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PREOPERATIVE MANAGEMENT OF MAXILLOFACIAL WAR INJURIES

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Abstract

The complex anatomical structures of the Cervico-Facial area, makes the knowledge of the anatomical extent of the tissue damaged by war injury, and the location of the foreign body or shell, quite difficult.

The terms perforating, penetrating and avulsive wounds used in war injuries are merely superficial description; they hide the nature and the actual amount of the tissue damage.

The critical nature of some of these wounds and their fatal consequences such as those who had sever bleeding and or sever airway obstruction mandates a quick diagnosis of the injured tissue and a quickly intubated and anesthetized patients.

It usually takes time and effort of imagination by the surgeon to follow the path of travel of the shell or bullet in different anatomical structures of the cervico-facial area in order to anticipate the amount and extent of the damaged tissues.

A simple division of the cervico-facial area into anatomical quadrants by two coronal planes, two transverse planes and two sagittal planes, helps the surgeon to remember and define the injured anatomical area, have a better localization of the foreign body and if these planes are used routinely and in a systematic way, the cervical vertebrae might be defined for any injury, and lastly these anatomical quadrants can be used by the maxillo-facial surgeon to communicate more easily with other specialists whose cooperation is of utmost important for the management of such injuries.

Introduction

The most characteristic nature of the eight years Iraqi Iranian War was the mass troop attack from either side, which lasts from few days to few months. This had resulted in a large number of casualties admitted at one time; those casualties received their first aid at a base military medical unite at the front line. Basra General Hospital, beside other three hospitals, is a few miles from the front line, has a maximum bed capacity of 900, received those casualties. To ensure a uniform and continuous flow of patients, major and definitive surgery were conducted to those patients and they were soon referred to other hospitals for follow-up and further treatment. The maxillofacial center at the hospital is the only major center at the governorate of Basra. The center had only two consultants who had the responsibility of treating casualties inflicting injuries in the maxillofacial area, upper cervical area, ear nose and throat injuries together with the plastic reconstruction of the defect either immediately or at later stage.

At the emergency department, casualties would be examined thoroughly; fresh crossmached blood prepared, X-ray taken and casualties were sent to appropriate department.

Casualties arriving at our department would have the chance again for general examination excluding any hidden injuries. Particular attention was paid to head injury, cervical spine injury beside

chest and abdominal injuries. If there is sever bleeding and or partial airway obstruction, he would be sent immediately to theatre, otherwise he would be waiting for a maximum of 12 hours before he was operated on.

To have a proper treatment plan, beginning from initial airway management (intubations difficulties, decision of tracheostomy) soft and hard tissue debridement and reconstruction. It was always necessary to know whether the casualty had inflicted a high or low velocity missile injury.

Low velocity injury is caused by bullets or shells traveling at less than 1200 feet/second. It produces direct effect on tissue by laceration and crushing within the missile track. If the surgeon imagines the path of travel of the bullet or shell from entrance to exit wound or to where it had settled, then he would anticipate the amount of tissue damage from the bullet or shell track.

High velocity injury is caused by the phenomenon of shock wave and temporary cavitations, thus the tissue damage is far more than that caused by the low velocity injury. These wounds carry the risk of severe bleeding, fatal airway obstruction and patients inflicting such wounds are very difficult candidates for intubation especially when those wounds are close type.

The avulsive wounds are open and self-descriptive whereas the close type wounds hid the actual amount of tissue damage, those casualties are always seen in a sitting position or lying on their abdomen and face down, they are very irritable, the tenderness present in the area, the sever swelling, comminution of bone, tongue injury, all render clinical examination very difficult, especially the intraoral examination, infact overzealous palpation will irritate the patient further and might open a temporary closed arterial bleeding and create an emergency situation. Therefore clinical examination in casualties inflicting a closed high velocity missile injury (Figure 1) is concentrated on inspection and on x-ray findings, further examination is conducted when the casualty is fully anaesthetized, however there are certain clinical findings which might give the surgeon a clue to the peripheral extent of the tissue damage.

1. The clinical extent of the swelling nearly corresponds with the periphery of the cavitational effect.
2. The absence of peripheral arterial pulsation, such as the lingual, labial, facial and superficial temporal arteries, is a good indication of a unilateral or bilateral damage to central arterial tree.
3. The presence of peripheral scatter of bony comminution of mandible in the x-ray nearly corresponds with the peripheral soft and hard tissue damage.
4. Sometimes the presence of peripheral scatter of metallic pieces of bullet casing corresponds with the peripheral extent of tissue damage.

Although the maxillofacial surgeon is familial with the anatomy of the face and upper cervical area, he might be less oriented with the deeper anatomical structures and their relation to one another, this is especially true when he is dealing with a large number of seriously injured casualties and under abnormal circumstances of stress and fear of shelling the civilian areas including the hospital itself.

Imaginary planes drawn clinically on the patient's lateral and front view and on the x-ray might help the surgeon to estimate and locate the tissue damage.

Anatomical Consideration

The Cervico-Facial Area might be divided into anatomical quadrants by two coronal planes, two transverse planes, and two sagittal planes. The pharynx is being the central important structure, within which the laryngeal opening lies in its

lower part and the presence of air in its upper nosopharynx and middle oropharynx has the known ricocheting effect on the high velocity missile.

The Coronal Planes (Figure 2)

1. Anterior Plane (Facial Plane)

This plane starts at the junction between the sub mental area and the neck. It passes vertically upwards into the cheek at the midpoint between the alae of the nose and tragus of the ear. It continues upward between the lateral canthal area and lower end of the helix of the ear. In a deeper section, it passes at the junction between the ramus and body of mandible goes upwards through the pterygoid fissure then upwards between the zygomatic arch and body. In a deeper section it passes through the floor of mouth at the junction between the anterior 2/3 and posterior 1/3 of the tongue and between the hard and soft palate then passes upwards to separate the anterior from the middle cranial fossa.

2. Posterior Plane (Prevertebral Plane)

This plane passes at the pre-auricular area vertically down the neck.

Deeply it passes at the prevertebral space.

The cervico-facial area is thus separated into an anterior facial segment, middle pharyngo-laryngeal segment with its lateral structures and a postero-cervical segment.

The Transverse Planes (Figure 3)

1. The Maxillary Plane.

This plane starts from the base of the alae of the nose traversing the cheek to the lobule of the ear. Deeply it passes through the maxillary body, soft palate to the anterior arch of the atlas vertebra, sectioning the ramus of the mandible above the inferior dental foramen.

2. The hyoid Plane

This plane starts from the sub mental area in the region of hyoid bone, back across the neck to the level of the fourth cervical vertebra, passing deeply through the pharyngo-epiglotic folds, thus separating the oropharynx from the laryngeal part of the pharynx.

Thus the Cervico-Facial area is separated into

Upper segment, consisting of the Nasal cavity, Nasopharynx and its lateral structures.

Middle Segment, consisting of oral cavity, oropharynx and lateral structures.

Lower segment, consisting of the hypo pharynx and its lateral structures.

The Sagittal Plane (pharyngeal plane) (Figure 4)

This plane passes along the lateral pharyngeal wall from the base of skull down the esophagus in the neck. It goes tangential to the cervical visceral equator. It passes along the medial wall of the orbit, lateral wall of the maxillary sinus, and it passes at the upper lateral incisor tooth and lower canine tooth.

The cervico facial area is thus divided into six quadrants: (Figure 5)

1. Nasal Cavity, Zygomatic body, Orbits and Maxillary sinuses.
2. Nasophyrynx with its lateral structures, these include, the infra temporal fossa that lies immediately lateral to the nasopharynx anteriorly. Posterior to which lies the carotid sheath. The styloid process with its attached muscles and the posterior belly of digastric muscle slops downward and forwards in front of the carotid sheath. Superficial to this lies the upper half of the parotid gland, upper part of the ramus, coronoid and condyle.
3. Oral cavity with its contents, maxilla, body of mandible, cheek, chin, submental area and lips.
4. Oropharynx with contents, posterior third of the tongue, epiglottis, tonsils, laterally lies the medial pterygoid muscle, ramus, masseter muscle, whereas the submandibular fossa lies laterally in a lower plane.

5. Hypo pharynx, containing the larynx and the trachea. the carotid sheath has a postero-lateral relation to the pharynx from the base of skull down the level of angle of the mandible from this level down, it takes a more lateral relation to the pharynx.
6. Posterior cervical area. this contains:
   *The cervical vertebrae with spinal cord. The anterior arch of the atlas on a level with the hard palate (maxillary plane). The lower border of the mandible lies at a level between C2 and C3, whereas the fourth vertebra lies on a level with the hyoid bone. C6 lies on a level with the cricoid cartilage.

The prevertebral flexure and posterior vertebral extensor muscles.

Discussion

Knowing the amount and anatomical location of tissue damage in the acutely injured maxillofacial war injury is very important for management.

Upper airway management is given a special concern.

A low velocity injury and high velocity open wound does not cause an airway embarrassment unless there is direct injury to the larynx and Para laryngeal structures. Whereas casualties inflicting a close type high velocity injury involving the lower third of the face and upper neck present a real threat to patients life, since the airway has a good chance of being involved in the cavitational effect. Those patients have little chance of survival; those who do survive are tracheostomized at the front line. However, the airway may be indirectly involved by the pressure of edema and or enlarging haematoma and by the presence of bleeding into the pharynx. The laryngeal inlet may be partially obstructed by traumatically created flaps from the posterior third of the tongue and soft palate. The presence of dead space between the pharynx and prevertebral fascia allows free mobility of the injured tissue of the posterior pharyngeal wall with the possible evertion of the traumatically created flaps anteriorly obstructing the laryngeal opening and obstruction the visual accessibility to the larynx. Moreover this dead space allows an erroneous passage of the endotracheal tube. Those patients are always seen in a sitting position, they maintain their airway by conscious voluntary breathing and any attempt of lying down will have a real airway embarrassment. Those patients present an extremely difficult case of endotracheal intubations. Tracheostomy at this stage and under local anesthesia is not advisable; our experience had shown that most of those patients go into cardiac arrest possibly because of hypoxia and or depression of respiratory centre with the administration of sedation and vagal stimulation and cardiac ischemia. Whereas the usual anesthetic procedure through blind intubation mostly leads to acute obstruction, emergency tracheostomy at this stage and under such circumstances is very risky. Therefore the cooperation between the surgeon and the anesthetist is important. If the anesthetist knows the type, amount and the exact location of the injury with the help of the above anatomical classifications, together with further inspection under a sleeping dose of anesthesia, then even if it was not possible to intubate then at least the surgeon would have enough time to do tracheostomy during which the patient has not lost his respiratory reflexes and the anesthetist partially clears the airway with the aid of laryngoscope and continuous suction.

Injuries to cervical vertebrae are sometimes masked in cervicofacial injuries, their early detection is important to prevent untoward fatal complications especially during manipulation. As a maxillofacial surgeon it is important to have in our routine x-ray examination of facial skeleton the cervical vertebrae. The

transverse planes mentioned above may be good indicators for identifying the individual vertebra. Deeply placed shell or bullet in the maxillofacial region are difficult to locate, especially when the size of the shell is small, if the decision was taken to extract these shells then utilizing the path of entrance will be complicated by the presence of bony pieces of fractured mandible or maxilla which simulate the tactical sensation of the shell therefore a precise location of the shell or bullet is important and the anatomical quadrants may be of help prior to surgery.

Conclusion

Imaginary planes drown on a large anatomical map in the theatre, dividing the cervicofacial area into six quadrants would be of great help to the maxillofacial surgeon and other specialties whose cooperation is very important for the management of acutely injured maxillofacial war injury.

Figure 1: Shows the extensive nature of injury in a closed type of high velocity war injury, which hides the extent and amount of tissue injury.

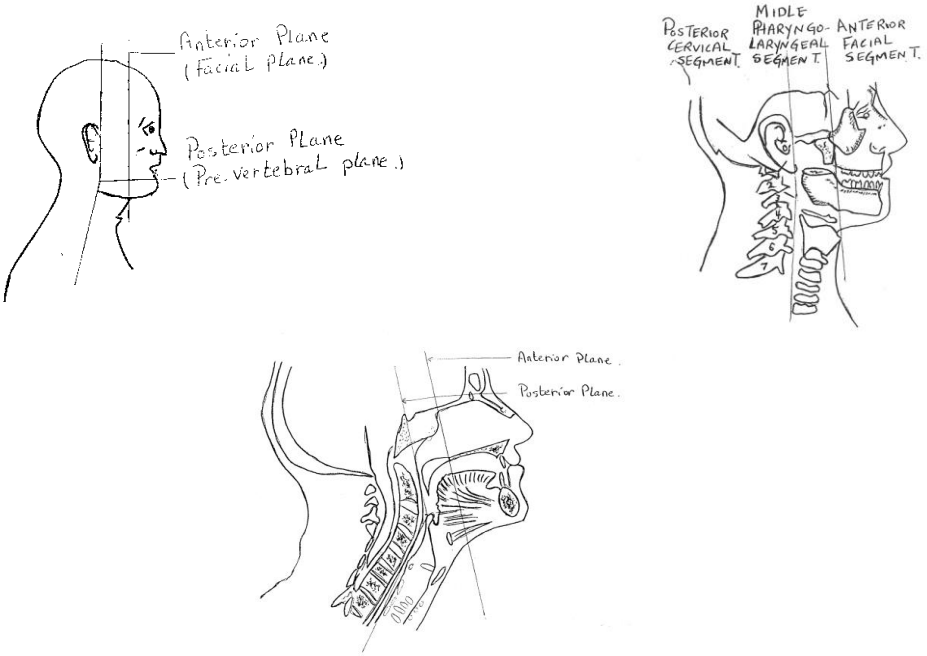

Figure 2: shows the two coronal planes thus dividing the face into three districts facial segments, the Posterior Cervical Segment, Middle Pharyngo laryngeal Segment, and Anterior Facial Segment.

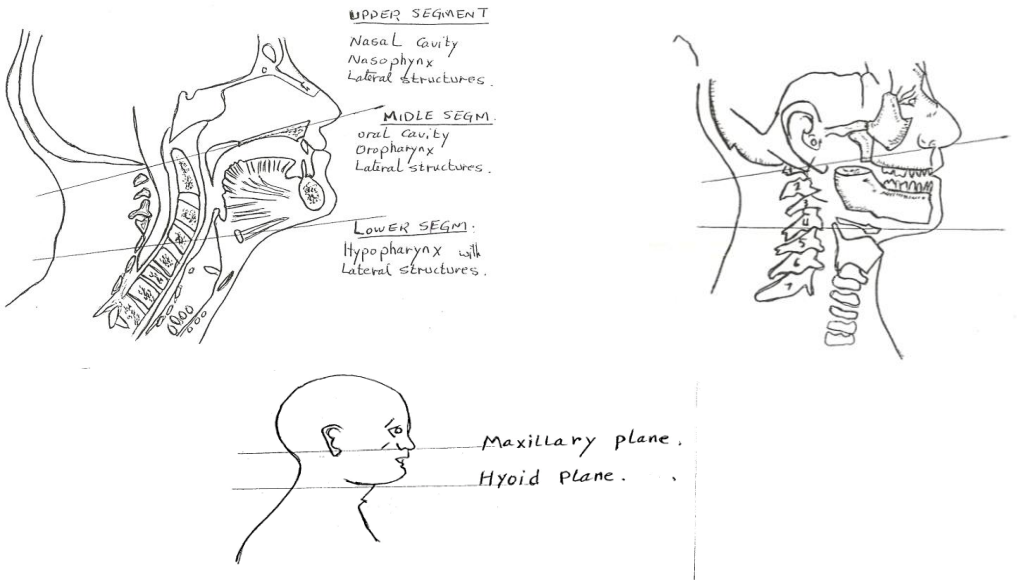

Figure 3: Shows the two Transverse planes, dividing the face into Three Segments, The Upper Segment containing the nasal cavity, nasopharynx and their lateral structures,The Middle Segment containing the oral cavity, oropharynx and their lateral structures,The lower Segment containing the hypo pharynx and its lateral anatomical structures.

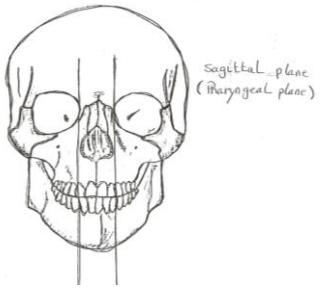

Figure 4: Shows the two Sagittal Planes,

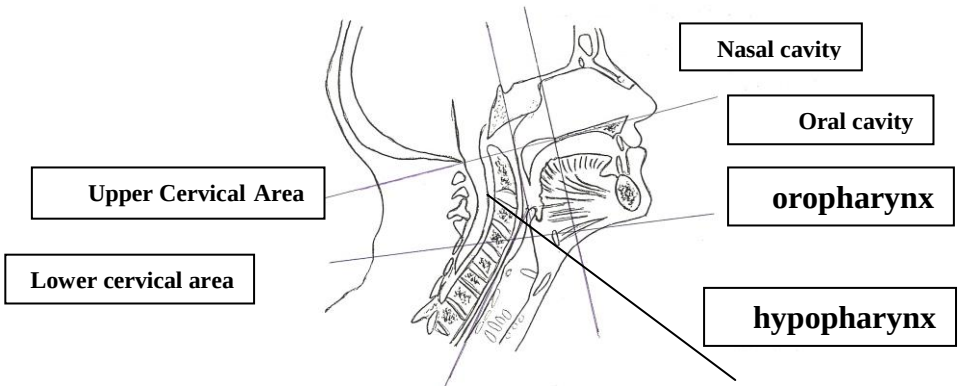

Figure 5: Shows the Six separate cervico facial Quadrants.

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