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MANAGEMENT OF VASCULAR INJURIES OF THE NECK; A STUDY FROM A LSADER TEACHING HOSPITAL/BASRA/ IRAQ

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Abstract

Background: The optimum management strategy of penetrating neck injuries is a controversial issue. The initial trend was a mandatory exploration of every PNI once the platysma is violated. It changed over time into a selective approach with surgery done to patients with overt clinical features and/or abnormal investigations.

Objective: This study was designed to discuss and resolve the ongoing controversy regarding the optimum strategy for management of the neck injuries in our centers and discussing the results with the other regional and national studies.

Methods: from Jan. 2007 to Oct. 2015, a retrospective study done on 95 patients, with neck injuries whom admitted to the thoracic surgical ward at the Al-Sader teaching hospital in Al- Basra city, the basic data collected including age, sex, occupation, type of injury whether penetrating or blunt trauma to the neck, zone of the neck injured and the structures were injured and the type of vascular injury and repair done were studied in this study.

Results: Out of 9787 patients whom admitted to the thoracic and vascular word in the Al Sader teaching hospital, 95 patients with neck injuries were included in this study, all of them were male, with the majority between 20 – 40 years old (64%), most of them were self-employed (75%), 94 % were suffering from Penetrating neck injuries while 6% had blunt neck trauma, most of them were wounded at zone II (61%), next is zone I (18.94%), while the least is zone III (9.47 %), (54.73%) of the patients had associated injuries, and most of them were associated with chest injuries (18.94%), next to them the head and upper limbs (9.47%) each. In our study, we adopted the selective approach for neck exploration, where only 34 patients (35.79%) out of 95 patients had been under went mandatory exploration, those whom presented with severe bleeding, expanding hematoma, or with signs and symptoms of airodigestive injuries, 10 patients of them had been explored for arterial bleeding, and 5 patients underwent venous repair, and 5 patients had been explored for airodigestive injuries, the other patients subjected simple venous ligation and simple wounds suturing and closure, while 64.21% treated conservatively. Finally, the outcome of the patients was relatively good, were Sixty-eight patients (71.58%) out of 95 patients recovered completely and discharged home, 5 patients (5.26%) developed post-operative neurological complications, in the form of CVA, with mortality rate only 2 patients (2.1%) died, both of them under went surgical exploration

Conclusion: It is not mandatory to explore all the cases of penetrating neck injury because the majority of cases in many studies can be managed conservatively, so the notion of treating the platysma like a peritoneum need to be revised. Meticulous physical examination is the most important triage tool for selecting cases which need exploration from those who can be observed, yet

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in few situations, the Invasive investigations like angiography, bronchoscopy, and esophagogram, need to be used selectively based on the physical examination in the cases in which the patterns of injury suggest a concealed damage. Having guidelines in approaching penetrating neck injury minimizes the rate of unnecessary exploration and the possibility of missing an injury.

Keywords: management of vascular injuries of the neck in Al-Basra vascular center.

Introduction

The approach to penetrating trauma of the head and neck has undergone significant evolution and offers unique challenges during wartime. Military munitions produce complex injury patterns that challenge conventional diagnosis and management. Mass casualties may not allow for routine exploration of all stable cervical blast injuries (1).

Ongoing debate exists regarding the optimal approach for treatment of penetrating neck injuries. Proponents of operative intervention cite the possibility of a missed injury, with its perceived higher morbidity and mortality. Improvements in diagnostic modalities allow evaluation of potentially injured structures, providing an alternative to those who favor a non – operative approach (2).

A remarkable number of changes have occurred in the treatment paradigm as new technologies have developed and as surgeons have explored the outcomes from different treatment protocols. Therapy has evolved from no treatment (prior to effective anesthesia and instrumentation), to non – operative management, to routine exploration, to selective exploration and adjunctive invasive or noninvasive assessment (3). In 1552, Ambrose Pare ligated both common carotid arteries and the jugular vein of a soldier with a traumatic neck injury. The patient survived but developed aphasia and hemiplegia.

In 1803, Fleming ligated a lacerated common carotid artery and reported a successful outcome with a 5-month follow – up (3).

In 1811, Abernathy ligated the lacerated left common and internal carotid arteries in a patient who had been gored by a bull. This patient developed a profound hemiplegia and subsequently succumbed to his injury (4).

Non – operative management of penetrating neck wounds was the standard until World War I. During World War II, a more aggressive approach to neck exploration was adopted. Continual advances in anesthesia and perioperative management since World War II have improved the care and outcome of these patients. (3)

In 1944, Baily proposed early exploration of all cervical hematoma on the basis of his wartime experience, thus mandatory exploration became the mainstay of surgical management for penetrating neck injuries.

As time elapsed, the operative mortality rate was noted to decline, with concomitant rise in the rate of negative neck explorations, which ranged from 40% to 63%. On the basis of these figures, a selective approach to management of these injuries emerged to challenge the old dictum of mandatory exploration. From that time till now, an issue of mandatory versus selective neck exploration became a heated controversy (5).

Knowledge of cervical anatomy, coupled with an effort to conceptualize which structures lie within each zone, allows the surgeon to institute a systematic diagnostic search of the three key anatomic components of the neck: the cardiovascular system (subclavian, carotid, and vertebral arteries; jugular and subclavian veins); the respiratory system (trachea and larynx); and the digestive system (pharynx and esophagus) (4).

There are two anatomic orientations that help to illustrate the relationships within the neck.

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• The first is fascial planes (6). The superficial fascia lies just beneath the skin and encompasses the body of the platysma. The platysma is a thin, superficial muscle that originates over the upper part of the thorax, passes over the clavicle, and continues upward in the neck, across the mandible and extends into the superficially located facial muscles.

The deep cervical fascia, Underlying the platysma, which is subdivided into investing, pre tracheal, and pre vertebral layers. The investing fascia splits to enclose the sternocleidomastoid, omohyoid, and trapezius muscles as it encircles the neck. The pre tracheal fascia attaches superiorly to the thyroid and cricoid cartilage and extends into the chest, where it blends with connective tissue between the sternum and pericardial sac. It encloses the major viscera of the neck including the thyroid gland, esophagus, and trachea (6).

The pre vertebral fascia surrounds the vertebral column and the muscles closely attached to it. As the lower cervical nerves and subclavian artery course between the anterior and medial scalene muscles, they are invested in a diverticulum of the pre vertebral fascia that, as it approaches the axilla, becomes the axillary sheath. (6)

The carotid sheath is considered the major neurovascular compartment of the neck. It is composed of portions of all three layers or the deep cervical fascia and houses the internal jugular vein, common carotid artery, and the main trunk of the vagus nerve. These tight fascial compartments of neck structures may limit external hemorrhage from vascular injuries, minimizing the chance of exsanguination, an apparently beneficial effect that is countered, however, by the effects of hemorrhage within these closed compartments, which frequently compromises the airway (6).

The second Anatomical classification of the neck is zonal classification, (6) the neck can be divided into three major zones in order to aid in the decision making for diagnostic tests and timing of surgery.

Zone I; is below the cricoid and represents a dangerous area because the vascular structures in this zone are in close proximity to the thorax. The bony thorax and clavicle act to protect zone I from injury as do other bony structures at the base of the neck. This osseous shield also makes surgical exploration of the root of the neck difficult. In zone I, injuries to the right side are often approached through a median sternotomy, while injuries to the left side are often managed by a left anterior thoracotomy to control the hemorrhage. (6)

Zone III; is located above the angle of the mandible. This area also is protected by skeletal structures and is difficult to explore because of the skull base and the need to divide or displace the mandible. The necessity for craniotomy in exploration and control of high carotid injury in this location makes zone III treacherous.

Recognizing injuries to many of the cranial nerves exiting the skull base in zone III is important because these injuries may be indicative of injuries to the great vessels due to their close proximity. (6)

Zone II; is the most frequently involved region (60% to 75%), and injury in this zone has created a great deal of controversy in the literature over the past 15 years. There is an ongoing debate about the use of mandatory exploration versus selective exploration with serial examination, endoscopic tests, and angiography. A substantial number of patients can be selectively managed depending on signs, symptoms, and direction of the trajectory. (6)

Clinical Presentation: Common to all neck trauma is that many patients with severe vascular or other injuries present with a clinical picture deceptively lacking obvious symptoms and signs of their

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injuries. Furthermore, significant associated intracranial lesions, multiple organ injuries, and alcohol or drug intoxication often confuse the clinical picture. The history and clinical examination must be performed with a high level of suspicion in order to achieve a good platform for the diagnostic evaluation and management. (7)

- Initial Evaluation and assessment:

The initial management of penetrating neck injuries should proceed in accordance with Advanced Trauma Life Support guidelines (8)

These trauma principles are easily remembered using the mnemonic ABCDE. (A) denotes assessment of airway and cervical spine)B) stands or assessment of breathing. (C) refers to assessment of circulation; (D) denotes assessment of disability and neurologic status, and (E) stand for exposure and overall evaluation of the patient for other injuries. The overall prevalence of cervical spine fracture in patients with cervico facial trauma is less than 2%, but all patients should be considered to have a cervical spine injury until proven otherwise. (6)

- Physical Examination:

A careful clinical examination with knowledge of the pertinent anatomy is an accurate predictor of the extent of injury in penetrating neck trauma. Clinical signs and symptoms of significant injury are as follows:

)1(Vascular injury: shock, hematoma, hemorrhage, pulse deficit, neurologic deficit, bruit or thrill in neck.

)2(Laryngo tracheal injury: subcutaneous emphysema, airway obstruction, sucking wound, hemoptysis, dyspnea, stridor, hoarseness or dysphonia.

) 3(Pharynx/esophagus injury: subcutaneous emphysema, hematemesis, dysphagia or odynophagia (6).

- Diagnostic testing:
- Plain film X-rays:

The first diagnostic test ordered should be a lateral and A-P soft tissue X- ray of the neck to look for sc. air, retropharyngeal air or swelling, any missile foreign body(s) or any cervical spine injuries. An upright chest X- ray is also important to look for pneumothorax, hemothorax, widened mediastinum or mediastinal air, elevated hemi diaphragm due to phrenic nerve injury, or any missile foreign body(s). (9)

- Color flow Doppler studies of the carotid/vertebral vessels:

The developing experience of the duplex technique has prompted a policy change in some hospitals, and duplex ultrasound is used as the primary diagnostic tool for all injuries in stable patients. In the hands of an experienced examiner, Duplex ultrasound has been shown to be consistent with angiography findings in more than 90% of cases (7).

- Angiography: Pre – operative arteriograms are used primarily for three reasons:

.1 To exclude need for operation.

.2 To detect a lesion that is not identified by clinical examination.

.3 To plan the operation (10).

Some investigators (11, 12) recommend four vessel arteriography in all patients in stable condition who have penetrating trauma to the neck. Their view was that this will safely eliminate unneeded operation, and it was not so expensive or time consuming as routine surgical exploration. Moreover,

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they believed that operative management of major vessel injuries can be improved with preoperative knowledge of the number, nature, and extent of the injuries.

- Esophagogram:

Is definitely indicated if there any clinical/radiological signs of a penetrating pharyngo-esophageal injury, such as painful swallowing, dysphagia, hematemesis, retropharyngeal air/swelling on a neck X-ray, proximity of injury to the esophagus in an obtunded patient, and trans cervical neck injuries. Water-soluble gastrografin is used first, followed by barium if the gastrografin study is negative (9(

- Endoscopy: Should be performed if the Esophagogram is negative. And the sensitivity for penetrating esophageal injury is significantly enhanced by a combined approach - barium swallow followed by endoscopy. (9(
- Laryngoscopy/bronchoscopy:

Is definitely indicated if there is suggestive evidence of airway injury, such as hemoptysis, hoarseness, subcutaneous emphysema, and laryngeal tenderness &/ or deformity. A rigid or flexible bronchoscope is used depending on local physician preference/experience. (9(

- CT scan/ digital subtraction angiography:

Quickly transfer stable patients to a higher echelon of care for the definitive evaluation. CT angiogram (CTA) has been used as a noninvasive alternative to conventional angiography, especially to evaluate a stable injury. The potential disadvantages are the administration of a contrast agent and degradation of image quality from the artifact produced by metallic fragments embedded in the soft tissues. (1(

Further Evaluation and management:

Management of the neck injuries according to the zonal Injuries as follows;

- Zone I Injuries: Penetrating injuries that enter zone I of the neck are potentially fatal because of the potential for injury to the great vessels of the neck and mediastinum, as well as the cervical and thoracic esophagus. As many as one-third of patients with a clinically significant zone I injury may be asymptomatic at presentation. Angiography of the great vessels can identify those patients who need a midline sternotomy or thoracotomy for vascular control. Further, esophageal evaluation is recommended because a missed zone I esophageal injury is potentially different from a missed zone II injury. An esophageal or pharyngeal injury in zone II will usually develop clinical signs or symptoms (such as subcutaneous emphysema) within a few hours, and overall morbidity and mortality may not be affected. A missed esophageal injury in zone I, however, may be clinically silent until sepsis and mediastinitis develop (6.(
- Zone II Injuries: Patients with penetrating zone II injuries who are symptomatic should undergo neck exploration. Asymptomatic patients with penetrating zone II injuries may be treated with either mandatory exploration or directed evaluation and serial examinations, provided that the hospital has the facilities for regular examinations and emergent operations (6.(
- Zone III Injuries: Penetrating injuries to zone III have the potential for injury to major blood vessels and the cranial nerves at or near the skull base. As many as one-fourth of patients with arterial injuries may be asymptomatic at presentation. In addition, surgical exposure and control of bleeding in this location may be quite difficult. Further, some of these injuries are amenable to definitive treatment by an interventional radiologist, particularly injuries to the internal carotid artery at the skull base, branches of the external carotid artery, and the vertebral artery. Therefore, the injury may be treated under local anesthesia in the same setting as the diagnostic angiogram (6.(

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MANAGEMENT OF VASCULAR PENETRATION

Preoperative Preparation and Proximal Control: The management of patients with major external bleeding is mostly related to penetrating injuries to the carotid artery. It is important to prepare and drape the patient for possible median sternotomy, which might be necessary to obtain proximal control. Bleeding can usually be controlled by external compression by a gloved finger during the preparation and until the complete surgical team is at hand. During control by direct finger compression of the artery, care must be taken to minimize manipulation because of the risk of thrombus fragmentation and embolization.

Compression also needs to be balanced with the desire to maintain flow in the artery.

Clamping the common or internal carotid artery for control might be necessary but should be avoided unless the patient's condition is life- threatening. The reason for this is the risk of embolization and cerebral ischemia due to interrupted flow. Inserting a shunt may be the only way to avoid a major stroke; the risk of major stroke in this patient category after carotid clamping may be as high as 50%. Shunting usually requires proximal and distal control, arteriotomy, and possibly also extraction of the thrombus before inserting the shunt. Extracting a thrombus requires a delicate technique and special consideration because it can easily be fragmented and dislodged as embolic masses. The safest way is to use traction with forceps and/or suction. If the extraction is followed by brisk back-flow, the result is satisfactory. The use of thrombectomy catheters is not recommended because of the risks of mechanical disruption of the thrombus and bringing fragments up into the circle of Willis. Clamping of the external carotid artery is, on the other hand, almost always safe and can be used more liberally (7.(

Surgical Exposure of the Carotid Arteries:

An incision anterior and parallel to the anterior border of the sternocleidomastoid muscle is recommended. The incision can be extended dorsal to the ear and down to the sternal notch. As previously noted, preparations need to have been made to allow elongation of the incision into a median sternotomy in order to obtain proximal control of, for instance, the brachiocephalic trunk on the right side or the common carotid on the left. After the skin has been incised, subcutaneous fat is divided and, if needed, the external jugular vein ligated and divided. The sternocleidomastoid muscle is retracted posteriorly, and a dissection plane anterior to the muscle is identified.

The next structure to identify is usually the facial vein and its confluence to the internal jugular vein. The former is suture-ligated and divided and is usually a very good landmark because it is located just above the carotid bifurcation. Dividing this vein allows posterior retraction of the internal jugular vein and exposure of the common carotid and its bifurcation. When preparing the carotid arteries, extreme care must be taken to avoid squeezing of the vessel, and other types of operative manipulation or trauma because of the risk of embolization to the brain. Vessel loops are applied, and the most cranial clamp is applied first to avoid embolization when the more proximal parts are clamped.

Important structures to protect are the hypoglossal and vagus nerves. The former usually crosses over the internal carotid artery 2–3 cm cranial to the bifurcation and is best exposed after cranial retraction of the digastric muscle, while the latter runs parallel and dorsal to the common carotid artery. The cervical Ansa, often located obliquely over the carotid bifurcation, can be divided to facilitate exposure (7.(

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Exposure and Repair:

For larger arterial injuries, proximal and distal control is mandatory. This always requires an indirect assessment of the cerebral perfusion by checking the back flow from the internal carotid artery. Measuring the stump pressure in the internal carotid artery is recommended if there is sufficient time. This is obtained by first clamping the common and external carotid arteries and then puncturing the internal carotid artery with a small-caliber injection needle connected to a catheter filled with saline and a pressure transducer. If the back flow is poor or the mean stump pressure is <50 mmHg, shunting is probably necessary (7.(

Different repair techniques include the following:

- Simple sutures are mostly sufficient in minor penetrating injuries or small pseudo aneurysms.
- Patch: A patch can be used for a minor wall defect or to compensate for diameter loss after arteriotomy and intimal repair.
- Resection with end-to-end anastomosis: This is possible in limited injuries requiring minor resections, allowing an anastomosis without any tension.
- Resection with an interposition graft: When larger segments must be excised because of the injury, continuity might be restored with an autologous vein graft harvested from the greater saphenous vein or with prosthetic grafts for un-contaminated wounds.
- Transposition of external to internal carotid artery: This is a good alternative in special cases in which vein grafts are unavailable.
- Ligation or balloon occlusion: Ligation should be reserved for inaccessible injuries that are impossible to repair. In cases with very distal injuries to the internal carotid artery, even ligation might be difficult. An occluding balloon catheter can then be inserted into the artery at the base of the skull and insufflated until bleeding stops. The balloon catheter can be left in place for 1 to 2 days or more and then be deflated.

Exploration of Minor Injuries and Hematoma:

A patient with an injury penetrating the platysma in anatomical zone II without a history of bleeding may be explored by extending the traumatic skin wound to allow inspection of the injured area, including vessels, trachea, and esophagus. If, how-ever, duplex ultrasound or angiography excludes a major vascular injury, there is no vascular indication for exploration (7.(

Injuries to the Vertebral Artery: Due to its relatively inaccessible location, injuries to the vertebral artery in the cervical region are usually best treated by modern endovascular techniques. The options are intraluminal covered stents or endovascular embolization with coil.

Besides bleeding and hematoma, pseudo aneurysms and arteriovenous fistulas can occur after vertebral artery trauma and also be successfully treated by trans catheter embolization. In unstable patients with life- threatening bleeding, immediate intervention with proximal and distal ligation might be necessary (7).

Venous Injury: Major venous injuries in the neck are almost exclusively seen after penetrating trauma. The most commonly injured veins are the external and internal jugular. Due to the low pressure in veins, many such injuries are never recognized. Isolated venous injuries consequently rarely need exploration or repair. Venous injuries encountered during exploration of a neck injury can be treated either by repair using simple or running sutures or by ligation. In bilateral injuries to the internal jugular veins, however, reconstruction of one of the sides is indicated to avoid severe

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venous hypertension. As in all other types of venous surgery, gentle and meticulous technique must be applied and caution taken not to extend the injuries to the veins by a traumatic technique (7.(

Endovascular Treatment: Endovascular technique is an alternative to consider in some cervical vascular injuries. Endovascular treatment is the first option in injuries to the vertebral artery due to its location and surgical inaccessibility. The application of detachable balloons, coils, stents, or hemostatic agents is usually successful for managing bleeding, aneurysms, and fistulas.

Endovascular techniques have also been reported to be successful for managing some carotid artery injuries (such as traumatic lacerations), pseudo aneurysms, and injuries in some non-critical and small terminal branches. If endovascular occlusion of an internal carotid artery is considered in severe traumatic injuries, the neurologic effect of a temporary occlusion should be evaluated prior to occlusion. It is reasonable to believe that the endovascular treatment option will become even more useful in the near future (7.(

Digestive tract evaluation: In the patient with a possible esophageal perforation, most radiologists recommend Gastrografin swallow as a first-order contrast study because barium extravasation radiographically distorts soft-tissue planes for other studies and is more toxic. There are mixed reports in the literature about which of these methods is more reliable in demonstrating a perforated esophagus or pharynx, a negative Gastrografin study should be followed by a barium swallow if suspicion remains high.

Many studies report the use of flexible esophagoscopy to circumvent the need for general anesthesia during rigid endoscopy. Missed esophageal tears represent most of the delayed injuries and, when they progress to mediastinitis, morbidity and mortality are considerable. At the time of exploration to rule out pharyngeal and esophageal injuries, a nasogastric tube can be gently pulled up to the level of the neck and methylene blue infused through the nasogastric tube to help localize the injury site. If suspicion of a pharyngeal perforation remains unconfirmed by examination or even by exploration, the patient is given no food and is observed for several days. Fever, tachycardia, or widening of the mediastinum on serial chest radiographs requires that repeat endoscopy or neck exploration be considered. When an esophageal injury is found early, management involves a two-layer closure with wound irrigation, debridement, and adequate drainage. After repair of the mucosal perforation, a muscle flap may be interposed over the esophageal suture line for further protection. If an extensive esophageal injury is present, it may necessitate a lateral cervical esophagostomy and definitive repair at a later date. If the clinical examination is benign, follow-up examination is done frequently. Monitoring of vital signs, as well as examination of the neck and the entry wounds, also is crucial. A 48- to 72-hour observation period should be used to monitor for changes in physical findings or vital signs that mandate urgent attention (6.(

MANAGEMENT OF LARYNGOTRACHEAL INJURY;

Laryngeal mucosal lacerations from penetrating injury should be repaired early (within 24 hours). The time elapsed before repair has an effect on both airway stenosis and on voice (13.(

Significant glottic and supraglottic lacerations and displaced cartilage fractures need surgical approximation. Endoscopy and CT will differentiate between the patients that need only observation (small laceration, shallow laceration, non-displaced fracture) and those that require a thyrotomy or open fracture reduction and mucosal approximation. A soft laryngeal stent may be needed for badly macerated mucosa (6.(

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Simple tracheal lacerations that do not detach a tracheal ring or encroach on the airway can be repaired without a tracheostomy. More severe disruptions (gunshot wound directly to the trachea) imply more soft tissue injury and a 6-weeks tracheostomy either below or through the tracheal injury is the safest procedure. Later the stenosis may require sleeve resection, but if the stenosis is soft, it can often be managed by a T-tube tracheostomy tube (6).

This study was designed to discuss and resolve the ongoing controversy regarding the optimum strategy for management of the neck injuries in our centers and discussing the results with the other regional and national studies.

Methods

A retrospective study done on 95 patients, with cervical vascular injuries whom admitted to the thoracic surgical ward at the Al-Sadder teaching hospital in Al- Basra city, from Jan. 2007 to Oct. 2015. We did exclude patients with soft tissue injuries or medical illness and malignancies.

The data were collected retrospectively from the clinical data base of the teaching Al-Sader hospital and then reviewed retrospectively.

The basic data collected including age, sex, occupation, type of injury whether penetrating or blunt trauma to the neck, zone of the neck injured and the structures were injured and the type of vascular injury and repair done were studied in this study.

All the patients had radiological X-ray, while the Doppler u/s, CT angiogram were in selected patients.

All patients admitted and resuscitated in the hospital, those with active bleeding controlled in ER by pressure and packing and rapidly carried to the theater for more evaluation of the wound and clinical assessment and if needed operative management, The clinical evaluation of the physical signs and any active bleeding, hematoma whether pulsating or expanding, any respiratory distress or surgical emphysema, hematemesis or hemoptysis, extensive tissue loss, any neurological deficits or absent pulses were evaluated.

The decision of exploration or observation was made by the most senior surgeon according to the clinical and radiological evaluation and patient’s condition for any suspicion of vascular or aero digestive injury with disregard to the concomitant spinal cord or neurological injury which was not by itself an indication for exploration.

The physical signs and clinical assessment of the injury were the main indicator to decide whether the patient need operative exploration or to be kept on conservative treatment and more radiological investigation that's because of the non-availability and shortage of the facilities and radiological investigation that might be needed at time in ER.

Other stable patients whom didn't subjected to surgical interventions, admitted to the ward and treated conservatively and then discharged home after exclusion of cervical vascular or aero digestive injuries.

Results

Ninety-five patients included in this study out of 9787 patients whom admitted to the thoracic and vascular word in the teaching Al Sadder hospital (figure 1).

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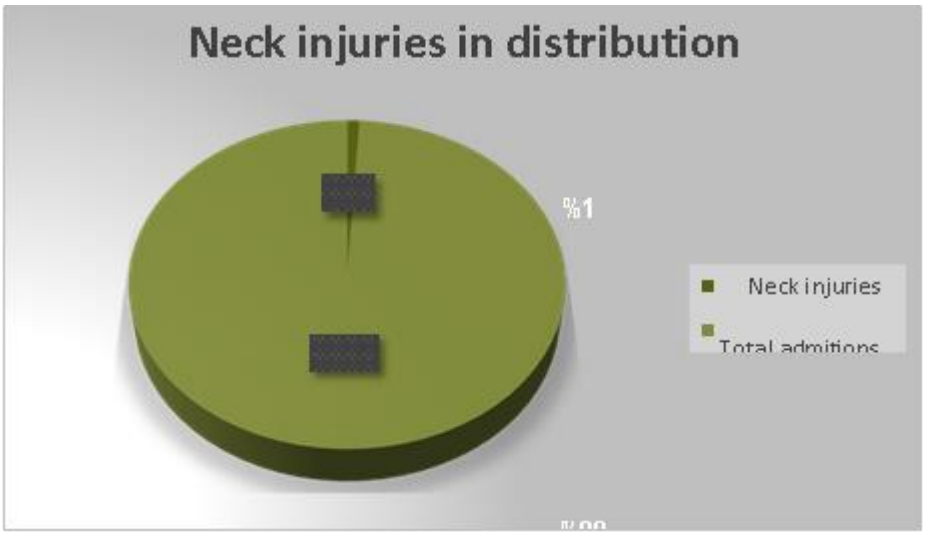

figure 1. pie gram shows the distribution of neck injuries in the surgical ward

All those patients had neck injuries either penetrating or blunt trauma to the neck,

- All of the patients (100%) were male, (figure 2).
- the age of distribution of the patients involved in this study ranged from 3 yrs. To 70 yrs. (Figure 6), With majority distribution from 20–29 yrs. (37 patients (39%), and next majority from 30 to 39 yrs. (24patients (25%). While the least age group Is the elderly above 60 yrs. (1%).

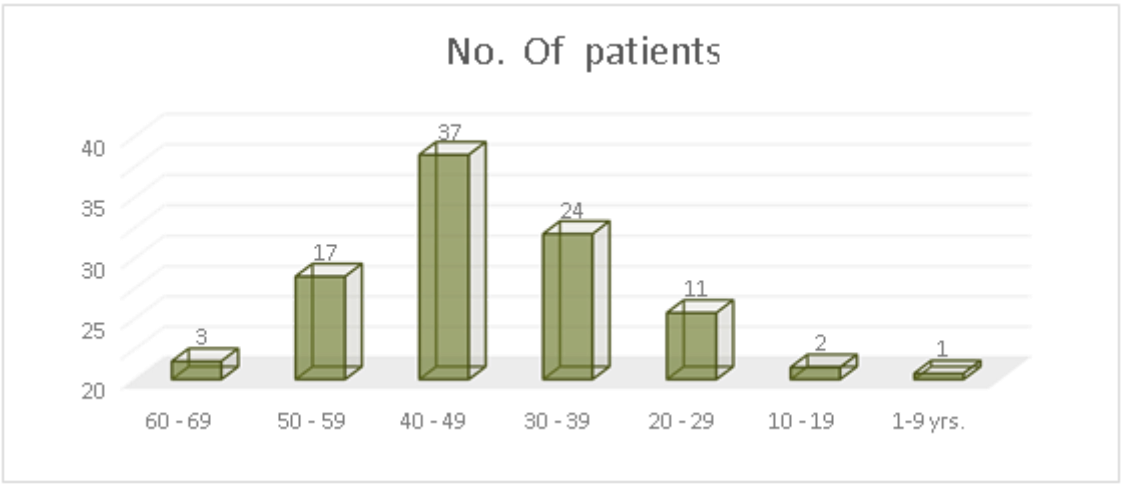

figure 2. histogram showing the distribution of neck injuries according to age

Patients distribution according to the zone of injury noted that the majority of the injuries at zone II 58 patients (61%), while the least was zone III, 9 patients (9.47%), zone I 18 patients (18.94%). (Fig3) Multi zone injuries noted in about only 10 patients (10.5%), those with multiple shells injuries and multiple stab injuries to the neck.

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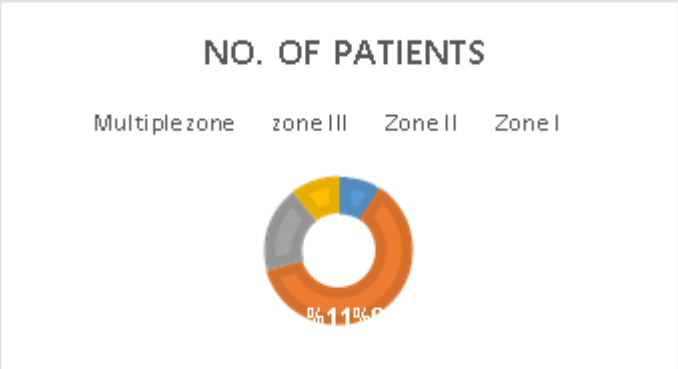

Figure 3. showing the distribution of the patients according to the injured zone.

The pattern of injury had been classified as penetrating (89 patients 94%), and blunt trauma to the neck (6 patients 6%). (figure 4).

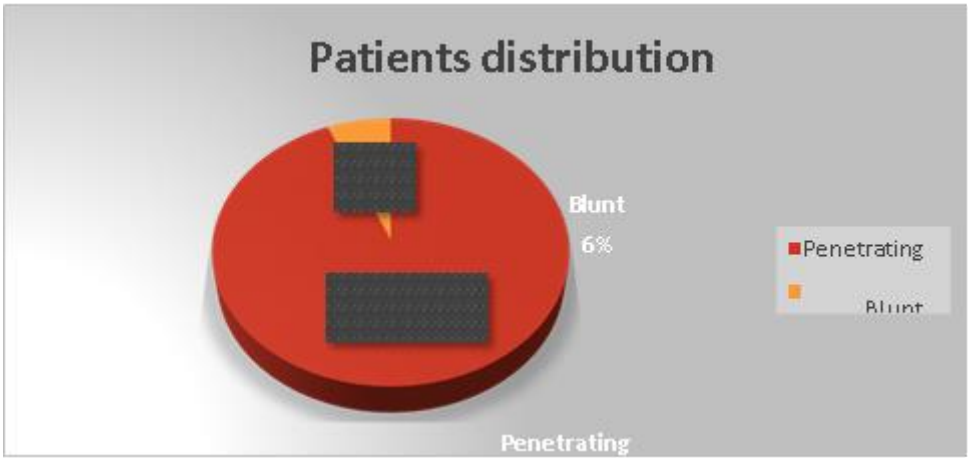

Figure 4. pie gram showing the distribution of patients with neck trauma according to the pattern of .injury

Furthermore, classification of the penetrating neck injuries into gun shots and stab injuries. The most of them noted those patients wounded with stab wounds (43 patients 48%), next to them the gun shots (34 patients 38%), while those with missiles and shrapnel injuries (12 patients 13.5%). (figure 5).

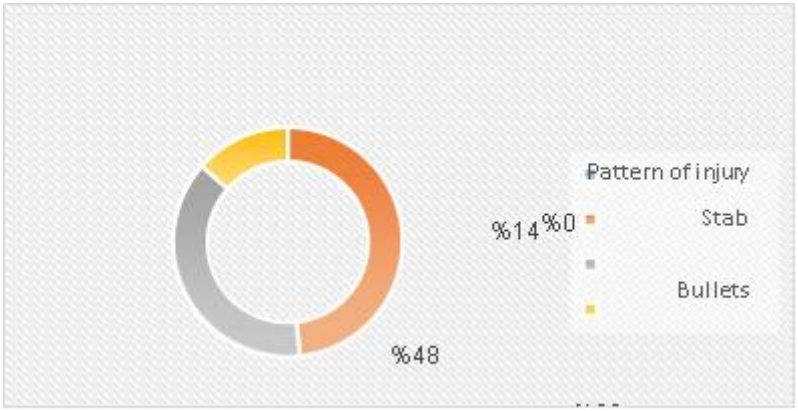

Figure 5. pie gram showing patients distribution according to the pattern of injury.

The patient's distribution had been classified according to their occupation, (figure 6). where noted that the majority of those patients were self- employed (71 patients) 75%, and next to them were the students (12 patients) 13%. While the children were the least of them (3 patients) 3%, The military were only four patients (4%).

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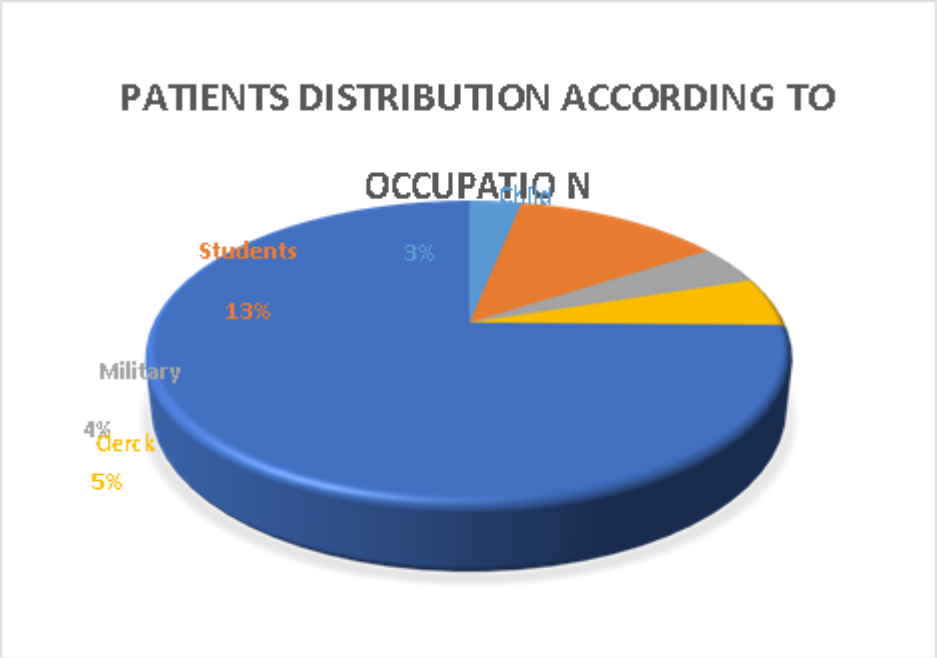

Figure 6: pie gram showing the distribution of the patients according to their occupation.

Clinical presentation: - (table 1)

Table 1: patient presentation

Signs & symptoms	No. of patients	%
Neck Wounds	89	93.68
Hematoma	47	49.47
Bleeding	32	33.68
Hemoptysis & hematemesis	5	5.26
Surgical emphysema	7	7.36
Neurological deficit	1	1%

Note that the total numbers and percentages of the patients is not equivalent to the total patients because of the combination of more than one presenting sign in each patient.

Many patients had some associated injuries in other parts of the body (head, chest, abdomen, back or limbs). (table 2)

Table:2; showing associated injuries

Associated injury	No. of patients	%
No injuries	43	45.26
Chest	18	18.94
Upper limbs	9	9.47
Head	9	9.47
Lower limbs	5	5.26
Abdomen	4	4.21
Spinal	1	1
Multiple sites injury	6	6.31

Management

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A- 34 patients underwent surgical explorations, (table; 3 a&b). 10 of them had been explored for arterial injuries, ligation of CCA done in 3 patients as a life saving measures to control bleeding. While 5 of them underwent arterial repair either by direct end to end anastomoses or simple suturing of arterial tears. 2 patients only whom had no major arterial Injuries, ligation of simple branches from the ECA done. 19 patients had venous injuries, 5 patients of them underwent simple direct suturing of the IJV tears, while venous ligation had been done for all the rest 14 patients. Only 5 patients had aerodigestive injuries.

A- 61 patients had been presented with not significant signs and symptoms of vascular injuries, and were stable hemodynamics, conservative treatment had been done.

Table; 3-a: pattern of management.

Management	No. of patients	%
Operative mx.	34	35.79
Conservative mx.	61	64.21

Table ;3-b : operative finding

Type of inj.	No. Of patients	Percentage
Arterial inj.	10	29.41%
Venous inj.	19	55.88%
Airodigestive inj.	5	5.26%

Outcome of the patients with neck injuries

Table 4; patient's outcome

Outcome of patients	No. of patients	%
Improvements	68	71.58
Neurological complications	5	5.26
Death	2	2.1
Others	20	21

Sixty-eight patients (71.58%) out of the total 95 patients was improved and discharged home, while 5 patients (5.26%) whom developed neurological complications in the form of CVA, of them only 2 patients (2.1%) was died. The other 20 patients (21%) involving those whom discharged on their responsibilities or those whom referred to other words or hospitals to complete their management in other branches.

Discussion

Demographically 100% of patients are male, most of them (61 patients, 64%) were from 20-40 yrs. Old. Which is consistent with Fox et al (1), Haba (5), Ramadan et al (17), Jebara et al (18), Abdulsalam (64), and Nazar B. Elhassani (63.(

We can explain This sex and age predilection if we know that people who were subjected to terrorist attacks and violence were the soldiers and the breadwinners in the society whom young males constitutes the majority of this sector.

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The different zones of the neck injured with differing frequencies, zone II is the most commonly injured one were (58 patients, 61%), next is zone I (18 patients 18.47%), while the least is zone III (9 patients 9.47%). And this is consistent with the zonal distribution in the study of Haba(5) , Ramadan et al(17) , and McConnell and Trunkey (19), Elhassani(63) and Abdulsalam(64.(

Fox et al(1) , showed a less injuries in zone I, explaining that by the use of individual body armor wore by the soldiers at the combat field, which has a short neck collar that may account for the smaller percentage of injuries isolated to this particular zone, while the majority of the casualties in our study were among civilians, similar to other studies done by Fogelman and Stewart in 1956.

The vast majority of patients were noted to be wounded with penetrating injuries to the neck (89 patients 94%), while only (6 patients 6%) were injured by blunt trauma to the neck.

46 patients (52%) out of the total penetrating injuries were wounded with gunshots and missile injuries of them 34 patients (38%) gunshot and 12 patients (13.5%) were wounded by shrapnel objects, while 43 patients (48%) were wounded with stabbing injuries to the neck.

That's due to the civilian and clans wars in our society and the explosions and antipersonnel behavior and that's against Elhassani (63) and Abdulsalam (64) studies in which they found shells and bullets injuries is superior to stab injuries.

Furthermore, knowing that the majority of our patients were self-employed (71 patients 75%), gives further explanation to the previous paragraph, and next were the students (12 patients 13%), while the military were only 4 patients (4%.(

52patients (54.73%) of the patients had associated injuries, and most of them were associated with chest injuries (18 patients 18.94%), next to them the head and upper limbs (9 patients 9.47%) each. These results are comparable to Ramadan et al (17) where 62% of patients had associated injuries, and the chest and face were the most common injured parts of the body in that review.

In our study, we adopted the selective approach for neck exploration, where only 34 patients (35.79%) out of 95 patients had been under went mandatory exploration, those whom presented with severe bleeding, expanding hematoma, or with signs and symptoms of aerodigestive injuries, of them 10 patients had been explored for arterial bleeding, and 5 patients underwent venous repair, and 5 patients had been explored for aerodigestive injuries, the other patients subjected simple venous ligation and simple wounds suturing and closure, while 64.21% treated conservatively.

As compared with Previous authors whom were strongly recommended early mandatory routine exploration of penetrating cervical trauma, especially in the

‘zone II’ region. These recommendations were based on a 1956 review of 274 patients by Fogelman and Stewart (1956) (21). In that study; patients who underwent early exploration had an operative mortality of 6%; those explored late or not at all had a mortality of 35%. Support for mandatory exploration is also k given by Meyer et al (1987) (22). The conclusions drawn from their study were that a formal neck exploration can be done with a diagnostic accuracy of 100%(8). This led to the wide spread theory of treating the platysma like the peritoneum: if explore (20,23.(

In the modern studies, Demetriades et al (1996) and colleagues have demonstrated that conservative non-operative management of penetrating cervical injuries can be performed safely if there are no clinical findings suggestive of vascular or aero digestive injury (24). And that's consistent with studies of Golueke et al (1984) (25), Biffl et al (26), Mansour et al (27), Sofianos et al (1996) (28.(

Sixty eight patients (71.58%) out of 95 patients recovered completely and discharged home, 5 patients (5.26%) developed post-operative neurological complications, in the form of CVA , with

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mortality rate only 2 patients (2.1%) died, both of them under went surgical exploration, one of them developed CVA and died at ICU after one week due to respiratory failure on ventilator, the other 5 years old patient presented with penetrating wound to zone II of the Rt. Side of the neck, was shocked and unconscious on ETT , on exploration Rt. IJV injury noted and direct repair done, then patient died at after 3 days at the ICU from brain anoxia and death.

This percentage of mortality rate is accepted as compared with the other studies like Fogelman et al (1956) : Civil War which was 15%(20) , world war I (11%), and world war II (7%), Abdulsalam et al (2.9%)(64) , and Elhassani et al (2.7%)(63)

Conclusion

It is not mandatory to explore all the cases of penetrating neck injury because the majority of cases in many studies can be managed conservatively, so the notion of treating the platysma like a peritoneum need to be revised .Meticulous physical examination is the most important triage tool for selecting cases which need exploration from those who can be observed, yet in few situations an invasive investigation is required but not always .Invasive investigations like angiography, bronchoscopy, and esophagogram, need to be used selectively based on the physical examination in the cases in which the patterns of injury suggest a concealed damage .Having guidelines in approaching penetrating neck injury minimizes the rate of unnecessary exploration and the possibility of missing an injury.

There should be new guidelines for the management of neck injuries that fit our circumstances.

Audit is mandatory in neck injuries to decide whether we were right in our decisions or not.

At initial presentation, almost always depend on the clinical picture in the decision of exploration which should be used very selectively.

Invasive investigation should be used very selectively in patients with neck injuries.

Should pay attention to the medical documentation of the patients in our hospitals.

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