Evaluation of immediate one stage reconstruction of the avulsive maxillofacial injuries

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ABSTRACT

Background: Avulsive maxillofacial injuries may cause significant functional and esthetic deformities so the subsequent management of this trauma becomes more controversial in terms of the time of surgical reconstruction. The aim this study was to evaluate the immediate one stage of reconstruction as a method of treatment.

Patients and methods: In this study 50 patients complaining from avulsed injuries to the facial area have been treated with in first 24hrs of injury by one stage of reconstruction of the hard and soft tissues defects. Different surgical techniques were used in this study in addition to evaluation of the general condition of the traumatized patients.

Results: The results were assessed according to the patient satisfaction, clinical examination, complications and the need of other reconstruction surgeries after a period of follow up. The over all results were good and very good in 39 patients (78%) and most of the managed patients need only minor surgical procedures after the treatment or they were satisfied with the result.

Conclusion: The primary one stage reconstruction was a useful method for management of patients with avulsed maxillofacial injuries if the general status of patient is suitable for such operation and surgical facilities is available this will minimize the patient's suffering and disabilities.

Key words: Avulsive injuries, bone graft, local flaps, blast injuries, (J Bagh Coll Dentistry 2008; 20(2):79-84)

INTRODUCTION

The human face constitutes the first contact point in several human interactions, thus injury and/or deformity of the facial structures have a negative influence on the affected person. Injuries to the maxillofacial region may result in functional and psychological disturbances particularly if these injuries associated with hard and soft tissues defect (1). Management of traumatized patient is directed toward saving the life followed by returning to the function as quickly as possible and all this aimed at not only prevention of the infection and disfigurement, but towards restoration or even improvement of esthetics. There is no consensus on the timing of reconstruction for bones and soft tissue defects resulting from maxillofacial trauma. The conventional method for treatment of these injuries is primary repair as soon as possible with serial debridement and definitive reconstruction in the delayed stage, an alternative to this approach is the immediate definitive surgical reconstruction of the patient during the first operation for acute management of trauma (2-4). In the immediate management, basic principles of life support are indicated, which include establishment of airway, control of bleeding. After the general condition of the patient became stable definitive reconstruction can be done depending on several factors including type of the injury, site of injury, severity, and general condition of the patient (4, 5).

The objective of this study is to assess the one stage reconstruction of avulsed maxillofacial injuries using different surgical techniques according to the type of the defect and time of the reconstruction.

PATIENTS AND METHODS

In this study 50 patients complaining from avulsed maxillofacial injuries were included. All patients admitted to the Emergency Hospital of Sulaimani during April 2005 to April 2006. The patient's information was taken into consideration over the course of this study which include; gender and age distribution of patients, etiology of trauma, localization of the defect, treatment modalities, time to treatment after the trauma and postoperative complications. The protocol of the treatment of these patients was:

1- Emergency treatment: in which Advance Trauma Life Support (ATLS) was followed. The aim is to seek and manage immediately life threatening conditions in the traditional sequence of; air way, breathing, circulation, disability and exposure.

2- Definitive clinical and radiological examination:

3- The patients then categorized according to:
  * The site of injury (upper, middle and lower face).
  * Type of injury: soft tissue defect, hard tissue defect, or combined defects.

All patients were treated with in 24 hours of injury. Timing of primary surgery was planned

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according to many factors including: The need of a lifesaving procedure, patient’s general condition, and the presence of associated injuries.  

4- Immediate maxillofacial treatment: It includes the immediate reconstruction of the hard and soft tissues defects by:
A- Frequent cleaning and irrigation of the wounds by iodine 10% with normal saline 0.9%.
B- Removal of the foreign bodies with minimum debridement and stabilization of fractured bones.
C- Reconstruction of the hard tissue; by either transosseous wiring, plates with or without bone graft.
D- Uses of the local flaps and management of dead space.
E- Antibiotics coverage including, (Ampiclox 500mg + Mertonidazole 500mg, three times daily for 7 days). In case of penicillin allergy, Cefotaxime 500mg have been used for the same period.

RESULTS

A total of 50 patients with avulsed maxillofacial injuries were treated in the Emergency Hospital of Sulaimani. The males accounted for 74% (37 patients), and females were 26% (13 patients). Age of the treated patients ranged from (3-60 years.) and the most common age group affected by this injury was (20-29 years.) 22 patients 44%. Blast injuries were found to be responsible for higher number of injured cases associated with avulsed tissues, 23 patients (46%) (Table 1). According to the type of the injury, 24 patients have soft tissues defects (48%) while the higher incidence of the avulsed injuries (28 patients 59%) were in the lower face which includes the mandible and its associated soft tissues (Table 2).

Definitive treatment: After resuscitation of the patients and the general condition is controlled, definitive maxillofacial treatment will be done by frequent cleaning of the wound by iodine 10% and normal saline which was done for all cases, followed by minimum debridement to preserve facial tissues as much as possible. Management of the defects was done by using different techniques for reconstruction of the soft and hard tissues (Table 3). Local flaps (rotation, advancement and transposition) were used for reconstruction of the soft tissues defects (Figure 1&2). For bony defect the reconstruction was made by using the bony fragments in the site of the injury or the use of autogenous bone graft form the iliac bone with fixation of these grafts by either soft stainless steel wire (0.5mm) or titanium miniplates. For the large defects reconstruction plates were used (Figures 3,4).

The patients followed from 6 months to one year after treatment to assess the result of the treatment according to the complications of the management, patient’s satisfaction, clinical assessment and the need for further surgical procedures as following:
1. Very good: if the patient satisfies functionally and esthetically and not need further surgical treatment
2. Good: if the patient satisfies functionally and need minor surgical procedure for cosmetic reason like scar revision.
3. Fair: if the patient satisfies esthetically and need operation for functional purpose like malocclusion or limitation of mouth opening.
4. Poor: the patients not satisfy esthetically and functionally and need operations for esthetic and functional purposes.

The results showed that 15 patients (30%) have very good results and there were no need for further surgical treatment while 24 patients (48%) have a good result and they need minor surgical procedures. These 39 patients (78%) were satisfied with the results and they restored the function of the face while the results was poor in 5 patients (10%) (Table 4 and Figures 1-6).

DISCUSSION

Avulsed maxillofacial injuries presents difficult problems for reconstructive surgery because of the composite tissue loss, including skin, mucosa, bone, and other vital structures of the face. Significant functional and aesthetic deformity may result after this kind of trauma and subsequent management of these patients becomes more controversial in terms of surgical reconstruction (6). Numerous studies advocate early aggressive intervention for one-stage reconstruction of all involved structures (3,6-8), however other series published in the literature favor the conventional method for more conservative approach, advocating non operative management of these injuries initially followed by late reconstruction (8-11). The ultimate goal of facial reconstruction is to return the patient to their previous state of function and improves the esthetic. In order to achieve this goal, the surgeon must attempt to restore bony continuity, facial contour, and correction of the soft tissues defect. The disadvantages of the conventional method are scarring, decrease of the blood supply, possibility of
infection and long duration of suffering of the patients in addition to the cost of long period of treatment and hospitalization making the goals of reconstruction is difficult to be achieved. Advances in surgical technique, antibiotics, diagnostic imaging and development of rigid fixation have enabled surgeons to perform primary one stage of reconstruction procedure, avoiding the morbidity and esthetic problems associated with traditional therapeutic approaches for such trauma and this manner have been followed in this study.

The cause of avulsed maxillofacial injuries of the most patients of the present study was blast injury and this type of injuries are result in sever damage causing devitalized tissues and subsequent infection. On the other hand the facial area have a good blood supply and most the affected patients were young so vigorous cleaning, careful debridement and management of dead spaces with the use of antibiotics founded to be effective in prevent post operative complications. The same manner was used for other types of injuries including bullets, RTA and industrial injuries.

All patients were treated within the first 24 hours from the time of injury which is the most suitable time for primary closure by different surgical techniques, Other studies showed that immediate reconstruction have advantages of less scaring, less infection, less contraction and also less morbidity (3,7,8,12,14,15). Time of the reconstruction play an important role in the outcomes of the treatment. As the time elapsed before the management of the defects the developing of oedema and the possibility of contamination of the wound made the reconstruction procedure difficult and the anatomical landmarks can not be easily identified which end with poor results (Figure 5).

Rapid evacuation of the casualties to the hospital with immediate assessment of the associated injuries which interfere with reconstruction procedure makes the control the general condition the victims easier specially ATLS. Massive maxillofacial injuries usually associated with damage to air way and sever bleeding so delay treatment usually end with resuscitation of the patient more than reconstruction of the avulsed tissues.

Different surgical techniques were used for management of the bony defects including the use autogenous bone graft which still the best for correction of the hard defects regarding the take of the graft immunological reaction. During the follow up some patients who treated with bone plating develops infection but they were controlled by the use of antibiotics and daily dressing. Simple material have been used like wire osteosynthesis for reconstruction of the bones which were completely detached from the soft tissues and act as bone grafts and this technique by using wiring can be done easily and its gave a good result with less possibility of infection if compared with the use of plates (Figure 6). Successful one stage reconstruction depend on many factors like availability of reconstructive material and the use of the advance surgical techniques like free flaps and microvascular surgery (6). These surgical facilities were not available in our hospital therefore; soft tissues defects have been reconstructed effectively by the local flaps which have the advantages of color matching, good blood supply and simple technique.

Local flaps gave a good results and most the patients satisfy with the results or they need a minor operation for scar revision even with large defects the use of local flap may not cover the all defect but it will makes the next reconstruction easier.

The over all results of this study were good and there is no reason to delay the reconstruction of the avulsed tissues if the general condition of the patient stable and the surgical facilities are available, this will minimize the patients suffering and disabilities. The immediate one stage of reconstruction of the avulsive tissues achieved the purpose of the restoration of the function and esthetic of the avulsed maxillofacial injuries and it can be consider as a good method of treatment of such type of traumatized patients.
Table 1: The causes and age groups of the injured patients

<table>
<thead>
<tr>
<th>Age group</th>
<th>Blast</th>
<th>Bullets</th>
<th>RTA</th>
<th>Industrial</th>
<th>Total</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>&gt;9</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10-19</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>20-29</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>30-39</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>-</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>40-49</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>50 &lt;</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>18</td>
<td>7</td>
<td>2</td>
<td>50</td>
<td>100</td>
</tr>
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</table>

Table 2: Distribution of patients according to the type and site of injury.

<table>
<thead>
<tr>
<th>Type of defect</th>
<th>Upper face</th>
<th>Middle face</th>
<th>Lower face</th>
<th>Combined area</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft tissues defective</td>
<td>3</td>
<td>6</td>
<td>13</td>
<td>2</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>Hard tissues defective</td>
<td>1</td>
<td>5</td>
<td>9</td>
<td>-</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Combined defects</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>-</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Total of cases</td>
<td>5 (10%)</td>
<td>14 (28%)</td>
<td>29 (58%)</td>
<td>2 (4%)</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: Treatment modalities for reconstruction of the avulsive tissues.

<table>
<thead>
<tr>
<th>Type of the defect</th>
<th>Modality of treatment</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft tissues *</td>
<td>Rotation flaps</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>(11+24 patients)</td>
<td>Advancement flaps</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Transposition flaps</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Hard tissues *</td>
<td>Wire osteosynthesis</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>(11+15 patients)</td>
<td>Bone graft with osteosynthesis</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Bone graft with miniplate</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Reconstruction plates</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

* Patients with combined defects were included in each group

Table 4: Evaluation of the result according to the function and esthetic

<table>
<thead>
<tr>
<th>Defects</th>
<th>Very good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft tissue</td>
<td>9</td>
<td>12</td>
<td>2</td>
<td>1</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>Hard tissues</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Combined</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>15 (30%)</td>
<td>24 (48%)</td>
<td>5 (10%)</td>
<td>6 (12%)</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 1 A  B  C
Figure 6 A

Legends of figures
Figure 1 A,B,C: Reconstruction of the cheek defect due to bullet injury by two rotational flaps and the result was very good.
Figure 2 A,B,C: Reconstruction of the soft tissues defect in the lower face by advanced flap. The patient need scar revision.
Figure 3 A,B,C: Immediate bone graft with the use of miniplate for reconstruction of hard and soft tissue defects in chin area.
Figure 4 A,B,C: The use of reconstruction plate for treatment of large defect.
Figure 5 A,B,C: Extensive edema prevent good management of the patient which give poor result
Figure 6 A,B,: Orbital reconstruction by osteosynthesis for prosthetic eye ball. C: Reconstruction of completely separated bone fragments of the mandible from the soft tissues by soft stainless steel wire.

REFERENCES