Primary wound closure in war amputations of the limbs

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Accepted: 20 May 1997

Summary. *We have reviewed 75 amputees, 58 in the lower limb and 18 in the upper. Closed amputation was performed in 69 patients (92%) and an open procedure in six (8%). Wound infection occurred in six (8%) and one patient died from thromboembolism. Wound healing was normal in the remainder. The results of closed amputation in war conditions are very good, if performed within 6 hours of injury.*

Résumé. *Le but de cette étude est de présenter nos propres expériences dans le traitement par amputation des blessures de guerre des extrémités. Nous avons étudié en tout 75 blessés sur qui a été pratiquée une amputation, des extrémités inférieures dans 58 cas et supérieures dans 18. Parmi eux 69 blessés (92%) ont subi une amputation fermée et 6 (8%) une amputation ouverte. Chez 6 (8%) patients s'est produite une infection de la blessure. Un patient est décédé des suites d'une thromboembolie. Chez tous les autres patients les blessures se sont cicatrisées normalement. Nos résultats montrent que l'amputation fermée, même dans les conditions de guerre, donne des résultats excellents si elle est pratiquée moins de six heures après la blessure.*

Introduction

In the first year of the Croatian war, 10.4% of all wounds to the limbs necessitated amputation [8]. In the Gulf war, the corresponding figure was 26.9% [1]. Two types of amputation, closed and open, are currently in use. In the former the skin is closed immediately after the amputation, whereas in an open procedure the skin and soft tissues are closed two weeks after the initial surgery. Open amputation is generally preferred in the treatment of war wounds [4, 14].

We present our own experience with closed amputation in military hospitals in Rama, Bosnia and Herzegovina.

Patients and methods

At a military hospital located near the battlefield, 487 patients with war wounds were treated between April 1992 and April 1994. Wounds of the limbs were present in 421 patients (86.4%), and amputation was performed in 75 (17.8%). The wounded were provided with first aid at the battlefield, and evacuated within 1–2 hours to the military hospital, located 8–10 km from the frontline. Resuscitation and preoperative measures were performed on admission, followed by emergency amputation of the irreparably damaged part of the limb. All patients received antitetanus and antimicrobial therapy. The injured limb was debrided and treated with antiseptic agents. The level of amputation was determined according to tissue viability and the length of stump needed for attachment of a prosthesis. Efforts were made to leave the stump as long as possible. Closed amputation was performed primarily in 69 patients (92%), and an open procedure with skin flaps in six (8%) in whom the tissue for primary wound cover was inadequate or more than 6 h had elapsed since injury. After primary closure a drain was left in the stump and an elastic compression bandage applied. Soft rubber drains or plastic tubes were used for suction drainage during 2 to 3 days after operation. The patients were in hospital for about a week after which they were transferred to the Split Clinical Hospital for

Table 1. Number, localisation and cause of the injury necessitating amputation

	Mine	Shell	Bullet	Total	%
Amputation					
Upper arm	0	2	0	2	2.6
Forearm	0	2	0	2	2.6
Hand	0	1	0	1	1.3
Fingers	0	9	4	13	17.2
Thigh	5	0	0	5	6.6
Lower leg	31	4	0	35	46.0
Foot	9	1	0	10	13.2
Toes	1	1	6	8	10.5
Total	46	20	10	76	100

further treatment which averaged a further two weeks. All closed amputations were undertaken in the military hospital while open procedures were closed at the Split Clinical Hospital two weeks after the initial injury.

Results

Of 75 patients in whom amputation was undertaken, seven were women. The patients were aged between 11 and 67 years, the mean age being 26 years. The wounds requiring amputation were mostly inflicted by pressure-activated mines, bombs or bullets. The causes and anatomical locations of the amputations are presented in Table 1. In one patient, both lower legs had to be amputated.

No major complications occurred and there were no instances of osteomyelitis, gas gangrene or tetanus. Infection of the soft tissues of the stump occurred in six (8%) patients, with superficial infection in four and deep in two. These infections developed during the first postoperative week in five patients with closed and in one with open amputations. They were treated within two weeks by target antimicrobial therapy, opening of the stump and abundant rinsing with antiseptics; thereafter the stump was closed.

One death in hospital resulted from pulmonary thromboembolism in a patient who had sustained explosive amputation of the upper leg. Out of 70 amputations with primary closure, 64 (91%) healed without complications. In six open amputations, five (83%) healed uneventfully. The patients treated with closed amputation were in hospital for an average of 20 days while those managed by the open method were in for two weeks longer. Referral for rehabilitation followed and, where indicated, appropriate prostheses were provided.

Discussion

Injuries to the limbs were present in 86.4% of our patients. Reports published prior to the Gulf war record amputations in 5.8%–18.4% of wounded persons [8, 11, 12]. In our series, amputation was indicated in 17.8%, as compared to 26.9% in the period following the Gulf war [1]. In the Gulf war, the extensive use of mortar shells and densely scattered pressure-activated mines were responsible for many injuries. The rocky ground intensified bursting after the explosion and favoured the formation of secondary projectiles. In the period after the Gulf war, the high percentage of amputations was probably influenced by more potent explosive charges and unfavourable ground characteristics, resulting in an extremely high percentage of amputations in wounded persons who had survived the explosion [1].

In the literature, the infection rates of war wounds range from 5.7% to 15.7% [6, 11]. In our patients, infection occurred in 8% of amputation stumps but in every instance treatment was successful within two weeks. Major complications were prevented by the prophylactic use of antibiotics and proper preoperative and postoperative care. Similar experience has also been reported elsewhere [2, 5]. The value of a compression bandage has been emphasised [9] and in our patients it was used extensively, without haematoma formation or the need for additional blood transfusion.

Satisfactory management of amputations by delayed closure of soft tissue and skin has been recorded. Simper [10] described successful healing in 94% of lower leg amputations with wound closure performed within a week from the wounding, and in 72% of instances when the closure was performed later.

The management of amputations has been regarded as being lengthy and expensive [7], although our experience suggests the opposite. With

early amputation and primary closure we reduced the duration of hospital stay to 2 weeks. In addition to the more favourable psychological effect, closed amputation also reduces the cost of treatment. As our patients were young, their rehabilitation proceeded rapidly and they returned to normal life.

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