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MISSILE HAND INJURIES IN BASRAH CITY

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Abstract

Missile hand injuries (MHI) have increased in our locality, in this prospective study 130 patients (140 hands) with MHI were included, they were 86% male, and 42% were between 21 to 30 years of age. Forty nine percent were injured by bullet and 26% by explosions of different objects. Combined tissue injuries were presented in 62% of the patients with associated fractures in 63%. In 70% of the hands initial surgical wound debridment was performed, 24% of the fractures were stabilized by K- wire and with the simple skeletal external fixations in 18%. Serial different types of secondary and definitive surgical treatment were performed in 62% of the patients. After the follow up period, most of the patients had multiple complains and only 14% had a satisfactory functional hand.

The initial, definitive management, the severity and mechanism of the injury that lead to multiple tissue damage had a great affect on final functional recovery.

Introduction

Unfortunately the hand is also one of the most commonly injured parts of the body and fairly common in missile injuries. MHI are rarely life threating, but threaten the occupation of the victim and placing a great responsibility on the treating surgeon[1,2].

Gaul and Charlotte (1987) noted that even a seemingly trivial injury could have tragic consequences leaving behind some physical impairment. Treatment therefore should restore the function as much as possible and should have absolute priority over restoration of appearance[1,3].

The purpose of this article is to the study the pattern of MHI, role of the severity of the insult, the results of treatment and to evaluate the management outcome.

Patients and methods

Between Jan.2005 to March 2006, 130 patients (140 hands) with MHI who were admitted in the Basrah General Hospital were studied. Evaluation criteria included age, gender, time since injury, the mechanism and location of the injury. Serial clinical examinations of the injured hands was done in the causality department and in the opera-ting room assessing the extent and the severity of the soft tissue and bony injuries and the degree of devitalization and contamination. Radiographic evaluation was done in most of the patients and occasionally cultures from the wounds was obtained. In the most of the cases Initial treatment was early surgical wound debridement. Fracture fixation by different methods including splints, Kirschner wires and external fixators. Completion of amputations of the severely damaged devitalized digits and most of the wounds were left opened followed by conventional staged wound excisions when the

wound needs that, this is usually done after 24 to 48 hours. Secondary procedures were performed for the coverage of the open wounds, amputations, fracture stabilization, tendon and nerve repair. Definitive treatment of the injured hands included soft tissue, tendon & nerve reconstructions, bone grafting, ray amputations, and correction of deformities. Patients were followed up for variable periods for the assessment of their functional outcomes and disabilities.

Results

One hundred forty injured hands in 130 patients were treated, they were 86% males. Adults in the second, third and forth decades were more prone (Table I). Sixty three patients (49%) had been injured by bullets, and 34 (26%) by explosions (Table II). The left hand was injured in 70 patients (54%) the right in 50(38%) and bilateral in 10 (8%). The non dominant hand was wounded in 66 patients (51%) and the dominant in 54 (41%).

In regarding to the types and frequency of the injuries, 80 patients (62%) had combined tissue injuries, open amputations in 29(22%), open lacerations in 12(9%) and puncture wounds in 9 (7%). Seventy fife patients (58%) had sustained bony injuries in 7 of them were bilateral so the total is 82 hands. Regarding the type of fractures, 53 (65%) were comminuted with bone loss, 18 (22%) stable and in 11 (13%) were unstable fractures.

One hundred five patients (81%) were treated during the first 24 hours since injury and after 24 hours in 25 (19%).

The Initial treatment was surgical wound debridement in 98 hands (70%), amputations in 13 (9%), and nonsurgical in 29(21%).

Table III shows the techniques of fracture stabilization, in 15 hands (18%) we fixed it by a simple and available external fixation and by dynamic traction for intrarticular fractures in 3(4%). The Initial complications were observed in 48 patients (37%); infections in 33(25%), tissue necrosis in 10 (8%) and gangrene in 5 (4%). Amputations were performed initially and after following operations in 98 digits (14%), coverage of the wounds was by secondary closure in 30 hands (21%), skin grafts in 21 (15%), flaps in 16 (11%), and by combination of procedures in 29 (21%)(Table IV). Ninety six hands required a definitive reconstructive treatment, 9 of them with unilateral injury were left against advice, so 87 hands(62%) underwent surgical reconstruction including bone grafting and fusion in 21 hands(24%), tendon reconstruction in 13(15%), nerve in 6(7%), ray amputations in 14(16%) and combined procedures in 33 (38%). The outcomes after the period of the follow up were deformities with loss of function of the hand and fingers in 44 hands (31.5%), combination of complications in 40 (29%) and 20(14%) were able to perform good hand activities (Table V).

Discussion

Missile hand injuries are a common complicated problem especially after high velocities that resulting complex tissue injuries require careful assessment and treatment to prevent the long term sequelae. In this present study of 130 patients, 86 % were males most were civilians, ages from 11-30 years are the most frequent this is because they are dealing with weapons more than other age groups. The mechanism of the injury is a good indicator for the extent of the damage and wound contamination and for treatment procedures. In our study, high percentage of MHI was due to explosions and shells, mine injuries and from explosion of grenade sparkers mostly in children. Combined injuries involving multiple important tissues was the major type in

our series, followed by open amputations and lacerations in the hand and digits. Early surgical treatment was performed in most of our cases, in low velocity injuries it is often unnecessary to debride questionable tissues at time of the injury, it is preferable to clean the wound thoroughly and observe recovery or necrosis of the remaining soft tissues[4]. We believe that early and thorough wound debridment with vigorous irrigation, preservations of important structures, fracture fixation and soft tissue coverage are the most important factors in preventing infections and potential problems. Most would agree that simple missile wounds can be closed primarily under some circumstances, but this is not advisable in complex injuries following high velocity missiles, delayed primary closure, skin grafting, local or distant flaps all may be used to achieve wound closure. Delayed closure also permits examination of the wound and removal of any devitalized tissue missed in the first debridement. The wound should be closed before the appearance of granulation tissue, delayed closure by more than one week with the subsquent granulation tissue formation sets up on inflammatory response leading to contracture of vital structures, making closure more difficult, and also early wound coverage facilitates early rehabilitation[4-6].

Stable fractures without significant bone loss and preserved clean soft tissue coverage are amenable to early definitive management, and can be treated by wound care and splintage so surgical intervention is not always necessary[6,7].

Comminuted fractures, often with the bone loss were commonly encountered in missile injuries, conservative treatment leads to bone shortening and angulations, it is better to maintain bone length early to avoid soft tissue contracture around the fracture which makes the subsequent reduction difficult[4-8]. Temporary external fixation in complex contaminated injuries is often the best choice and play an important role in the extensive comminuted fractures that cannot be fixed rigidly with internal fixation. Also maintain the fingers in maximum position that decrease the risk of contracture which provides better wound dressing and allows motion of the uninvolved joints and digits to prevent stiffness[6,9,10]. Some authors have stated that definitive fixation be performed within 1 week of the injury, preferably with internal fixation in the absence of wound contamination which permits earlier mobilization than external fixation[10-12].

Comminuted fractures with bone loss require bone grafting, this should be done when the infection is eradicated and soft tissue bed is optimal. If there are concerns about the quality of the surrounding soft tissue it should be performed at the later time. Grafts can be obtained from distal radius, upper tibia or iliac crest[4,7,13,14]. Intra-articular injuries increase the risk of functional complications due to severe intra-articular bone destruction or arthtrofibrosis, and stiffness. The articular cartilage is more susceptible to the bacterial, mechanical and chemical damage because of the solubility of lead in synovial fluid so intra-articular fragments should be removed[4,15,16]. At the same time and to maintain the articular congruity as much as possible, we use dynamic traction devices in 4% of the hands that also permits motion of the fingers.

Missile injuries also involve tendons and nerves and they may be crushed or lacerated with segmental loss making the treatment more difficult and challenging, many authors discourage primary repair and advised once the bone and the skin have been treated then repair or reconstruction can be done at

the time of definitive reconstruction by the end of the first week[4,6,17,18]. We found in our injured hands that it is difficult to treat it in severely damaged soft tissues which does not permits early repair, and delayed staged surgical reconstructions with prolonged periods of immobilization and disuse of the digits adversely affect the outcome results to the formation of adhesions, scarring and often ended with stiffness.
Amputations can only be accepted in severely mangled fingers during the initial treatment. later, the option to amputate several factors must be considered; if the thumb is involved salvage attempts must be made whenever possible, in case of multiple finger involvement, the residual parts of the finger may be used to salvage other fingers[4,10].
Our results unfortunality were unfavorable, 14% of the patients were satisfied and exhibited sufficient improvement in the hand function. The unsatisfactory results are caused by several specific conditions like deformities, stiffness, pain and chronic infections or multiple complains. As reported, these may be related to the severity, mechanism and location of the injury, potential complications, incorrect initial treatment procedures, delayed definitive management and the rehabilitation programs which was the most difficult when the entire hand often is affected[2,7]. Patients cooperation or compliance and the follow up also are important factors affecting the outcome of the management of MHI. In this study, some individuals are difficult to cooperate with prolonged physiotherapy program efficiently and they resists the early active motions even of the uninjured fingers which effects the assessment of the final outcome and lead to deterioration in the hand function and some cannot tolerate the failure of the initial and reconstructive treatment efforts.

Conclusion

In MHI no definite conclusions and uniform approach of treatment can be decided. Our results indicate that MHI especially following high velocity generally have bad prognosis. We believe that the restoration of hand function is difficult and uncertain in the most of these cases when the deep structures are seriously injured despite of the treatment efforts because the destruction involve a combination of significant tissue types including the joints, and it is difficult to repair every important functional damaged structure in the proper time and situation.
It is concluded that careful assessment of the actual damage, immediate and thorough wound debridement in logical way, skeletal fixation and early definitive treatment minimize the infection rate, deformities and allow early rehabilitation.

Table I: Age and gender distribution

Age(years)	males	females	Total no.	percentage
1-10	15	6	21	16%
11-20	26	3	29	22%
21-30	47	7	54	42%
31-40	15	2	17	13%
41-50	6	0	6	5%
>50	3	0	3	2%
Total	112 (86%)	18 (14%)	130	100%

Table II: Distribution of the mechanism of injury

Cause	Number of patients	percentage
Bullet	63	49%
Machine gun	23	18%
Handgun	35	27%
Gunshot	5	4%
Explosions	34	26%
Mine	13	10%
Bullet	12	9%
Grenade sparker	9	7%
Shell	33	25%

Table III: Modalities of fracture treatment

The procedure	Number of hands	percentage
Splint	30	37%
k-wires	20	24%
External fixation devices	15	18%
Dynamic tractions	3	4%
Combination of procedures	14	17%

Table IV: Procedures of wound coverage

procedure	Number of hands	percentage
Healing(secondary intention)	22	16%
Primary closure	22	16%
Late closure	30	21%
Skin graft	21	15%
Flap	16	11%
Local	12	8%
Distal	4	3%
Combination of procedures	29	21%

Table V: Long-term clinical outcome

outcome	Number of hands	percentage
Deformity	44	31.5%
Stiffness	18	13%
Chronic infection	5	3.5%
Swelling	6	4%
Sudeck's dystrophy	4	3%
Chronic pain	3	2%
Combination	40	29%
Normal	20	14%

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