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Bilateral lower limb amputations as a result of landmine injuries

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Abstract

Landmine explosions cause most of the war injuries in the battlefield. Amputations resulting from severe injuries reveal serious problems despite the improvements in surgery. Bilateral lower limb amputations have more impact than unilateral on social life.

Some 29 cases with lower limb amputations due to landmine injuries were treated in the Department of Orthopaedics and Traumatology, Gülhane Military Medical Academy between January 1992 and December 1996. Amputation levels were as follows: 1 case had hip disarticulation and a trans-femoral amputation, 6 had bilateral trans-femoral amputations, 6 had trans-femoral and trans-tibial amputations, 12 had bilateral trans-tibial amputations, 1 had trans-femoral and Chopart amputations and the remaining 3 cases had trans-tibial and Chopart amputations.

The initial treatment was done for all cases in the first 6-8 hours after injury at the field hospitals. Aggressive debridement, excision and primary closure were performed. None of the stumps required reamputations and/or revision. No case had gas gangrene or tetanus.

Postoperative, pre-prosthetic training programme which ranged between 30-120 days with an average 48 days; and prosthesis fitting and adequate post-prosthetic training programme which ranged 32-126 (average 94) days was applied. All the cases were followed-up with a mean of 38.5 months (14-72 months). Nine (9) cases (31%) returned to their previous occupation, while 20 (69%) cases had to change their jobs.

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Introduction

The trade of weapons and explosive materials is a huge market where much investment is made. Since there are conflicts in different parts of the world, money and time is spent in treating the complications of resulting injuries, instead of on human welfare.

Surgeons have learned new treatment techniques and would care on the battlefield (King and Rne, 1969; Coupland and Howell, 1988). Landmines cause most war traumas. They are often used since they are explosive, easily installed and effective in discouraging personnel on the battlefield (Baise and Baumgartner, 1990). Amputation for war wounds is difficult and different (Coupland and Korver, 1991). Failure to appreciate the disparities between amputation in war surgery and civilian practice result in unhealed stumps, bone exposure and serial proximal amputations.

Lower limb traumatic amputations and/or severe limb injuries result from landmines. Therefore, the treatment and rehabilitation of cases with bilateral lower limb amputations is important in social life.

Material and methods

A total of 29 male patients with bilateral lower limb amputations due to landmine injuries were treated and followed up at the department of Orthopaedics and Traumatology, Gülhane Military Medical Academy between January 1992 and December 1996.

Age average was 22.4 (21-23.5) years old.

Patients were divided into 6 groups in terms of amputation level and are presented in Table 1.

First aid and prophylaxis for tetanus were applied in all cases with evaluation at the field hospitals of Mangled Extremity Severity Score (MESS) (Robertson, 1991) within the first 6-8 hours following the injury. Appropriate

Table 1. Amputation levels of the cases.

Group number	Amputation level	Case number
1	Trans-tibial and Chopart	3
2	Trans-tibial and trans-tibial	12
3	Trans-femoral and Chopart	1
4	Trans-femoral and trans-tibial	6
5	Trans-femoral and trans-femoral	6
6	Hip disarticulation and trans-femoral	1
Total		29

amputation level was determined after aggressive excision and debridement of the contaminated, contused and dead tissues under tourniquet control; then the wound was closed with primary myoplasty technique. Antibiotics were given for 5 and 7 days. (Crystallized Penicillin 5x4.10^6 IU, iv. + Aminoglycoside 80mg 2x1im).

One (1) case with bilateral trans-femoral amputation had a perineal wound, one (1) with bilateral trans-femoral amputation had upper limb trans-humeral amputation, one (1) with bilateral trans-tibial amputation had tibia diaphysis fracture which was treated with internal fixation at the same time as the amputation. All cases were referred to physiotherapeutic training immediately and transported from the field hospital to the authors' hospital between 2 and 8 (average 3.4) days after operation.

An intense training programme including postoperative and pre-prosthetic exercises, was initiated for all cases. This programme comprised contraction prevention and strengthening. Bandaging and pain treatment were also used.

Prosthetic fitting was applied between 30 and 120 (average 48) days. Three (3) Group-1 amputees were provided with PTB (patellar-tendon-bearing) prostheses and Chopart prosthesis. Group-2 amputees had PTB prostheses. One (1) Group-3 amputee was provided with a suction socket prosthesis with free knee motion and a Chopart prosthesis. All of Group-4 amputees had a suction socket prosthesis with free knee motion and a PTB prosthesis. A suction socket prosthesis with free knee motion and the same socket type prosthesis with knee lock were applied to Group-5 amputees. One (1) Group-6 amputee was provided with a total contact socket hip disarticulation prosthesis with knee lock and a suction socket prosthesis with free knee motion.

After prosthetic fitting, a training programme

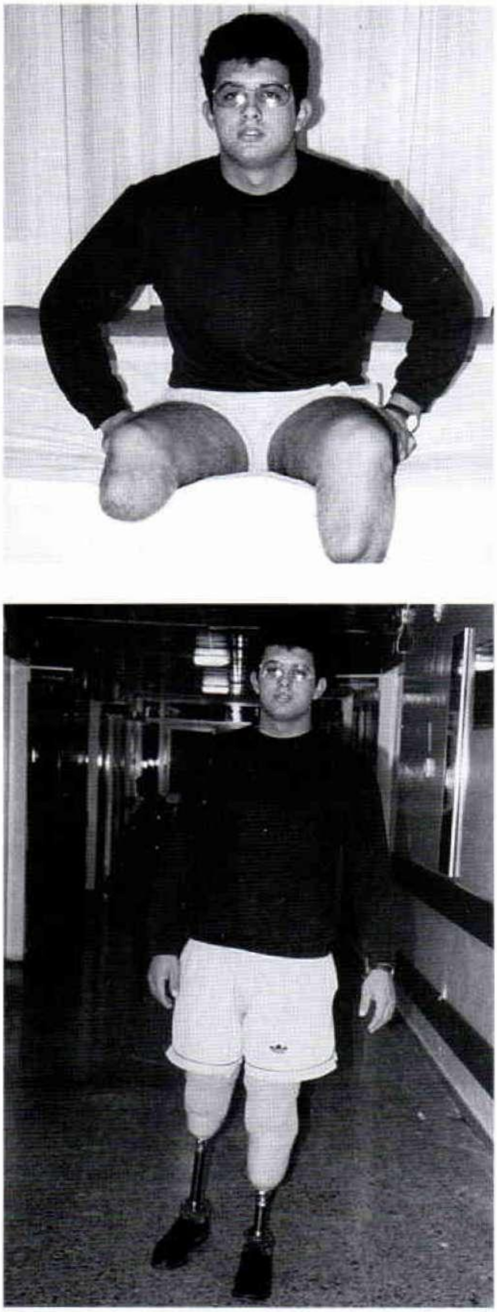

Fig. 1. Above: the appearance of the patient with bilateral trans-tibial amputation before prosthetic fitting. Below: same patient after prosthetic fitting and training.

including standing, balance training and walking training were also initiated. Post-prosthesis training period was 32-126 (average 94) days.

Samples from the cases are presented in Figures 1 and 2.

The average follow-up period was 38.5 (14-72) months.

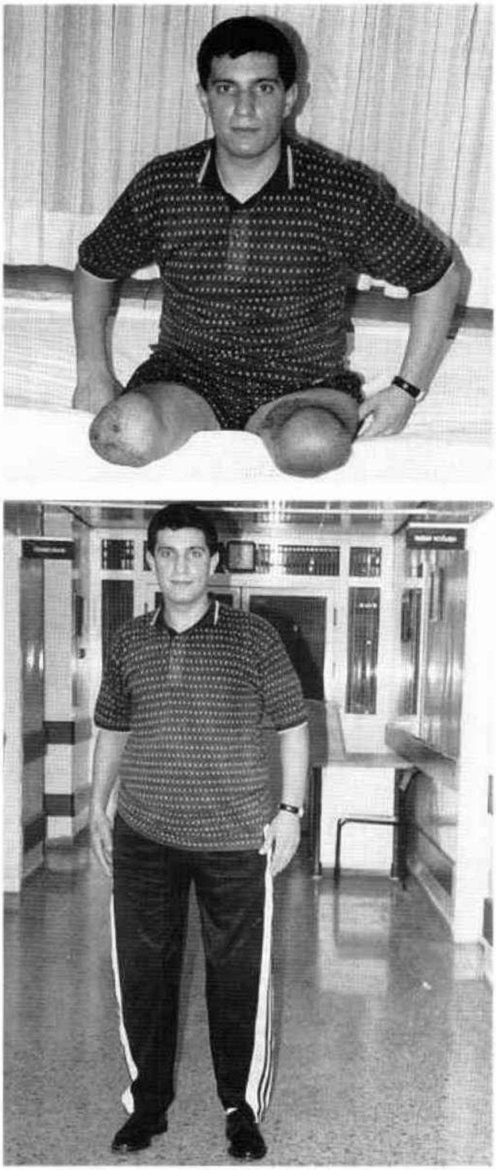

Fig. 2. Above: the appearance of the patient with bilateral trans-femoral amputation before prosthetic fitting. Below: same patient after prosthetic fitting and training.

Results

No early complication such as bleeding and/or infection was encountered in any case. One (1) case with trans-femoral and trans-tibial amputation had skin necrosis on the stump and was treated with skin graft. Six (6) cases had phantom pain.

No case had neuroma, protrusion, or limitation in range of motion or joint contracture.

Revision or reamputations were not performed in any case.

All of the patients used their prosthesis every day. Group-1,2,3,4 amputees were able to put on their prosthesis by themselves. As for the Group-5 amputees, 4 managed to put on their prosthesis without any assistance, while 2 required assistance from others. The Group-6 amputee also required assistance from others.

For determination of the outcome in relation to the objective for amputees supplied with prosthesis various definitions were established: bad result, fair result, and good result (Christensen *et al.*, 1995) as outlined in Table 2

The result of the evaluation of the functional level of the patients is stated in Table 3.

Group-1,2,3 amputees were able to walk without any aid. Group-4,5 amputees used 1 or 2 canes. The Group-6 amputee used 2 canes.

All the patients thought that the training period was adequate. As to the quality of the

Table 2. Definition of bad, fair and good result.

Bad	Fair	Good
-does not use prosthesis	-indoor walking	-does not use wheelchair
-uses prosthesis for cosmetic purposes	-mainly indoor walking but also slight outdoor walking	-goes for walks
-uses prosthesis for transfer	-walking on stairs	-leads an active, outgoing life

Table 3. Functional level – result.

Group number	Result		
	Good	Fair	Bad
1	3	-	-
2	8	4	-
3	1	-	-
4	3	3	-
5	2	4	-
6	-	1	-

training 20 patients thought it was good. Nine (9) patients found that it was acceptable.

At follow-up it emerged that 9 cases (31%) returned to their previous occupation while 20 cases (69%) had to change their jobs.

Discussion

For amputation surgery, the preservation of the joints during the urgent intervention is of the utmost importance for rehabilitation and prosthetic fitting (Atesalp *et al.,* 1995). The amputation level should be determined according to the extent of the wound (Bowen and Bellamy, 1988). Reamputation will be inevitable when the surgeon tries for too low a level where there is an infection risk (Coupland, 1989).

Amputation in war surgery must eliminate all dead, contaminated and contused tissue. The stump should be covered with enough soft tissue using the myoplasty technique. In trans-tibial amputation medial gastrocnemius myoplasty technique should be preferred (Coupland, 1989).

Most authors recommend delayed primary closure of the wound in order to prevent infection. (Trong, 1972; Bowen and Bellamy, 1988; Coupland, 1989; Simpler, 1993). In case of early wound closure, there is a high risk of anterolateral compartment syndrome in lower limb amputations (Coupland, 1989).

In open amputation, muscle edema and/or proximal skin retraction within 4-5 days may cause problems for delayed primary wound closure, and even may result in reamputation. (Baise and Baumgartner, 1990).

In the authors' clinical experience, the wound may be closed primarily following aggressive excision and debridement within the first 6-8 hours in the treatment of traumatic limb amputations as a result of landmine injuries. The wound should be left open for 3-7 days after excision, and debridement; then delayed primary closure should be applied if the patient is transported more than 8 hours after the primary impact.

Two hundred and ninety-eight (298) (78.2%) patients out of 381 with lower limb amputation transported to the authors' department within the first 6-8 hours between 1989 and 1994 were treated by primary closure and 83 (21.8%) patients who arrived more than 8 hours after injury had delayed primary closure. Only 24 cases (8%) out of 298 with primary closure had superficial infection, which was treated in a short period by daily wound care, dressing, and antibiotic therapy. None of them had severe stump infection, toxemia septicemia and gas gangrene. Some 7 cases (8.4%) out of 83 with delayed primary closure had muscle edema and skin retraction and required reamputation. These patients are usually distressed in the expectation of a new operation (Atesalp *et al.,* 1995).

Surgical intervention should be gentle since the disability ratio is 80% in cases with bilateral lower limb amputation. In addition to the orthopaedic surgeon, plastic and microsurgery specialists should be in the operating team.

The bilateral amputee has specific problems during the rehabilitation process. Not only does the patient have to train with two prostheses but also the increased energy requirement needs special attention (Rommers *et al.,* 1996). Improving technique in fitting, improved availability of sizes and types of sockets and appropriate patient selection should decrease failure or rejection rate (Kerstein *et al.,* 1975).

It is recommended that the bilateral amputee should be trained and encouraged in self-strengthening exercises for the muscles of the amputated limb. Stronger muscles will improve standing balance and quality of gait, especially among those with a short stump (Kerstein *et al.,* 1975). Training of the bilateral amputee consists of 4 periods: preoperative, postoperative, pre-prosthetic and post-prosthetic periods (Millstein *et al.,* 1985; Thornhill *et al.,* 1986).

Preoperative period; since all the amputations were unplanned and resulted from landmine injuries a preoperative rehabilitation programme could not be initiated. Postoperative period; appropriate position of the stump should be maintained. For trans-femoral amputees flexion, abduction, and external rotation and for trans-tibial amputees a flexion position should be avoided. The programme should include upper limb muscle strengthening, breathing exercises, paravertebral and abdominal muscle exercises. Active exercises for stump muscles for contraction prevention and strengthening is also necessary. No contractures were observed in this series.

Pre-prosthetic period; in addition to the postoperative exercises, bandage application in order to relieve edema and give a suitable position to the stump is necessary. Post-prosthetic period; includes muscle