War Wounds — Changing Concepts

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Abstract

The accepted standard treatment of war wounds through the last century has been debridement and delayed primary closure. However, recently, there has been a renewed interest in primary closure of these wounds. 1481 war wounds were managed by the authors and out of 789 soft tissue injuries, 389 (47%) were closed primarily (group 1) after meticulous debridement and 220 (28%) underwent delayed primary closure (group 2). The infection rate in group 1 was 4.87% compared to 6.36% in group 2. The average hospital stay in group 1 was 15 days, significantly shorter by 10 days than in group 2. In the war zone both time and resources are at a premium and primary closure of selected wounds offers a better alternative to delayed primary closure.

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Key Words : Debridement; Delayed primary closure; Primary closure; War Wounds.

Introduction

War wounds occur not only in times of war but whenever and wherever the weapons of war are used. The management of these wounds has evolved over hundreds of years through various armed conflicts. All war wounds are considered contaminated and accordingly Antoine Depage from his experiences in the great wars formulated the present standard treatment consisting of early and thorough debridement with delayed primary suture [1]. Though it has stood the test of time through various wars, it has been reviewed in the recent conflicts across the globe and many surgeons have tried primary repair of wounds with equally good results [2]. The added advantage of primary closure being lesser morbidity and a shorter hospital stay.

The present paper is based on work done in a zonal hospital at a Forward Field Hospital in a UN Peace Keeping Mission and the ongoing work at Forward Field Hospitals.

Material and Methods

A total of 1489 casualties were received and managed. The casualties were mostly from the army, paramilitary forces and civilians. 1389 casualties were treated in a zonal hospital and 100 at Forward Field Hospitals of a UN Peace Keeping Mission.

The casualties were evacuated by air or by road, within 1-16 hours of the time lag between injury and hospitalization. Casualty reception was done directly in the surgical ICU to prevent wastage of precious time in the Medical Inspection (MI) Room. Evaluation and resuscitation were done simultaneously with administrative formalities. Two 16G IV lines were established, essential blood sampling and

required X-rays were taken and the patient wheeled into the Operation Theatre (OT) within shortest possible period of time since arrival.

Concomitant thoracic, abdominal and head injuries received priority over soft tissue injuries alone. All soft tissue injuries were treated by the same protocol by all treating surgeons. All wounds of entry and exit were explored and their tracks laid open. Skin excision was restricted to dead skin at the edges. Necrotic subcutaneous fat and dead fascia was excised and a decompressing fasciotomy was done. Dead muscle was excised till it bled, contracted and appeared healthy. No bony fragments were removed unless they were lying free. Copious irrigation of the wounds was done with hydrogen peroxide to remove all dirt, debris and clots. This was followed by a povidine wash (0.5% w/v). Haemostasis was ensured with minimal use of the cautery and the wound closed over a corrugated drain if the depth of the wound warranted its placement (Fig 1,2). Split skin grafts and flaps were used for primary closure in case of extensive skin loss.

Grossly contaminated wounds that could not be converted to surgically clean wounds even after thorough debridement were left open for delayed primary closure or secondary suturing. The criteria for selecting a wound for primary or delayed primary closure was solely clinical wound contamination and not the time lag since injury which was routinely >6 hours. Wounds with extensive soft tissue damage and bone loss and unsalvageable limbs were taken up for primary amputation (Fig 3,4).

Routine use of broad-spectrum antibiotics-ampicillin, genta-mycin and metronidazole and others if warranted was made, pre, intra and per operatively. All patients received a single dose of tetanus toxoid pre operatively and the wound was inspected after 48 hours, the drains removed and the wounds observed daily. Any sign of collection or tension on the suture line was managed by removal of a few sutures,

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Fig. 1 :

Fig. 2 :

but in presence of pus it was converted to an open wound and subjected to secondary suturing. Sutures were removed after 8-14 days depending up on the anatomical site.

Results

Most casualties were young male patients of 20-35 year age. There were 4 children and 4 females in the series. Gunshot wounds (GSW) accounted for 55.54% (n=827) of casualties, and 44.46% (n=662) had suffered blast injuries. The anatomical distribution of the various sites is as shown in Table-1. 23% (n=340) of patients had more than two sites involved. The majority of injuries (63%) involved the extremities. Table 2 shows the distribution of these injuries and the percentage of bone and soft tissue injuries. There were a total of 789 soft tissue injuries alone. Table 3 shows the anatomical distribution of these. Primary closure was done in 369 (46.76%) of soft tissue injuries. Delayed primary closure was done in 220(27.88%). Table 4 shows the type of closure and the infection rate in each group.

Fig. 3 :

Fig. 4 :

TABLE 1
Anatomic sites of injuries

Site	Number
Head and neck	147
Chest	169
Abdomen	168
Extremities	941
Back and spine	64

TABLE 2
Injuries of extremities

Limbs	Soft tissue	Bony injuries	Total
Lower limbs	263	216	479
Upper limbs	167	135	302
Both lower and upper	105	55	160

TABLE 3
Anatomical distribution of soft tissue injuries

Site	Number	Percentage
Head and neck	147	18.63
Chest	39	4.84
Abdomen wall	17	2.15
Trunk	29	3.61
Extremities	557	70.59

TABLE 4
Type of wound closure and infection rate

Procedure	Number	Infection rate
Primary closure	369	18 (4.87)
Delayed primary closure	220	14 (6.36)
Secondary suturing	145	7 (4.82)
Split skin grafting	55	3 (5.45)

Discussion

The steady improvement in the mortality and morbidity in the major wars of the 20th century has been based on sound principles of Military Medicine and Surgery. War wounds are more than just a physical injury to the soft tissues. They are characterized by devitalized tissue with debris and are contaminated and are liable to become infected. The concept of wound debridement and delayed primary closure after 4-6 days has stood the test of time through innumerable armed conflicts and forms the standard treatment against which other management options have to be compared.

A review of literature regarding the incidence of wound infection in recent military conflicts, strongly suggests that infection in open war wounds occurs with relative frequency despite strict adherence to the principles of surgical debridement and administration of prophylactic antibiotics [3].

Freidrich originated the idea of excising the bacteria laden tissue around the contaminated wound in 1898 and reasoned that such a wound be closed primarily and heal without infection. Le'aitre, in World War I practised meticulous excision of carefully selected wounds, closed them primarily and had a wound break down rate of only 2.36% [4]. The concept of primary closure has been practised in the Israel-Arab wars and recently in the Croatian-Bosnian conflict with good results [2,5].

In our series we were able to close almost 50%

(n=368) of soft tissue injuries primarily with an infection rate of 4.8% and an average hospital stay of 15 days. 28% (n=220) of wounds were subjected to delayed primary closure and had an infection rate of 6.36% and average hospital stay of 25 days. Though the infection rates were not statistically different primary closure did not increase the infection rate and actually decreased the hospital stay significantly, thereby decreasing morbidity and the strain on resources.

The overall infection rate in our series was 5.37%, which compared well with infection rates of 3.6% to 6.4% in other armed conflicts [6,7]. A wound closed within 6 hours had an infection rate of 4.87% while it was 6.36% if closed after 6 hours - a difference that was not statistically significant.

Selection of wounds for primary closure or delayed primary closure was based on clinical assessment before and after debridement. An untidy wound, which could be converted, to a tidy wound after thorough debridement was subjected to primary closure. However, the most important factor is the postoperative monitoring of the wound so that conversion to an open wound for delayed primary closure or secondary closure could be done at the earliest sign of infection. In our series the conversion rate was 1%.

Primary closure was found to decrease infection rate, hospital stay, re-operative rate, dressing rate and decrease the burden on already overstretched hospital resources. It also led to lesser morbidity and early recovery for the patients.

In a war zone, where both time and resources are at a premium, primary closure of selected wounds offers an alternative, which was found to have excellent results. The nature of war wounds and the circumstances in which they arise makes comparisons and conducting randomized trials impossible. Even a uniform classification system of war wounds - the EXCFVM scoring systems of Red Cross has not been uniformly adopted [8]. Wound treatment recommendations in emergency war surgery NATO handbook, contrast sharply with the advice given in ICRC's surgery for victims of war [4]. The surgeon at the battle-front is the sole judge of the feasibility of primary closure of a wound and bases his decisions on his experience. Our observations have clearly shown primary closure to be effective, but all wounds cannot be closed indiscriminately, as infection will defeat any possible gain from primary closure. The final decision is that of the treating surgeon.

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