hemithorax will release any air under tension and is life saving. A wide-bore intercostal tube is introduced laterally and directed to the apex of the pleural cavity..

TRAUMATIC HAEMOTHORAX

Drainage is essential because re-expansion of the lacerated lung compresses the torn vessels and reduces further blood loss. Drainage will also allow the mediastinal structures to return to the midline and relieve compression of the contra lateral lung. If left, a dense fibrothorax will result, with the possibility of an added empyema. The procedure is similar to drainage for pneumothorax but a wide-bore tube (> 28F) is required and a basal drain is sometimes necessary. Continuing blood loss in excess of 200ml h-1 for 3 hour or more may require urgent thoracotomy within the first few hours.

LUNG PARENCHYMAL CONTUSION

The underlying lung is often injured in moderate to severe blunt thoracic trauma and the area of contusion may be extensive. This usually resolves but lacerations with persistent air leak may require exploration by thoracotomy. It is important to prevent infection of the underlying lung by early mobilization (if the patients condition permits), prophylactic antibiotics, suction drainage and physiotherapy. The importance of a good-quality posteroanterior erect chest radiograph following any trauma to the lung cannot be overemphasized.

MAJOR AIRWAYS

Injuries to major bronchi are infrequently seen as the patient rarely survives the insult

leading to major airway disruption. There is usually a combination of surgical emphysema, haemoptysis and pneumothorax. Chest drainage, despite the addition of suction, fails to reinflate the lung and a persistent air leak may be present. Injury to the trachea requires considerable force and consequently less than one quarter of patients survive to reach hospital. The injury may be from direct trauma or the result of high intratracheal pressure against a closed glottis. There is hoarseness, dyspnoea and surgical emphysema. The exact pattern of signs will depend on the site of the injury and whether or not the pleura has been breached. The treatment is exploration and repair if possible. Resection of lung should be avoided as a surprising degree of recovery may occur.

DIAPHRAGM (DIAPHRAGMATIC RUPTURE)

The mechanism for diaphragmatic rupture is high-speed blunt abdominal trauma with a closed glottis. The sudden rise in intra-abdominal pressure breaches the weakest part of the abdominal wall, namely the diaphragm. This occurs much more commonly on the left hemidiaphragm (the right is protected by the liver). The colon and stomach may herniate into the thorax, displacing the lung. Bowel sounds may be heard in the chest and the chest radiograph may reveal bowel gas in the lung fields. A contrast study will confirm the diagnosis. Occasionally, the injury is overlooked and the patient presents some time later with a diaphragmatic hernia. Cases presenting acutely should be explored by thoracotomy not only to repair the diaphragm and prevent respiratory embarrassment, but to exclude injury to an underlying abdominal viscous such as the spleen.

CARDIAC INJURY

Major injuries to the heart and great vessels from blunt trauma are frequently fatal and

the patient rarely survives long enough to reach hospital. The injuries that are encountered in the accident and emergency department are following.

MYOCARDIAL CONTUSION

This must be suspected when the sternum is fractured, although the true incidence is not known. Myocardial damage from trauma will give an electrocardiogram pattern similar to myocardial infarction and enzyme changes may occur. In severe trauma, there may be arrhythmias and signs of heart failure. Patients with ECG changes and enzyme rises even in the absence of any problems should be nursed in a high dependency area with full monitoring and resuscitation equipment available. There is no specific treatment in the uncomplicated case but the risk of fatal arrhythmia diminishes after 48 hours or until the enzymes have returned to normal and any electrocardiogram changes have resolved. Occlusion of the coronary arteries, progressing to discrete, localized myocardial infarction, has been documented.

MANAGEMENT OF BLUNT CHEST TRAUMA

Most chest injuries in which the heart is not injured are managed conservatively with underwater seal drainage if necessary, and oxygen and physiotherapy to help-the patient to expectorate while the underlying lung parenchyma heals.

Indications for thoracotomy after blunt trauma

- ***1000ml drained at insertion of chest drain***
- ***Continued brisk bleeding > 100ml per 15 min***
- ***Continued bleeding > 200ml h for three or more hours***
- ***Rupture of bronchus, aorta, oesophagus, diaphragm***
- ***Cardiac tamponade***

In 10% of cases a thoracotomy is required. The indications for thoracotomy following blunt thoracic trauma are the following .

- In total, 50-1000ml of blood at the time of initial drainage is common and may need no further action but greater volumes, especially if the blood is fresh, require intervention.
- Continued brisk bleeding (>100ml/15min) from the intercostal drain indicates a serious breach of the lung parenchyma and urgent exploration is required.
- Continued bleeding of > 200ml h for three or more hours may require thoracotomy under controlled conditions.
- Rupture of the bronchus, aorta, oesophagus or diaphragm.
- Cardiac tamponade (if needle aspiration is unsuccessful).
- All explorations following trauma should have double lumen tube endotracheal intubation to facilitate surgery on the injured side and to protect the undamaged lung.
- If transfer is undertaken, the patient must be stabilized before the journey. All lines must be secured and ECG monitoring available. Chest drains must not be clamped during transfer and a medically qualified person should accompany the patient.

PRACTICAL ASPECTS OF CHEST DRAIN INSERTION

In a conscious patient, infiltrate 10 to 15ml of 1 percent lignocaine through to the

periosteum on the upper border of the rib below the chosen interspace. Advancing the needle above the rib should infiltrate the pleura. Passage of the needle into the pleural cavity confirms the presence of free air, fluid, or blood on aspiration. Liberal local anaesthesia facilitates scalpel incision through the full thickness of the chest wall so that the drain can be inserted smoothly without pushing. The needle used for infiltration can be left in situ so that the precise skin area and direction of anaesthetic infiltration is not lost when the skin is cleansed with povidone iodine solution.

Aseptic technique is important since a sterile effusion or haemothorax can easily be turned into an empyema when infection is introduced through the drain. A wide area of skin around the proposed site is cleaned with povidone iodine or chlorhexidine in spirit. The operator should scrub as for a surgical procedure and wear a mask and gloves.

For trauma patients it is wise to cover the procedure with a single dose of prophylactic intravenous antibiotic. In an emergency situation may of these precautions will be over-ruled by the degree of urgency. For life-threatening tension pneumothorax a stab wound through the chest wall without preparation provides immediate relief and should not await aseptic technique or the availability of a drain. An antibiotic should be administered after completing the procedure.

Use a scalpel to incise the chest wall skin and subcutaneous fat 1 . Chest drain insertion. (a) Needle and local anaesthetic infiltrating the proposed drain track. (b) Blunt dissection of

the parietal pleura. (c) Digital examination along the tract into the pleural space. (d) Withdrawal of central trocar and positioning of drain. to 2cm beneath the proposed site of pleural incision so that the drain track leads the drain towards the apex of the pleural cavity. The underside of the rib above should be avoided so as to preserve the intercostals nerve and vessels. The scalpel should find the rib below the interspace to be breached; the remainder of the track is then completed by blunt dissection through to the pleural cavity with artery forceps. If there is any question about the adequacy of this incision a gloved finger should be passed through the track. The finger tip should enter the pleural cavity easily without resistance and on removing the finger air, blood, fluid, or pus should exit through the drain site. This precaution should always be taken, when a partially obliterated pleural cavity is expected

The drain should slide easily through the track and into the pleural cavity when blood, fluid, or air will flash fill the tube. When the expected contents of the pleural cavity do not appear in the drain it is important to ascertain why. First, there is the possibility that the drain has not passed through the intercostal space but has deflected into the tissues of the chest wall. Second, the radio-opaque contents of the pleural cavity may be solid instead of liquid, as in clotted haemothorax or empyema. Drains haven been inserted into mesothelioma and lung tumours. Do not be concerned about allowing air to enter along the drain: this will be evacuated immediately when the lung expands and underwater sealed drainage is established.

When the drain is in good position it is secured with at least zero gauge silk or nylon suture to prevent displacement. Once inserted a drain should never be allowed to fall out. The suture material must therefore be strong enough to ‘bite into’ the plastic tube and grip firmly.

A purse string suture is placed around the incision to close the track when the time comes for drain removal.

CARE OF THE CHEST DRAIN IN SITU

Once the drain is inserted in the required position and securely fixed no further adjustments should be made. In particular, the temptation to advance the drain further into the chest should be avoided since this will introduce infection into the track. The wound should be sealed around the drain with povidone iodine gel or the wound sprayed with clear plastic dressing. Dressings are unnecessary although a thin square of gauze around the drain will absorb exudates. The ill-advised application of large quantities of adhesive tape should be avoided. Many patients suffer blistered skin from sheets of Elastoplast. This practice also hinders expansion of the chest wall and physiotherapy.

The chest drain should never be clamped in the presence of an air leak because of the risk of tension pneumothorax. In contrast, disconnection of the drain from its underwater seal merely allows air to enter the pleural cavity through elastic recoil of the lung. Reconnection of the drain to its underwater seal will immediately clear the pneumothorax.

WHEN TO REMOVE THE CHEST DRAIN

Any surgical drain acts as a conduit for bacterial infection. The chest drain should therefore be removed as soon as its purpose is accomplished. Long-term drainage may be required for chronic air leak in patients with obstructive airways disease or bullous emphysema and in some patients with chylothorax and empyema. Problems which remain unresolved after 2 to 3 weeks should be treated surgically. An intercostal drain should not be left in one site for

more than 3 weeks since erosion of the intercostals vessels may cause hemorrhage.

PENETRATION OF THE PERITONEAL CAVITY

Liver, spleen, stomach, and bowel have been transfixed by chest drains. This occurs trough poor technique when the drain is inserted beneath the sixth intercostal space, and penetrates through the lower part of the pleural cavity and diaphragm into the upper abdomen. This also occurs after traumatic rupture of the diaphragm if siting of the drain has not taken into account the radiological appearance. It is avoided by siting the drain above the sixth interspace, or higher when a large pleural effusion obscures the position of the diaphragm.

When deep liver penetration occurs we advocate leaving the drain in situ for 48h until resolution of blood clot prevents major haemorrhage. Penetration of the colon requires early laparotomy for peritoneal toilet. Penetration of the spleen or stomach may be managed conservatively, though clinical deterioration will often precipitate laparotomy..

MAJOR HAEMORRHAGE

Penetration of the heart is rare but may occur in patients with cardiomegaly, where the left ventricle is in opposition to the chest wall laterally. Exsanguination has occurred through left ventricular penetration followed by removal of the drain. If entry of a cardiac chamber is suspected the drain must be left in situ and the tube clamped pending urgent thoracotomy. Laceration of a major pulmonary vessel occurs particularly when a collapsed lung is deeply penetrated. The drain should be left within the pleural cavity and the rate of bleeding determined. When immediate drainage exceeds 1000ml or the subsequent rate 100ml/h for three consecutive hour's thoracotomy should be performed. Substantial haemorrhage may also occur through penetration of an intercostal or internal mammary vessel. This complication can usually be managed conservatively but occasionally requires exploration.

MATERIALS AND METHODS

In my study I have included fifty patients who presented to the casualty with multiple injuries due to blunt trauma with injuries to chest with or without associated injuries. I have included only those patients who presented with rib fractures with significant hemothorax or pneumothorax who required tube thoracostomy. I have excluded patients with isolated rib fractures with or without minimal hemothorax or pneumothorax who did not required tube thoracostomy.

The various modes of injury, the various presentations, and the **various factors associated with poor outcome like elderly patients, multiple rib fractures, first and second rib fracture, co existing chronic lung disease, flail chest have been evaluated.**

All patients were assessed and resuscitated using the advanced trauma life support (ATLS) steps. The six immediately life threatening injuries related to the airway and the chest were looked for and treated namely airway obstruction, tension pneumothorax. Open pneumo thorax, massive hemothorax ,flail chest and cardiac tamponade.

In unstable patients with clinical evidence of tension pneumothorax tube thoracostomy has been done without waiting for x-ray chest.

Other stable patients have been evaluated with x-ray chest, Ultrasound abdomen and CT

chest for assessing the various chest injuries.

Simple rib fractures were managed with analgesics, antibiotics. First and second rib fractures were evaluated for potential serious injury to chest and other organs. Patients with lower rib fractures were evaluated for underlying abdominal visceral injuries (spleen on the left and liver on the right). Patients with multiple rib fractures and flail chest were managed in the intensive care unit and provided thoracic epidural analgesia and ventilator support if needed.

Patients with respiratory distress due to significant pneumo and hemothorax underwent tube thoracostomy on the day of admission. A stable patient without respiratory distress was evaluated by CT chest and tube thoracostomy was done if required. Cardiothoracic surgeon's opinion was obtained in all the patients.

Normally tube thoracostomy tube was removed on the 3rd to 7th day if the drain was clear and less than 50 ml. Patients were taken up for emergency thoracotomy,.if indicated (ie. More than 1000ml of blood drained at insertion of chest drain or continued bleeding >200ml for three or more hours).

Purse string sutures were not applied during ICD tube insertion and the ICD site wound was not closed after removal of ICD tube as these were inserted in emergency conditions.

OBSERVATION AND CORRELATION

Blunt injury to chest occurs commonly in poly trauma patients. In the study the various causes of blunt injury to chest are listed below.

Road traffic accident	- 34 patients (68%)
Accidental fall from height	- 8 patients (16%)
Assault	- 4 patients (8%)
Bull hit injuries	- 2 patients (4%)
Wall collapse	- 1 patient (2%)

Road traffic accidents 68% are the commonest cause for blunt injury chest.8 patients (16%) sustained injuries due accidental fall from height. Of these three patients were elderly who accidentally fell while climbing up or down the stairs. Five persons fell while climbing trees. 35% patients (70%) were males and 15 (30%) were females. More men were injured due to road traffic accident and fall from tree than females.

The various clinical presentations in this study were

RIB fractures	-	50 patients (100%)
Hemo/pneumo thorax	-	50 patients (100%)
Lung contusion	-	3 patients (6%)
Cardiac injuries	-	Nil
Tracheo bronchial injuries	-	Nil

Associated injuries were

Head injuries	-	5 patients (10%)
Facial injuries	-	2 patients (4%)

Spinal injuries - 3 patients (6%)

Fracture bones of extremities And pelvis - 9 patients (18%)

Rib fractures

First and second rib fractures - 8 (16%)

Multiple rib fractures - 4 (8%)

Flail chest - 2 (4%)

Lower rib fractures - 5 (10%)

Other rib fractures - 31 (62%)

Various treatment modalities given were

Tube thoracostomy - 50 patients (100%)

Emergency thoracotomy - 1 patient (2%)

Thoracic epidural analgesia - 6 patients (12%)

Ventilatory support - 3 patients (6%)

Various treatment outcomes were

- Improved well - 46 patients(92%)
- Expired - 3 (6%)
- Discharged AMA - 1 (2%)

Complications of tube thoracostomy:

No significant complications occurred following tube thoracostomy in this study. Few patients developed minimal infection at ICD site which settled during hospital stay.

EVALUATION OF VARUOUS FACTORS WHICH INFLUENCED THE OUTCOME OF PATIENTS WITH BLUNT INJURY CHEST IN THIS STUDY

1.AGE:

A simple RIB fracture may be serious in elderly patients. In this study 6 patients were aged more than 60 years.Of these 1 patient died. Another two patients who died were aged 55 years and 25 years.

2. PRE EXISTING CHRONIC PULMONARY DISEASE:

In this study three patients were known COPD patients. Of this one elderly patient smoker with COPD with multiple rib fractures and flail chest expired. He underwent tube thoracostomy on the day of admission and was shifted to intensive care unit and given ventilatory support. In spite of these measures, he developed ARDS and he expired after 4 days. The other two patients with COPD improved well.

SITE AND NUMBER OF RIBS FRACTURED FIRST AND SECOND RIB FRACTURE

Fracture of the first and second rib should alert the clinician to a potential serious chest injury. These ribs are well protected and require a considerable force to fracture and associated injuries to the great vessels, abdomen, head and neck are common. The mortality associated with fracture first rib exceeds 30%.

In this study 8 patients had sustained fracture of first or second ribs. Of these patients 2 patients had died, a mortality rate of 25%. A brief account of the two patients who expired is given below.

One 62 year male, smoker and known COPD patient had sustained blunt injury chest due to bull hit. He had sustained fracture of left 2, 3, 4, 5^{th} ribs with flail chest and fracture clavicle and moderate hemothorax. Tube thoracostomy done on the day of admission. He was shifted to intensive care unit. intubated and given ventilatory support. However he expired after four days .

At post mortem, the findings where fractures right 2,3,4,5 ribs along the anterior axillary line and fracture right 3,4 ribs along the posterior axillary line with laceration of the right lung. Whole of right lung adherent to chest wall and converted into a purulent mass. He appeared to have died due to his chest injury.

Another 61 years old male patient had sustained injuries due to RTA. He was treated privately for 3 days and then got admitted in TMCH.At the time of admission his GCS E_1 VET M_1. He had sustained fractures of left 2, 3, 4, 5 RIBS with fracture clavicle. He also had fracture of left frontal bone with pneumocedphalus. He was managed in intensive care unit and given ventilatory support. He expired after 5 days.

The post mortem findings were depressed fracture frontal bone, fracture left temporal bone, laceration of about 4x2x1 cm left temporal lobe of brain, fracture dislocations cervical vertebra c5 c6, fracture left 2,3,4,5 ribs. Lungs were normal. He appeared to have died of associated head and cervical spine injury.

Three of the remaining five patients with fracture first or second rib had sustained serious associated injuries. One 45 years female with injuries due to RTA had sustained fracture left 2, 3 rib with fracture scapula right with spinal cord hematoma $C_2 - C_3$ level with wedge compression fracture T_1 with quadriperesis and feeble left radial pulse she was treated with cervical collar, analgesics heparin, pentoxyphylline, aspirin. She improved well, radial pulse was palpable after two days and her weakness improved and had a power of 4/5 in all four limbs after 1 week.

Another patient 47 years old with fall from three with fracture left first rib had associated compression fracture of D_{12} vertebra. He improved with left tube thoracostomy.. Another patient 54 years old male with injuries due to RTA had fracture right 2, 3, 4, 5, 6 with fracture right clavicle and right lower lobe lung constusion had associated fracture right femur and fracture right tibia. Tube thoracostomy done on first day and he was managed in intensive care unit. He continued to have respiratory distress and got discharged against medical advice after two days.

MULTIPLE RIB FRACTURES (SIX OR MORE RIBS)

In this study 4 patients had multiple rib fractures involving six or more ribs. They were treated with tube thoracostomy, thoracic epidural analgesia and supportive measures. With this treatment all the four patients improved well Of the patients who survived one 45 years old female with injuries due to RTA had sustained fracture left 4, 5, 6, 7, 8, 9 ribs with contusion left lower lobe lung with fracture both bone left leg. She was treated with thoracic epidural analgesia, Oxygen, antibiotics. She improved well. Another 56 years old female with injuries

due to RTA had sustained fracture right 4, 5, 6, 7, 8, 9, 10 ribs and left 3, 4, 5 ribs. With fracture left humerus. She had no respiratory distress and was treated with antibiotics, analgesics and she improved well. Another 60 years old male with injuries due to accidental fall from tree had sustained fracture right 2, 3, 4, 5, 6, 7 ribs with pneumothorax. Tube thoracostomy done on the first day and he improved well.

LOWER RIB FRACTURES

Fractures of the lower RIBS 9 – 12 ribs may involve underlying abdominal viscera (spleen on the left and liver on the right). In this study five patients had lower rib fractures. However none of them had associated injury to liver or spleen.

FLAIL CHEST

In this study two patients had multiple rib fractures with flail chest.Both these patients had fracture of the second rib. Both these patients were treated with tube thoracostomy, thoracic epidural analgesia and ventilatory support in intensive care unit. One patient died and another patient improved well with this treatment. The patient who died was 62 yr old male with fracture left 2,3,4,5 ribs and moderate hemothorax. He was a known COPD patient, smoker and he developed ARDS and expired. Post mortem revealed he had died due to the effects of chest injury.

Another 55 yrs old male patient sustained fracture of right 2,3,4,5,6,7,8 ribs with

pneumothorax right with fracture clavicle with flail chest. He improved well with treatment repeat x- ray showed adequate lung expansion. He had no respiratory distress.

HEMOTHORAX

In this study 26 patients had significant hemothorax which caused respiratory distress for patient. All the patients underwent tube thoracostomy and of these 24 patients improved well One patient with flail chest and moderate hemothorax expired. One patient had to undergo emergency thoracotomy as he had blood loss of more than 1000 ml at the time of tube thoracostomy.

EMERGENCY THORACOTOMY

This 25 years old male had sustained injuries due to RTA. At the time of admission his GCS was 11/15. History of loss of consciousness and left ear bleeding present. Clinically he had massive Hemothorax left X- ray Chest showed massive hemothorax left . CT brain not taken in view of the poor general condition. Tube thoracostomy drained more than 1000ml. He was taken up for emergency thoracotomy on the same day. Intra operative findings were # 6, 7 ribs left, bleeding from mediastinal tear, lung normal. About 250ml or clotted blood in left pleural cavity.3 units of blood transfused preoperatively,2 units of blood transfused peroperatively.Bleeding vessel ligated. However patient developed hypotension at the end of surgery, shifted to Intensive Care Unit and expired on the day of surgery.

Post mortem findings were fracture right 2,3,4 ribs, fracture left 6,7 ribs with left lung contusion, linear fracture left temporoparietal bone, fracture dislocation left middle cranial fossa with sub arachnoid haemorrhage and laceration right cerebrum. He appeared to have died due to the associated head injury.

PNEUMOTHORAX

In this study 24 patients had significant pneumothorax which caused respiratory distress. After tube thoracostomy 23 patients improved well. One patient with multiple rib fractures with associated head injury, depressed fracture frontal bone with fracture left temporal bone with, fracture dislocation cervical vertebra c5,c6 expired in Intensive Care Unit.

LUNG CONTUSION

Presence of contusion of lung indicates moderate to severe blunt thoracic trauma. In this study three patients had contusion of lung and all three had severe chest injuries and severe associated injures. One patient was a 45 years old female who sustained injuries due to RTA and she had contusion left lung. # Left 2, 3rd ribs, # scapula right with compression # first thoracic vertebra. With spinal cord hematoma C_{2-3} level with quadriperesis. She improved well with the treatment.

Another 55 years old male had sustained injuries due to fall from tree. He had severe lung contusion right with # right 2, 3, 4, 5, 6, 7, 8 ribs, with flail chest. He improved well with tube thoracostomy and ventilatory support.

Another 54 years old male who sustained injuries due to RTA had right lower lobe

contusion with # right 2, 3, 4, 5, 6 ribs # Right clavicle with # femur right, # tibia right. He underwent tube thoracostomy but continued to have respiratory distress and discharged against medical advice after two days.

CARDIAC INJURIES

Major injuries to the heart and great vessels from blunt trauma are frequently fatal and the patient rarely survives long enough to reach hospital. In this study no patient presented with significant cardiac injuries.

DISCUSSION

Injury is the commonest cause of death among people aged 1 – 34 years in the western world. By the year 2020 road traffic accidents will be the second most important cause of death in developing nations.

Prevention is better than cure. A 10% increase in speed translates into 40% rise in case fatality risk for the occupants of motor vehicle. Use of seat belts reduces the risk of death or serious injury for front seat occupants by 45%. Helmets reduce the risk of fatal head injury by about one-third and reduce the risk of facial injury by two thirds.among persons who ride two wheelers. Avoiding alcohol before driving is an important preventive step.

In the management of poly trauma patients. The steps in the ATLS philosophy should be followed.

(a) Primary survey with simultaneous resuscitation to identify and treat what is killing the patient.

(b) Secondary survey to proceed and identify all other injuries.

(c) Tertiary survey and definitive care of the injuries.

The steps in the primary survey are

1. Airway with cervical spine protection.
2. Breathing and provision of oxygen.
3. Circulation and hemorrhage control.

4. Disability evaluation.
5. Exposure and examination.completely

Blunt trauma to chest is fatal in 10% patients in isolation. Rising to 30% if other injuries are present. The majority of chest injuries are confined to thoracic cage. These consist of rib fractures with underlying pulmonary contusion, hemothorax or pneumothorax.

In this study all the included patients had rib fracture with significant hemo or pneumo thorax which required tube thoracostomy.

RIB FRACTURES

Simple isolated rib fractures or rib fractures with minimal hemo or pneumothorax were managed conservatively with antibiotics, analgesics. However they were not included in this study. Initially parenteral analgesics were given. Later switched over to oral analgesics. Most of the patients had good pain relief from this mode of treatment. Inter costal nerve blockade with local anesthetic was not given in this study. Six patients with multiple rib fractures were given thoracic epidural analgesia. All the patients had good pain relief and were comfortable and improved well.

Patients with fracture of first or second rib were evaluated carefully for serious injuries. Of the 8 patients with first or second rib fractures two patients died. Mortality is high in first and second rib fractures because these ribs are well protected and require considerable force to fracture and associated injuries to the great vessels, abdomen, head and neck are common.

Patients usually die due to severe chest injury or associated severe injury to vital organs.

Patients with fractures of the lowed ribs routinely underwent Ultra Sound abdomen to ruleout injury to liver and spleen.Patients with pre existing chronic pulmonary disease were managed with broncho dilators, chest physiotherapy and oxygen support.

Patients with rib fractures with underlying hemothorax or pneumothorax with respiratory distress underwent tube thorcostomy on the day of admission. Patients with multiple rib fractures with respiratory distress underwent tube thoracostomy on the day of admission and were managed in the intensive care unit and given ventilatory support. Thoracic epidural analgesia was given for pain relief.

One patient with massive hemothorax and continuous blood loss in ICD drain more than 1000 ml at the time of tube thoracostomy, underwent emergency thoracotomy and was found to have bleeding from a mediastinal tear which was ligated. Total 5 units of blood transfused . Unfortunately this patient died. Post mortem findings revealed fracture dislocation left middle cranial fossa, linear fracture left temporal parietal bone laceration of right cerebrum with sub arachnoid hemorahage, fracture right 2,3,4 ribs and fracture left 6,7 ribs with left lung conctusion. He appeared to have died of associated head injury.

Another patient who died was 61 yrs old male with fracture left 2,3,4,5 ribs with GCS 3/15 with depressed fracture left frontal bone. Post mortem revealed he had died due to associated head and cervical spine injury. Another patient who died had sustained fracture 2,3,4,5 ribs with flail chest and hemothorx. Post mortem revealed he had died due to the chest

injury.

Thus of the three patients who died in this study one patient had died due to the chest injury and other two patients had died due to associated injury to head and cervical spine.

No patient with cardiac injury was encountered in this study.

The various factors which adversely affect the outcome of patients with blunt injury chest in this study were.

1. AGE:

Elderly patients especially those with pre existing chronic pulmonary disease have a higher risk. In this study 6 patients were aged more than 60 years of whom one patient died.

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2. FIRST AND SECOND RIB FRACTURE

Fractures involving first and second ribs is a definite risk factor. In this study two of the eight patients with fracture first or second rib died. A mortality rate of 25%.

3. FLAIL CHEST

Flail chest is a serious injury. In this study two patients had multiple rib fractures with flail chest. With tube thoracostomy and ventilatory support and thoracic epidural analgesia one patient improved well. The other patient died..

4.LUNG CONTUSION

Presence of lung contusion indicates serious chest injury and serious associated injuries. In this study all the three patients with lung contusion had serious chest and associated injuries.

ASSOCIATED INJURIES:

In this study 5 patients had associated head injury, 3 patients had spinal injuries, 9 patients had fracture bones of extremities and pelvis. **Two patients died due to associated head and spinal injuries.**

CONCLUSION

- **The various factors which adversely affect the outcome of a patient with blunt injury chest are**

(a) Elderly patients

(b) Pre existing chronic pulmonary disease

(c) First and second rib fractures

(d) Multiple rib fractures (6 or more ribs)

(e) Flail chest **(f)**

Underlying lung contusion

(g) Failure to insert a chest drain when indicated.

(h) Associated injuries to other vital organs.

The commonest cause of blunt injury chest is road traffic accident.

- Prevention is better than cure in road traffic accidents.
- All trauma patients should be managed by the steps of advanced trauma life support (ATLS)
- (a) Primary survey with simultaneous resuscitation to identify and treat what is killing the patient.

  (b) Secondary survey to proceed and identify all other injuries.

  (c) Tertiary survey and definitive care.
- The majority of chest injuries are confined to thoracic cage.
- Rib fractures with underlying hemo thorax or pneumothorax can usually be managed

effectively by tube thoracostomy.

- Thoracic epidural analgesia gives good pain relief and improves survival in multiple rib fractures and flail chest patients.
- Flail chest patients should be managed aggressively by tube thoracostomy, oxygen, chest physiotherapy, thoracic epidural analgesia and ventilatory support if required.
- Patients with fracture of First or Second ribs should be evaluated carefully for serious chest injury and serious injury to other vital organs.

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PROFORMA

NAME

AGE / SEX

ADDRESS

IP NUMBER

MODE OF INJURY

PRESENTING COMPLAINTS

a) CHEST PAIN

b) DIFFICULTY IN BREATHING

c) OTHER COMPLAINTS
H/O PAST ILLNESS

PRE EXISTING WHEEZE / DYSPNEA

H/O SMOKING

CLINICAL EXAMINATION

CONSCIOUSNESS

TRCHYPNIA / DYSPNEA

PALLOR

PULSE: VOLUME, REGULAR, IRREGULAR

BLOOD PRESSURE:

CARDIO VASCULAR SYSTEM

RESPIRATORY SYSTEM

INSPECTION - POSITION OF TRACHEA

AND APEX, FLAIL CHEST

PALPATION	-	TENDERNESS, CREPITUS
PERCUSSION	-	HYPER RESONANT NOTE STONY DULLNESS
AUSCULTATION	-	ABSENT BREATH SOUNDS WHEEZE ASSOCIATED SOUNDS

ABDOMEN

CENTRAL NERVOUS SYSTEM

EXAMINATION OF NECK

SPINAL INJURIES

INVESTIGATIONS

XRAY CHEST : SITE AND NUMBER OF RIBS FRACTURED

a) FIRST OR SECOND RIB FRACTURE

b) MULTIPLE RIB FRACTURE (6 OR MORE RIBS)

c) LOWER RIB FRACTURES (9 - 12 RIBS)

d) HEMOTHORAX, PNEUMO THORAX.

ECG - FOR ARRHYTHMIAS

ULTRASOUND ABDOMEN: LIVER OR SPLEEN INJURY, OTHER INJURY

CT THORAX : 1. HEMOTHORAX

2. PNEUMOTHORAX

3. LUNG CONTUSION

4. RIB FRACTURE

OTHER ASSOCIATED INJURIES

TREATMENT GIVEN FOR CHEST INJURIES

1. ANTIBIOTICS ANALGESICS

2 TUBE THORACOSTOMY

3. THORACOTOMY

4. THORACIC EPIDURAL ANALGESIA

5. VENTILATORY SUPPORT

TREATMENT FOR ASSOCIATED INJURIES

OUTCOME

COMPLICATIONS

FOLLOW UP