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Early Extremity Reconstruction in Trauma: A Trauma Surgeon's Perspective

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Abstract

Context: Early reconstructive surgery done by trauma surgeons, in context with favourable recovery of the wound and good functional outcome.

Aim: To evaluate functional outcome of the early reconstruction by trauma surgeons at level 1 trauma centre.

Settings and design: It was a retrospective study, evaluation of result following early reconstructive surgery

Material and methods: Study was performed in at Level 1 trauma centre in India. Reconstructive surgery of the extremities performed by single surgeon at the centre from February 2019 to February 2020.

Statistical analysis: Data analysis was done by using Microsoft excel 2020.

Results: Total 32 patients underwent reconstructive surgeries; most of the patients were having tendon injury associated with other injuries like vascular, bony fractures and nerve injuries. Most of the patients were managed by tendon repair and K-Wire placement. 78% were hand injury and 22% were foot injuries. Most of the patients 47% were road traffic injuries, second most common injuries we found were machine cut injuries (28%), 16% were fall of object (stones) 6% were accidental glass cut injuries and 3% suicidal wrist cut injuries.

Conclusion: Its well-known fact that early wound wash and repair have better outcome in trauma patients. Across the India, plastic surgeons are not available around the clock in emergency even at level 1 trauma centres. Hand and foot reconstructive surgery can timely manage by trained trauma surgeons with better functional outcome and early recovery.

Keywords: Reconstructive surgery; Hand trauma; Early reconstruction; Trauma surgeon

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Introduction

Reconstructive surgery in extremity injuries is an essential part of the trauma services [1]. India has approximately 2000 certified plastic surgeons for a population of 1.35 billion [2]. Round the clock availability of plastic surgeons does not feature in Government of India's vision on Trauma Services in country [3]. Though extremity trauma may not always be life or limb-threatening, delayed reconstruction can potentially lead to suboptimal healing, infections, and above all, loss of function and aesthetic value of limb [4]. Its, therefore, prudent for Indian trauma system to have a provision of limb reconstructive surgery, accessible across all echelons of care and round the clock.

Methodology

This study was conducted in the Department of Trauma Surgery, Level 1 Trauma Center, All India Institute of Medical Sciences, Rishikesh. Surgeries for post traumatic reconstruction (Tendon Repair of extremities, performed by single unit over 1 year (February 2019 to February 2020) were included. Patients who underwent large vessel repair (proximal to and including elbow and knee), debridement, and those undergoing reconstruction of face, scalp, perineum, and abdomen were excluded.

Thirty-two patients qualified for inclusion in the study and were analysed. Median age was 35 Years (range 8- 55 yrs.), majority being males (n=28; 87%) and most common cause of injury being RTIs (n=21; 65%) Hand injuries were the most common (n=25; 78%) (Table 1).

Table 1: Reconstruction in Trauma.

Parameters	N	% (Percentage)
Male	28	87.5
Female	4	12.5
Repair		
Tendon	21	65.6
Nerve	11	34.3
Vessels	5	15.6
Bone	10	31.2
Level of Injury		
Phalanx	16	50
Palm	1	3.12
Wrist and forearm	5	15.6
Foot and toes	2	6.2
Intervention		
STSG	7	18.7
FTSG	2	6.2
K-wire	15	47.8
Nailing	2	6.2
Plating	1	3.1
Male	Male	Male
Types		
Spaghetti wrist repair	3	9.3
Replantation	1	3.1
Reattachments	3	9.3

Functional outcome

Reimplantation done at MCP joint level in a case of multi-digit amputation failed due to venous failure. All reattachments (3 at MCP level, 2 PIP level) survived and continue to be in follow up for rehabilitation **(Figures 2)**. One patient who underwent tendo-achilles repair got readmitted after 7 days with wound (skin) dehiscence; patient had comorbid factors (diabetes, scleroderma) contributing to poor wound healing. Bony union in a case of ulnar fracture managed with TENS nail (1) was suboptimal (gap) and continues in follow up; fracture healing in patient of machine injury with spaghetti wrist and ulnar fracture managed with plating (1) was optimum **(Figure 3)**. K-wiring was done in 5 digits with satisfactory bony union **(Figure 1)**. Four patients of nerve repair (57.1%) were lost to follow up. One patient with median and ulnar nerve repair in spaghetti wrist gained near complete function in both at 1 year of follow up **(Figure 4)**. Another patient had complete recovery of median and partial recovery of ulnar nerve at 8 months follow up.

Figure 1 (A) crush injury right foot, (B) immediate post-op with K-wiring, (C) after 2month of follow-up.

Figure 2 (A) Near total amputation of thumb (B) immediate post-op (C) after 28days follow-up.

Figure 3 (A) crush injury right lower limb following road traffic injuries,(B) after 7 days of admission with External fixator for femur fracture and debridement of devitalized tissue, (C) after 75 days follow up - healed wound following grafting.

Figure 4 (A) at presentation - crush injury, right upper limb (B) after 30 days follow-up.

Results and Discussion

Around the world, more than one billion people live with injury-related disabilities (extremity disability more relevant), more in developing countries and related to road accidents [5]. In India, trauma surgery and critical care is a new growing super speciality, dedicated for trauma patient, though long due [6]. Trauma emergency room is core workplace for trauma surgeons and provides all immediate care to trauma victims. In India, Trauma Surgery and Critical Care is a super speciality branch, means trauma residents already underwent their General Surgery rotatory posting to other super specialities like Neurosurgery, Plastic Surgery, Urology, Gastroenterological surgeries etc. over three years of period. As so far concerning reconstruction, they are adequately exposed to making decisions and performing general reconstructive procedures. In Emergency, most of the general reconstructive procedures are performed by Senior Residents, either by trauma surgery residents or by plastic surgery residents. In India, M.Ch. Burn and plastic surgery also recruits resident from Master in Otorhinolaryngology (ENT) [7]. Master of Surgery (MS) in ENT provides no exposure for limb reconstruction; they need to begin general reconstructive procedures in M.Ch. Residency [8] that's further increase learning curve for limb reconstruction surgery for plastic surgery Residents.

The curriculum of M.Ch. Trauma Surgery and Critical Care concerns it is based on a holistic approach to trauma [9]. Chest, abdomen and vascular trauma exclusively managed by trauma surgeons, other than this, general reconstructive procedures (tendon repair, nerve repair, split skin grafting), damage control orthopaedics (compartment syndrome, application of slab, wound debridement, external fixator, k-wire fixation), neurotrauma (emergency management burr hole, evacuation of EDH and decompressive craniectomy) maxillofacial trauma (intermaxillary fixation, interdental wiring) [10]. All trauma surgery, M.Ch. Residents get trained in the parent super specialty department for learning necessary damage control surgeries and decision making for emergency.

Most of the (62%) reconstructive procedures required bony fixation along with tendon repair in our study.(vis-à-vis above) Knowledge of orthopaedic intervention and reconstructive procedures among trauma surgeons allow them to do immediate trauma reconstruction in trauma victims with a favourable outcome. Since trauma residents are involved in the care of trauma patients, so they better understand for timing and duration of reconstruction procedure in critically ill patients that usually part of damage control surgery. According to Hopkins et al., 15 cases of tendon repair, 19 cases of an external fixator, 23 cases of operative fixation for ankle trauma are required to perform the independent procedure [11]. The learning curve for soft tissue reconstructions like tendon repair, K-wiring for phalangeal injuries for incomplete amputations is average between 20-25 cases to perform independent and related simple complications [11].

As in our study out of 32 cases, only one patient develops wound dehiscence, which was having associated co-morbidities, one patient has prolonged hospital stay for his large wound over the lower limb. Even in a developed country, emergency reconstructive procedures performed by emergency surgeons usually trained general surgeons [12].

Early general reconstructive procedures can be performed in local anaesthesia or regional blocks, occasionally requires general anaesthesia [13]. An early procedure not only associated with good surgical outcomes but also evacuates emergency room early, provides confidence and trust on doctors and hospital with the feeling of early and better treatment, also reduces the length of hospital stay.

There is a significant role of trauma surgeon at a Level 1 trauma centre in India. The trauma surgeon's interventions are life and Limb saving, many at times morbidity of post-traumatic sequelae are either prevented or treated. Other specialty also important for definitive management like Neurosurgeon, Orthopedicians, plastic surgeons play an integral role in a Level 1 trauma centre. The policymakers should take note to augment the number of trauma surgeons with other specialties, as the workload is heavy and is steadily on an increasing trend.

The need of trauma surgeon at a Level 1 trauma centre is undeniable. The holistic role of trauma surgeon in the multidisciplinary trauma management has been important for smooth functioning , Such studies help in training of residents of trauma surgery and other specialties for better understanding the concept of interdisciplinary management and delivery of quality healthcare to victims of trauma. In the context of upcoming expansion of Level 1 trauma centres and other designated trauma care facilities across the country, a study with this background may be useful for policymaking, planning and financing, the establishment of minimum standards for the performance of a trauma care system. The Level 1 trauma centre provide services for complex multisystem injuries including referral cases. Within the geographic area under its jurisdiction, the trauma centre is obliged to manage all the minor cases too. This additionally helps in trauma resident training to impart skills in managing all types of injuries.

Although all of the mentioned patients do not require a Level 1

trauma centre care in a strict sense, due to non-availability of trauma surgeons and trauma experts all trauma patients being referred to level 1 trauma centres. The trauma surgeon at a Level 1 trauma centre has to deal with all the injuries which come under the scope of the speciality for the above-mentioned reasons. Patients with polytrauma are usually associated with minor to major limb-threatening injuries which requires reconstruction surgeon's expertise. In reference to developing trauma centers across India, All India Institute of Medical Sciences started a MCh Program in view to handle acute trauma burden and provide definitive or damage control care according to the patient severity. Emergency reconstructive surgeries are important domain of trauma care, and better performed by a trained trauma surgeon or plastic surgeon (Not by untrained resident under rotation in plastic surgery) after getting proper training in reconstructive procedure, with reasonable good outcome.

Conclusion

There is a significant role of trauma surgeon at a Level 1 trauma centre in India. The trauma surgeon's are trained to save a life or limb in given period of time, as they are highly trained in life or limb saving skill e.g. intubation to tracheostomy, damage control thoraco-laparotomy to damage control vascular and orthopedic interventions and reconstructions surgeries without waiting for plastic or orthopaedic surgeons. Increasing trauma related mortality and morbidity, needs to grow trauma care facilities across the country. In developing countries like India trauma care facilities yet to be developed.

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