

Original Research Article

Management of patients with forearm and hand injuries

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Received: 03 April 2020

Accepted: 18 April 2020

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ABSTRACT

Background: Injuries to the hand and the forearm, particularly crush injuries have always been a major challenge to even the best of surgeons, whether it is a major case of a mangled hand by a high pressure injury or even a small case as an injury to the tip of the finger by getting squashed in a closing door. Any injuries in the forearm and the hand requires a very meticulous and thoughtful approach towards coverage with the aim of maximal restoration of function as well aesthetic appearance.

Methods: The study was conducted in the Department of Surgery, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, over the period of 12 months. Subjects were recruited from patients presenting in emergency/surgery OPD, HIMS, Dehradun with a primary diagnosis of soft tissue injuries in the forearm and the hand. A total of 114 patients were included in the study.

Results: 39.5% (45 patients) were treated with combined modalities, including debridement, grafting & flap coverage. 14.1% (16 patients) required some form of orthopaedics intervention. 21.1% (24 patients) needed neurovascular or tendon repair surgery. 37.7% (43 patients) faced some sort of early or late complications.

Conclusions: Proper assessment and management of complex injuries of hand and forearm is mandatory for a good functional and aesthetic outcome.

Keywords: Management, Hand and forearm injuries, Emergency

INTRODUCTION

The hand has been designed in such a way that it can withstand substantial wear and tear over years and also provide all the tactile input from the environment along with performing an array of intricate movements. The neurovascular and musculo-tendinous structures of the hand lie just beneath the skin owing the absence of ample fat and subcutaneous tissue as seen in other parts of the body. Therefore, any injuries in the forearm and the hand requires a very meticulous and thoughtful approach towards coverage with the aim maximal restoration of function as well aesthetic appearance.¹ Hand injuries are among the most frequent injuries, constituting between 6.6% and 28.6% of all injuries.² Injuries to the hand and the forearm, particularly crush injuries have always been

a major challenge to even the best of surgeons, whether it is a major case of a mangled hand by a high pressure injury or even a small case as an injury to the tip of the finger by getting squashed in a closing door. In view of the increasing incidence of hand and forearm injuries presenting to the emergency department and the need for management of these injuries in a specialized manner, quite a few high-end hand surgery centers have surfaced. These have the main aim to cater to the plethora of cases of hand injuries in a more efficient manner. However, even though such specialist hand trauma centers have come up, but still most of the hand injuries are dealt with by the plastic surgeons, general surgeons or orthopedic surgeons. This study was undertaken to evaluate the current status of management of hand and forearm

injuries in a tertiary level center situated in the foothills of the Himalayas.

METHODS

The study was conducted in the Department of Surgery, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, over the period of 12 months from December 2017 to 2018. Subjects were recruited from patients presenting in emergency/surgery OPD, HIMS, Dehradun with a primary diagnosis of soft tissue injuries in the forearm and the hand. A written informed consent was taken from all the patients. The study was undertaken after ethical clearance from the ethics committee.

Study design

This was an observational study

Sample size

Sample size was calculated keeping in mind the previous hospital records for such patients. However, all the patients who presented to the hospital emergency or OPD were included in the study if they met the inclusion criteria which amounted to 114 patients in this study.

Inclusion criteria

Inclusion criteria were patients of either sex and all age groups. All patients of soft tissue injuries in the hand and the forearm including burns. Patients with bony injuries in association with the soft tissue injuries.

Exclusion criteria

Exclusion criteria were patients with healed and chronic injuries including post burn contractures. Patients who did not give consent.

Study tools

Structured study instruments (formats/case recording form) developed, and used to generate data. Camera for capturing photographs.

Study protocol

A complete history of patients and detailed examination of patients was performed after obtaining the written informed consent of the patients. Management options were taken into view which included both systemic and local options available. Local options were assessed under wound care, any immobilization if needed, the different types of operative procedures underwent, any complications that occurred during and after the procedure. Post-operative care was analysed under headings like the any physiotherapy provided to the patient during the stay of the patient in the hospital in the

post-op period. The outcome of the treatment provided was analysed under headings like cosmetic outcome and functional outcome which was graded objectively. The patient was followed up in the post-operative period after discharge for a period of one month to look for the outcomes of the treatments done.

Interpretation and analysis of obtained results were carried out using software SPSS version 22 and MS Excel by application of descriptive methods (e.g., mean, proportion, ratio etc). Data thus collected was analyzed and presented in the form of tables/charts.

RESULTS

A total of 114 subjects with soft tissue injuries of the forearm and hand were included in the study. These patients were studied for the different options regarding management of such injuries and their outcomes were seen at the end of 6 weeks.

Most of the injuries were treated with combined modalities of treatment including debridement with flap and graft coverage. This amounted to 39.5% of the cases (45 subjects). Primary closure was done in 26.4% case (30 subjects). Primary flap and graft coverage alone were done in 11.4% (13 subjects) and 8.7% cases (10 subjects) respectively. 9 subjects (7.8%) underwent only amputations and 7 subjects were (6.2%) managed with debridements and dressings (Table 1).

Table 1: Distribution of patients based on surgical intervention (n=114).

Method	No. of wounds	Percentage (%)
Primary closure	30	26.4
SSG	10	8.7
Flap coverage	13	11.4
Debridement	7	6.2
Amputation	9	7.8
Combined	45	39.5
Total	114	100

Table 2: Distribution of patients based on need for orthopedic intervention (n=114).

Orthopaedic intervention	Number of subjects	Percentage (%)
Needed	16	14.1
Not needed	98	85.9
Total	114	100

In the study, it was observed that 16 (14.1%) of the 114 subjects required orthopedic intervention which included open reduction with internal fixation, external fixation and splintage (Table 2). Out of the 114 subjects in this study, 24 subjects (21.1%) had to undergo neurovascular

or tendon repair as part of the surgical intervention (Table 3).

Table 3: Distribution of patients based on need for neurovascular or tendon repair (n=114).

Neurovascular/tendon repair done	No of cases	Percentage (%)
Yes	24	21.1
No	90	78.9
Total	114	100

A total of 25 subjects (21.9%) required physiotherapy in the post-operative period for complete rehabilitation and return to functional use (Table 4).

Table 4: Distribution of patients based on need for post-operative physiotherapy (n=114).

Post-operative physiotherapy given	No of cases	Percentage (%)
Yes	25	21.9
No	89	78.1
Total	114	100

The reconstruction of hand and forearm injuries faced local complications in the form of partial SSG loss in 7 subjects (6.2%), marginal flap dehiscence or necrosis in 6 (5.2%), wound Infection in 12 (10.5%) and necrosis along suture line in 7 subjects (6.2%). Post-surgery contracture development was seen in 6 subjects (5.2%). Other complications which included residual weakness or flexion/extension deformities were seen in 5 subjects (4.4%) (Table 5).

Table 5: Distribution of patients based on complications of reconstructions (n=43).

Complication	Number of subjects	Percentage (%)
SSG loss	7	6.2
Flap dehiscence/necrosis	6	5.2
Wound infection	12	10.5
Necrosis	7	6.2
Contracture	6	5.2
Miscellaneous	5	4.4
Total	43	37.7

DISCUSSION

Most of the injuries in the present study were treated with combined modalities of treatment including debridement with local flaps and/or graft coverage. This amounted to 39.5% of the cases (45 patients). Primary closure was done in 26.4% case (30 patients). Primary flap coverage alone was done in 11.4% (13 patients). Only primary grafting was required in 8.7% cases (10 patients). 9 patients (7.8%) underwent only amputations and 7

patients were (6.2%) managed with debridement's and dressings alone. Most of the patients managed with dressings were burn patients. In a similar study carried out by Jagdev et al, out of 23 patients 6 underwent split thickness skin grafting, emergency flaps were done in 3 patients, while early flaps and delayed flaps were done in a total of 11 patients.³ Prasad R noted that in their study group 19.7% cases underwent primary closure, 6% reconstruction with local flaps, 11.8% underwent split thickness skin grafting and 17.8% underwent closure after shortening of the stump.⁴ In a similar study by Ravikumar et al, local flaps were used for reconstruction in 33.6% cases followed by primary suturing in 31.8% cases and split thickness skin grafting in 5.4% cases.⁵

Work done by Godina et al proved that with early radical debridement and coverage of the wounds within 72 hours of the injury, risk of infection, morbidity and healing times were all reduced significantly.⁶ In general, the choice for soft tissue coverage can be approached using the reconstructive ladder.⁷ Early coverage of the wound reduces pain and prevents infection thereby reducing the hospital stay and the number of surgical procedures performed. This further translates as early recovery and reduced costs to the society.⁸ Skin-only defects may be best addressed by the mobilization of a local flap or in combination with a split-thickness skin graft. Local flaps will be optimal, but this may be limited by the zone of injury. More extensive defects with greater exposure of underlying structures may require resurfacing and dead-space obliteration with pedicled or free flap options in the form of fasciocutaneous, muscle-only, or myocutaneous flaps.⁷

Of the 114 patients in this study, 24 patients (21.1%) had to undergo neurovascular or tendon repair as part of the surgical intervention. A total of 25 patients (21.9%) required physiotherapy in the post-operative period for complete rehabilitation and return to functional use.

In case of neurovascular, tendon or orthopedic repairs, the patients are required to have the surgical site immobilized via a cast or a splint to prevent undue traction on the area. Post-operative physiotherapy was given to the patients once the mobilization was started in order to enhance the recovery of function of the repaired nerve and to prevent the development of any contracture in the post-operative period.

The reconstruction of hand and forearm injuries may face local complications. Such complications were noted in the present study in the form of partial loss of split thickness skin graft in 7 patients (6.2%) and marginal flap dehiscence or necrosis in 6 patients (5.2%). Wound Infection was seen in 12 (10.5%) followed by necrosis along suture line in 7 patients (6.2%). Post-surgery contracture development was seen in 6 patients (5.2%). Other complications which included residual weakness or flexion/extension deformities were seen in 5 patients (4.4%). Jagdev et al found that the infection rate was

21.53%.³ Godina et al also documented infection rates at 17.5%.⁶ In a similar study by Ravikumar et al, infection rates were found to be 19.1% with necrosis present in 7.7% cases followed by flap necrosis in 1% and contracture or stiffness in 13.1% cases.⁵

CONCLUSION

Hand and forearm injuries range from isolated soft tissue injuries to those associated with bony and neurovascular involvement. Proper assessment and management in the form of combined modalities including debridement and reconstruction is the mainstay of management of such injuries.

ACKNOWLEDGEMENTS

Authors would like to thank Mr Deepak Kumar for technical help during the study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Bisht B, Rajan M, Dvivedi S, Rawat KAV, Konda S. Management of patients with forearm and hand injuries. Int Surg J 2020;7:1593-6.