International Journal of Advances in Medicine
Ray M. Int J Adv Med. 2022 Mar;9(3):350-352
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: https://dx.doi.org/10.18203/2349-3933.ijam20220440

Case Report

Emerging role of physiotherapy in management of crush injury over forearm

Mansi Ray*

Department of Physiotherapy, Shree Swaminarayan Physiotherapy College, Kadodara, Surat, Gujarat, India

Received: 17 January 2022
Accepted: 02 February 2022

***Correspondence:**
Dr. Mansi Ray,
E-mail: mansiray93@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

The objective of the case report is to discuss the case of a patient with crush injury over right forearm. A 37 years old male came with complain of pain, swelling, restricted range over affected side, muscle weakness over right forearm, wrist and hand, reduced grip strength on right hand, and difficulties in ADL'S over right-hand following crush injury over right forearm. Treatment involved physical therapy and Electro modalities for the elimination of pain and returning the patient's full range of motion in the wrist and hand. After range of motion was restored, a home exercise program was initiated. The home exercise program included a return to ADLs and occupational related activity and active, resistive, gripping activities of the hand. After 11/2 month follow up, our patient showed dramatic recovery after appropriate Surgical and physiotherapy management. Physiotherapy plays significant role in the elimination of pain, improving range; muscle strength and hand function and also reduces the risk of stiffness, contracture and deformity in crush injuries.

Keywords: ADL, Crush injury, Physical therapy, Exercises

INTRODUCTION

Crush injuries to the forearm and hand are devastating phenomenon with poor outcomes.[1,2] A compressive force, usually caused by a motor vehicle and industrial accident. Crushes and transiently increases the pressures within the hand and leads compartment syndrome.

That causing damage to bones, blood vessels, nerves, and soft tissues.[3] These injuries can lead to compartment syndrome, vascular damage, infection, neurological injury, and tissue necrosis.[4]

Crush injuries with skin disruption can be challenging to accurately diagnose and manage. This case- report provides initial evaluation of forearm crush injuries as well as short- and long-term physiotherapy management strategies.

CASE REPORT

A 37 years old male had history of crush injury over right forearm because of the gas cylinder blast in 2021. At that time; his forearm was managed by multiple surgeries. Wound debridement and multiple flexors and extensor tendon repair, open reduction internal fixation with nailing / K-wire and skin grafting were done over affected forearm. After that, his arm was immobilised for 2 months. After completing immobilization phase, Physiotherapy reference was given.

He came for hand rehabilitation in our institute. At that time, he had complained of pain, swelling, restricted range over affected side, muscle weakness over right forearm, wrist and hand, reduced grip strength on right hand, and difficulties in ADL'S over right-hand following crush injury over right forearm.

Our musculoskeletal assessment revealed dull aching pain noted during right hand movement. Swelling was present over dorsal surface of forearm. Scar was present over right dorsal aspect of forearm which was healed. ROM examination revealed grossly restricted range of motion over right wrist and hand. The power in the muscle of hand, wrist and forearm on right side was grade 3 at available ROM. Grip strength of right hand was 4.6 kg and 23 kg over left hand.

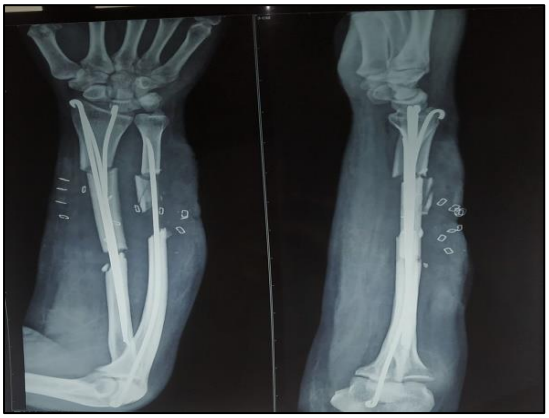

Figure 1: Post-operative.

Figure 2: Skin graft over dorsal surface.

Baseline neurological testing, dermatomes, SD curve and Deep tendon reflexes were performed and provided no helpful diagnostic information. Dermatomes were equal bilaterally and circumferential sensory testing was unable to determine any nerve root involvement. Lastly, reflexes were normal. In order to determine functioning skill level, "Sollerman Hand Function" Test was taken. The eight normal grip patterns can be divided into total 20 subtests, each involving hand ADL task. Each subtest is scored on a scale of 0-4 points. The total score of this test is 80. The patient got 40 scoring out of 80 at beginning of physiotherapy programme.

Physiotherapy management

Taking into account the most frequent manifestations, the goals of physiotherapy interventions include reduce pain, swelling, increasing of ROM, muscular strength and facilitation of hand function and hand grips and prevent contracture and deformity. The objective of physical therapy is to preserve and recover the patient's autonomy, reduce dependence and improve quality of life. The exercise programme is described in table 1.

Table 1: Physiotherapy exercise programme.

Aim	Physiotherapy protocol
Reduce pain	Cryothaerpy (10-15 mins after exercises)
Reduce swelling, to maintain muscle property	Cryotherapy electrical stimulation to hand muscles: Inter galvanic current (60 contractions) Dorsal interossei Abductor pollicis brevis Surged faradic current (30 contractions) Thenar muscles Hypothenar muscles Lumbricals
Increase range of motion	Active assisted exercise of right forearm, wrist and hand: (15 repetitions) Stretching to wrist flexors and extensors (3 repetitions with 30 sec hold) Tendon gliding exercise
Improve muscle strength	Strengthening exercise to right forearm, wrist and hand muscles: (10 repetitions) With dumbbells, Wight cuff, Therabands, Theratubes, Supination pronation with wrist roller
Improve hand grip strength	Grip strengthening exercise: (10 repetitions) Smiley ball Spring Various hand unit equipment Peg board activity Intrinsic muscle strengthening
Scar management	Deep fiction massage
To prevent contracture	Patient education Home exercise programe Positioning Splinting

All exercises were started with few repetitions and they were progressed gradually according to patient's ability to perform. Exercises were progressed gradually according to X- ray findings. Physiotherapeutic exercises were given 40 min/day, 6 days a week for 11/2 month. After 11/2 month of follow up, dull aching pain and swelling were subsiding. Patient showed good improvement in ROM and muscle strength as well as in grip strength. Patient showed good improvement in ADLs also. After range of motion was restored, a home exercise program was initiated. The home exercise program included a return to ADLs and

occupational related activity and active, resistive, gripping activities of the hand. However the patient was satisfied with the outcome of the operation and physiotherapy treatment and was able to use his hand with a reasonable strength for the daily activities.

DISCUSSION

Early involvement of a hand rehabilitation by physiotherapist will minimize posttraumatic contractures following crush injuries.[5] Physiotherapy interventions include patient education and exercises like passive, active-assisted, and active range of motion exercises, as well as customizing an intrinsic-plus splint.[6] Immediately after injury, the hand assumes an intrinsic-minus position for prolong time can lead to edema over the dorsum of the hand in the loose subcutaneous and sub tendinous space.[6,7] If the hand is allowed to stay in this suboptimal position for longer time, the joints become stiffen and also causes interstitial adhesions.[7]

CONCLUSION

Physiotherapy plays significant role in the elimination of pain, improving range; muscle strength and hand function and also reduces the risk of stiffness, contracture and deformity in crush injuries.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Del Piñal F, Herrero F, Jado E, García-Bernal FJ, Cerezal L. Acute hand compartment syndromes after closed crush: a reappraisal. Plast Reconstr Surg. 2002;110(5):1232-9.
2. Choueka J, Scott SC. Intrinsic contractures of the thumb. Hand Clin. 2012;28(1):67-80.
3. Graham TJ. The exploded hand syndrome: logical evaluation and comprehensive treatment of the severely crushed hand. J Hand SurAm. 2006;31(6):1012-23.
4. Friedrich JB, Vedder NB. Mangled upper extremity. In: Wolfe S,Pederson W, Hotchkiss R, Kozin S, Cohen M, eds. Green's Operative Hand Surgery. 7th ed. Philadelphia, PA: Elsevier Health Sciences; 2017;1486-527.
5. Oak NR, Abrams RA. Compartment syndrome of the hand. Orthop Clin North Am. 2016;47(3):609-16.
6. Dorf E, Blue C, Smith BP, Koman LA. Therapy after injury to the hand. J Am Acad Orthop Surg. 2010;18(8):464-73.
7. Tajima T. Treatment of post-traumatic contracture of the hand. J Hand Surg Br. 1988;13(2):118-29.

Cite this article as: Ray M. Emerging role of physiotherapy in management of crush injury over forearm. Int J Adv Med 2022;9:350-2.