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RESEARCH ARTICLE

PENETRATING CHEST INJURIES.

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Abstract

This is a retrospective study carried out in Fallujah teaching hospital during the period February 2007 –February 2012 to evaluate the style of penetrating chest injuries and the methods used in their management, and to increase awareness of penetrating chest trauma.

Materials and methods:-Data records were inspected of 248 patients seen at our thoracic surgery department in Fallujah teaching hospital over a 4-year period. Cases either received directly from casualty department or referred to our hospital from other hospitals in Anbar governorate.

Results:-Group contained 188 male (75.8%) and 60 female (24.2%) patients, with a mean age of 24 years. Of these patients, 154 (62.1%) had left sided, 84 (33.9%) had right-sided, and 10 (4%) had bilateral penetrating chest injury. Stab wounds comprised 75 cases (30.2%) and 38 patients (15.3%) caused by gunshot wounds and other patients 135 (54.4%) were victims of blast injury. Tube thoracostomy was the curative therapy required in 198 patients (79.8%), whereas 8 patients (3.2%) had conservative management and only 42 patients (16.9%) underwent thoracotomy. Mean hospitalization period was 6 days in the tube thoracostomy group whereas mean hospitalization duration in the thoracotomy group was 14 days.

Conclusion:-In this study we emphasize that chest tube thoracostomy should remain by far the most common and appropriate method of treating penetrating injury to the thorax.

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Introduction:-

Trauma is perhaps the oldest of humankind, and the history of trauma is as old as medicine itself. One of the earliest writings on thoracic injury was found in the Edwin Smith Surgical Papyrus, written in 3000 BC, which describes cases of penetrating thoracic trauma (1).

Thoracic injury is a common cause of mortality and major disability, and it is the leading cause of death in the first 3 decades of life (1,2). Thoracic injuries account for 20%-25% of deaths due to trauma (2,3). Penetrating thoracic trauma accounts for almost 33% of total chest traumas (2). The population has suffered increasing rates of penetrating trauma, with such trauma thus becoming a public health problem, associated with increasing levels of violence in society (4,5).

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Penetrating thoracic trauma is mostly attributed to violence and has a higher mortality rate than blunt trauma (2,6). It is more common in men due to their propensity to violence and the mechanism of injury is usually a gunshot wound or stab wound. Early recognition and timely treatment of life-threatening injuries, better resuscitative techniques, preoperative care, and elective surgical procedures can significantly affect outcomes in these patients (2). Studies have shown chest tube thoracostomy to be the primary modality for managing nonmediastinal, peripheral chest injury, with a very low incidence of thoracotomy (2,7). Our study aims to emphasize patterns of penetrating thoracic injuries, including their causes and the techniques used in management, and to add further data on the knowledge of penetrating thoracic trauma.

Materials and Methods:-

Retrospectively studied records of 248 patients presenting to Fallujah teaching hospital with penetrating chest trauma during (February 2007 to June 2012) from Fallujah city and villages around it. Our study included patients with penetrating chest trauma only, while blunt chest injuries were excluded from the study even cases with combined blunt and penetrating injury were excluded from this study. A standard posteroanterior chest X-ray is the most frequently used diagnostic modality in patients who sustain traumatic chest injury. Chest X-ray was the initial radiographic diagnostic tool for all cases. When pneumothorax and/or hemothorax were suspected or confirmed by chest X-ray, a computerized thorax tomography was performed. Chest tube thoracostomy was the initial treatment modality in cases of advanced pneumothorax or hemothorax. If there was only subcutaneous emphysema, conservative treatment modalities were performed.

Immediate thoracotomy was performed if more than 1000 cm³ of blood had drained with insertion of a chest tube, if drainage exceeded 200 cm³/h for 3 h, or if there was a major air leak. In those patients who had massive drainage or air leakage in vitally unstabilized patients, standard exploratory posterolateral thoracotomy was performed in order to control bleeding and to remove destroyed or devitalized lung tissues. Saturation of lung parenchyma, with or without wedge resection, was performed in lung trauma cases.

All patients postoperatively had appropriate antibiotic and analgesic medicines. Removal of chest tubes depended on air leakage and drainage of the chest tube. If the patient ceased air leakage and drainage was less than 50 cm³/day, then chest tubes were removed.

Results:-

Our study included 188 male (75.8%) and 60 female (24.2%) patients with a mean age of 27 years (range: 10-69 years). Of those, 154 patients (62.1%) had left sided penetrating injury, 84 patients (33.9%) had right-sided penetrating injury, and 10 patients (4%) had bilateral injury. Left -to-right injury ratio was 1.8:1. Blast injury wounds were the most frequent mode of injury, comprising 135 cases (54.4%), while 75 patients were victims of stab wounds (30.2%) and the remaining 38 cases were victims of gun shot injury. In terms of management, 198 patients (79.8%) were treated with only tube thoracostomy, 8 patients (3.2%) had conservative management, and 42 patients (16.9%) had thoracotomy and exploration. Out of 135 blast injured patients 19 (14.1%) needs thoracotomy, In the 38 gunshot wound patients, 8(21.0%) had thoracotomy, whereas only 11 (14.7%) of the 75 stab-wound patients had exploration. Mean duration until removal of chest tubes was 14 days in the exploration group and 6 days in the tube thoracostomy group.

One hundred ninety-eight patients (79.8%) were treated with only tube thoracostomy. indications for tube thoracostomy were hemothorax in 36 patients (18.2%), pneumothorax in 79 patients (39.9%), and both hemothorax and pneumothorax in 83 patients (41.9%). Eight patients (3.2%) had conservative management, of which 6 patients (75%) had accompanying pneumothorax whereas only 2 patients (25%) did not have injury beyond pleura. Exploration group included 42 patients (16.9%). Indications of exploration were hemothorax for 21 patients and massive air leak in 14 of the patients; the remaining patients had big foreign body, chylothorax or esophageal and mediastinal injury including great vessel injury and one pericardial injury. Duration of hospitalization time in the exploration group was 14 days. While it is 6 days in the tube thoracostomy group compared with 3 days in the conservative management group. 4 patients (1.6%) were died due to sever injury after unsuccessful resuscitation and another one patient dies from severe mediastinitis unresponsive to treatment.

Discussion:-

True incidence of pulmonary injuries is unknown and not easy to be estimated from the literature (8). The incidence of blast injury in Fallujah city seems very high as it is linked to unstable security situation during the study period if we compare it to stable areas. Reported incidence of civilian pulmonary injuries varies according to authors and institutions. Graham et al. (9) reported a 1-year experience in which 373 patients sustained penetrating pulmonary injuries. Robison et al. (7) described a 13-year civilian experience in the management of pulmonary injuries in 1168 patients. Tominaga et al. (10) described a 7-year single institutional experience of 2934 patients sustaining both blunt and penetrating chest trauma. Petrone et al. (8) described 101 patients who sustained complex penetrating pulmonary injuries.

Mechanism of injury is important; penetrating injury is usually the result of direct application of a mechanical force to a focal area and depends on the velocity and biomechanics of the projectile (1). Penetrating injuries can be divided into 3 groups (low, medium, or high) according to the velocity of the projectile. Low-velocity injuries include stab wounds that disrupt only the structures penetrated. Medium-velocity injuries include bullet wounds from handguns and are characterized by much less primary tissue destruction than wounds caused by high-velocity injuries. Those injuries include bullet wounds caused by rifles, which produce injury in adjacent structures in addition to that in the bullet path, tissue cavitation, and shock waves that extend beyond the area of tissue damage. The velocity of the penetrating projectile is the single most important factor that determines the severity of the wound (1). The degree of injury also depends on the biomechanics of the penetrating projectile, in which energy is transferred from the object to the body tissues (1).

Studies have shown that most chest injuries can be treated by relatively simple nonsurgical methods, such as tube thoracostomy, appropriate analgesics management, oxygen inhalation therapy, and good pulmonary toilet (11). In our study treatment of both groups included oxygen inhalation therapy (2 L/min), appropriate analgesics, and pulmonary toilet.

The majority of thoracic injuries requiring surgical intervention were due to penetrating mechanisms such as blast injury or gunshot wounds or stab wounds. In our study blast injury wounds represent the major penetrating mechanism of injury for patients requiring surgical treatment, which is higher than gun shot injury and stab wound injury.

Males outnumbered females due to their greater exposure to outdoor activities and propensity to violence.

During the 4-year duration of our study, 25 of 248 patients (10%) underwent exploratory thoracotomy. is very similar to the 10.2% reported in a Belgian study (14), but much less than the 16.1% reported in Nigeria by omas et al. (13).

Among those patients requiring thoracotomy for pulmonary injuries, simple over sewing of the lung can treat most. Some patients, however, may require formal pulmonary resection to control massive hemorrhage, to repair severe injuries, or to remove devitalized and destroyed tissue (15). Lobectomy is performed for massive tissue destruction isolated to a lobe or a bronchovenous communication that is not controllable by local techniques, or for pulmonary hemorrhage that may not be controlled by simple over sewing. Because pneumonectomy has a mortality rate of 50% according to a study by Tominaga et al. (10), it should be reserved for central irreparable pulmonary parenchymal, vascular, or bronchial injuries (7). The decision of whether to perform pulmonary resection is made at operation and depends on the location and extent of the injury (7). In our series, 10 patients had thoracotomy due to morbidities and/or hemorrhage. All patients had simple over sewing of the lung parenchyma, bleeding control, and appropriate positioning of chest tubes. There was no necessity for any type of anatomic lung resections in our cases.

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