

# OUTCOME OF TISSUE SPARING CONSERVATIVE SURGERY IN BLAST INJURIES TO LIMBS

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## ABSTRACT

**Background:** Blast injuries are common in countries affected by conflict. **Objective:** To evaluate the outcome of conservative surgical intervention in the blast injuries of limbs in civilian population. **Methodology:** Study Design: Cross sectional study. Place and Duration of Study: Department of Orthopedic Surgery, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan from 1<sup>st</sup> September 2011 to 31<sup>st</sup> March 2013. Fifty patients suffering from blast injuries to upper and lower extremities in civilian population regardless of age and sex were enrolled. Those patients who already had been treated after injury at some other centers were excluded from the study. Only clinical evaluation was used to check the vascular status and viability of the remaining attached tissues. Patients were operated either under general or regional anesthesia. Repeated debridement's followed by skin coverage in the form of split thickness skin graft or rotational flaps were the treatment option for soft tissues and exposed bone respectively. Post operative antibiotics were given for a period of one week at least. Rehabilitation exercises were continued up to six months after discharge from the hospital. The data was entered and analyzed by using SPSS version 15. **Results:** Mean age of the victims in this study was 22 years. Twenty nine patients had some sort of traumatic amputation at presentation resulting from original injury. Original injuries occurred were as follows; loss of limb below knee 7(14%), loss of limb at ankle region 05(10%), mid foot amputations 08(16%), and hemi foot amputation in 05(10%). In upper limb injuries pattern was as follows; 01(2%) mid palmer amputation, 02(4%) two fingers amputation, and 04(8%) had soft tissue involvement of hand. Infection rate was 22% in patients who did not have wound dressing by the primary physician while it was 10% in patients who had wound dressing by primary physician before presenting to this institution, the collective infection rate was 32%. **Conclusion:** Conservative wound debridement, early skin coverage, preserving maximum soft tissues and bone results in functionally and cosmetically better limb in blast injuries.

**Key words:** Tissue Sparing Surgery, Blast injury, Wound Toilet, Debridement, Conservative Surgery.

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## INTRODUCTION

Although infectious diseases remain a formidable enemy, however non communicable diseases and traumatic injuries are increasing health challenge.<sup>1</sup> A high velocity missile imparts kinetic energy to all surrounding tissues for example skin, muscle, tendon, Ligaments, vessels and nerves.<sup>2</sup> Blast injury can lead to death, amputation, severe disability and psychological trauma.<sup>3</sup> Three common patterns are observed as classified by international committee of Red Cross.<sup>4</sup>

First pattern is that blast injuries may be caused by stepping on a mine resulting in foot or leg being blown away resulting in traumatic amputation with varying degree of injury to the other leg, genitalia, arms, chest and head. Second pattern of injury is caused by fragmentation of mine affecting any part of body. Third pattern of injury is caused by accidental detonation (explosion) whilst handling a mine resulting in severe wounds of hands, arm and face leading to blindness in some cases. The first pattern is most commonly associated with limb injuries, however no pattern

is exempt. In addition to the direct damage, very often the shoes or the foot on the affected side can act as a missile and can drive dirt or shrapnel upwards into the same extremity, this has been claimed to be the reason for doing amputation above the level of the original blast injury. Moreover on initial inspection it is rather difficult to assess the actual deficit and later on may result in the loss of potentially salvageable portion of the limb. Though the recovery of patients is early if amputation and primary closure of stump at a level considerably higher than the original injury. Despite the fact that recovery is fast, cheap and rehabilitation is early and successful yet the physical and psychological trauma is definitely severe.<sup>5-6</sup>

Conserving the useful functioning limb is better option because this results in less physical and psychological trauma.<sup>7</sup> However this approach is time consuming, cumbersome, expensive, need multiple surgeries and last not least, the help of plastic surgeon experienced with trauma management.<sup>8</sup> Sound understanding of reconstructive surgery is imperative to all practicing General and Orthopedic Surgeons.<sup>9</sup>

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The objective of this study was to determine the pattern and outcome of conservative tissue sparing surgery in patients with limb blast injuries.

## METHODOLOGY

This cross-sectional study included 50 patients of all ages and both sexes presenting with blast injuries from Rahim Yar Khan, adjacent areas of Sindh and Baluchistan provinces that were referred and shifted to Emergency Department of Sheikh Zayed Medical College/Hospital without any primary surgical intervention. The study was conducted from 1<sup>st</sup> September 2011 to 31<sup>st</sup> March 2013. Patients having some sort of surgical intervention at primary health center were excluded from the study. All patients were admitted through emergency department and were examined thoroughly by orthopedic surgeon present on duty. The life and limb viability was assessed. Two wide bore canolas were passed and intravenous fluids infused immediately.

Resuscitation was done according to ATLS protocol and tetanus prophylaxis administered. Antibiotics were given for at least one week. First debridement and fixation of fractures was performed in emergency and an attempt was done to save as much soft tissue as possible excising vivid dead tissue. Wounds were thoroughly irrigated with copious normal saline, dead tissue and necrotic material was removed meticulously. Debridement was continued at 48 – 72 hours intervals in all patients if needed. Complications noted were infection, pain and phantom limb. Functional and cosmetic outcome was measured as excellent, good, satisfactory and poor.

Once the wounds were healthy and clean, closure was done secondarily. Weight bearing area wounds were covered with fasciocutaneous flaps while non weight bearing areas wounds were covered with split thickness grafts. In patients with bone fracture of same amputated segment, revision of stump if infected was executed at a higher level. The data was entered and analyzed by SPSS version 15.

## RESULTS

Thirty six (72%) patients were provided resuscitative care in primary center and were only dressed in these health centers and referred for further treatment to Sheikh Zayed Hospital, Rahim Yar Khan. The pattern of injuries according to the region involvement is shown as in table I.

**Table I: Pattern of Injuries**

Pattern of Injury	No. of Patients	Percentage
Isolated upper limb injuries	03	6%
Isolated lower limb injuries	31	62%
Upper/lower limbs injuries	10	20%
Lower limb and other areas	06	12%

Other areas involved were face in 03, abdomen and genitalia in 02 and 01 respectively. Infection was treated with judicious drainage, wound irrigation, daily dressing and systemic antibiotics according to culture sensitivity. Patients were mobilized at the earliest possible time and early rehabilitation started. Patients were followed for 04 to 06 months. Age range was 10 to 53 years. Mean age was 22±16 years. There were 42 (84%) male patients and 8 (16%) patients were females. Secondary closure was achieved in 07 patients. 31 (62%) severely injured patients necessitated immediate resuscitation. Two pints blood was transfused in 13 (26%) patients. Twenty one (42%) injured patients had no amputation, while the level of amputation of rest of patients is shown in table II.

**Table II: Frequency of Amputation**

Level of amputations	No. of Patients	Percentage
Below knee	07	14%
Distal Tibiofibular	05	10%
Mid foot	08	16%
Hemi foot	05	10%
Two or less toes	02	04%
Two or less fingers	02	04%

**Table III: Frequency of Complications.**

Infection	16 patients (32%)
Painful limb	9 Patients (18%)
Phantom limb	4 Patients (8%)
Psychological problem	7 Patients (14%)

Infection rate was 22% in patients who did not have wound care at the periphery. Those who had wound toilet at the peripheral hospital had an infection rate of 10%. Two patients developed fulminating infection requiring below knee amputation. Painful limb was a long term complication in 9 (18%)

patients. One patient required ankle arthrodesis to alleviate the pain. Four patients developed phantom limb that was managed conservatively. 07 patients developed psychological problem requiring antipsychotic medication. (Table III) Average hospital stay was 19 days. 47 (94%) patients were successfully rehabilitated and 41 (92%) resumed their original job and routine life. A total of 36 (72%) patients has excellent functional and cosmetic rehabilitation, 05 (10%) has good functional and acceptable cosmetic recovery, 07 (14%) patients has satisfactory functional rehabilitation with poor cosmetic outcome and 02 (4%) patients has poor functional outcome. (Table IV)

**Table IV: Outcome among patients**

Outcome	No(%)
Excellent	36 Patients (72%)
Good	05 Patients (10%)
Satisfactory	07 Patients (14%)
Poor	02 Patients (04%)

## DISCUSSION

Blast injuries are devastating physically as well as psychologically. The victims are usually harmless civilians. These weapons cause varying degree of injury depending upon the pattern of their explosion and surface area of contact. Children are more severely injured.<sup>10</sup> Moreover, mode of transfer and nearest health facility also contribute to the outcome. Survivors suffer worst outcome. These injuries are physically mutilating and may lead to loss of function unless extremities are involved.<sup>11</sup> These mutilating injuries are difficult to manage and need multidisciplinary approach. In a previous study, showed that blast injuries occurred to shaft of long bone mainly, which in contrast to our finding where all area of limb bones were involved.

Where the limb is involved, salvage of limb is difficult and needs involvements of multiple disciplines for salvage surgery.<sup>12</sup> Amongst the blast injuries lower limb is more often involved as is evident in this study. It is due to fact that most of these devices are exploded by accidental stepping over the mine. Hand injuries can occur due to handling of device in patients who are involved in mine clearance or children who handle them accidentally.<sup>13</sup> As there is a deep contamination with blast wave in this sort of injury, traditionally

amputation is required more proximally up in the limb than are apparent level of injury.<sup>14</sup>

It is evident from this study that by meticulous debridement and wound irrigation, infection rate and limb loss is reduced to a significant extent. It has got a direct relationship with the better psychological, functional and rehabilitative outcome.<sup>15,16,17</sup> Revision of stump was done in few subjects in this study i.e. 04% only. As the hand has got greater functional impact it is necessary to save as much tissue as possible.<sup>16</sup>

We were lucky to receive mostly those children with less severe finger injuries only. Rate of early and long term complications was low in these patients.<sup>17</sup> Wound infection rate was also low and manageable. It was even lesser with the patients dressed in the periphery or early in emergency and accident department that clearly demonstrate the importance of early, meticulous wound wash and debridement. It reduces the bacterial count in these wounds. In a study conducted in India, wound infection was noted in 36% of patients.<sup>18</sup>

Pain and minor stiffness was also encountered among patients but they were managed by range of motion exercises, physiotherapy, psychological support and anti inflammatory drugs. Our study showed that up to 82% study subjects has good to excellent outcome of conservative surgery this is comparative to a previous study.<sup>19</sup>

One of the striking deficiencies in the current health delivery structure is lack of focus on the emergency care in primary health care system which is ill equipped to offer appropriate care in the emergency situation resulting in high burden of preventable death and disability .

## CONCLUSION

Blast injuries among limbs, predominantly affects lower limb. Prognosis is better by preserving maximum soft tissue and bone, conservative debridement and early skin coverage both functionally and cosmetically.

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