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ORIGINAL ARTICLE

FREQUENCY, DISTRIBUTION AND TREATMENT OF ACUTE FLEXOR TENDON INJURIES IN ZONE V OF HAND

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ABSTRACT

Background: Flexor tendons injuries are common emergency procedures The objectives of this study were to determine the frequency, distribution and results of treatment of acute flexor tendon injuries in zone V of hand in our population.

Material and Methods: This descriptive cross-sectional was conducted in the Department of Orthopedic, Gomal Medical College, D.I.Khan, Pakistan from January 2015 to December 2017. Sample size was 30, selected through consecutive technique. Patients having flexor tendon injuries in zone v, admitted through emergency department were included in this study. Demographic variable were sex and age-groups. The research variable were tendon involved, nerves involved, artery involved, mechanism of injury, wound size, duration of injury, season, type of injury, hand involved and results of treatment. All variables, being categorical were analyzed by frequency and percentages using SPSS version 16.0.

Results: Out of 30 patients, 22(73.33%) were male. Twenty four (80%) patients were between 21 to 40 years age. Mechanism of injury was glass in 16(53.33%) cases, knife in 10(33.33%) cases. Twenty (66.66%) cases presented in summer. Flexor digitorum sublimus was injured in 21(70.0%), FCR in 11(36.66%), FPL in 8(26.66), FDP in 6(20.0%) and FCU in 4(13.33%) cases. Median nerve was involved in nine (30%) cases. Radial artery was involved in eight (26.66%) cases. Wound size was 2 cm in 24(80%) cases. Sixteen (53.33 %) cases came with self-inflicted injuries. Twenty (66.66 %) cases came after 12 hours. Twenty five (83.33%) patients achieved good to excellent results.

Conclusion: Flexor digitorus sublimus was the most common tendon injured in non-dominant hand, especially in young males. Median nerve and radial artery were commonly injured structures mostly with glass. Majority patients presented more than 12 hours after injury, having wound size of 2cm. Mostly the injuries were self-inflicted and occurred in summer season.

KEY WORDS: Flexor tendon; Self-inflicted injury; Zone V injuries; Radial artery; Median nerve.

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INTRODUCTION

Flexor tendon injuries are very common and constitute a considerable workload on medical professionals.[1] Therefore basic knowledge of anatomy and physiology is essential for treating surgeon.[2] There are three phases of tendon repair; early inflammatory, intermediate active repair and late remodeling phase. The important compounds that take part in tendon repair are; type 1 collagen, fibronectin and integrin. These injuries are divided in five zones on anatomic bases. Zone 5 extends from the musculotendinous junction to the proximal aspect of carpal tunnel.[3] Zone 5 injuries are simple to treat but sometimes the treating surgeon underestimates the small wound size and hence treatment delayed. The flexor compartment includes two main nerves & arteries and twelve tendons, and all structures should be repaired. At the level of midforearm the flexor digitorum sublimus (FDS) tendons to middle and long finger are superficial to that of little and index finger. The flexor digitorum profundus (FDP) and flexor pollicis longus (FPL), Flexor carpi ulnaris (FCU) and Flexor carpi radialis (FCR) tendons lie adjacent to each other in the deepest layer of volar aspect of forearm.

Normal range of motion of finger and thumb is the goal of tendon repair. Various techniques for tendon repair and suture materials for that are available in literature; each having its own pros and cons. Anyhow multistrand or at least four strand suture techniques is universal.[4] Epitendinous suture also add strength to

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the repair site. In order to ensure adequate strength, some surgeons are performing tendon repair under local anesthesia and the patient is awake during surgery for tendon repair testing.[5] Proper post op immobilization and rehabilitation protocols are crucial for optimal results. The only long term strategy to improve outcome is early active mobilization.[1,6]

The mechanism and extent of flexor tendon injuries varies in different patients. Usually sharp injuries like glass, knife and blade of various machines are involved. The size, extent, depth and nature of the wound are one of the important factors in determining results of tendon repair. Clean, sharp and superficial wound involving only tendons without neurovascular involvement, if properly treated give excellent results. Self-inflicted injuries usually fulfill these criteria. Extreme seasons may contribute to increase incidence of these injuries due to unknown reasons. There are some factors which have negative effects on tendon repair like increasing age, heavy smoking, extensive soft tissue damage, concomitant skeletal & neurovascular injury, delay in performing surgery and using 2 strand Kessler repair.[7] There are various methods to assess the results of flexor tendon repair, but we used Buck-Gramcko criteria to compile our results.[8] The function of the hand is essential in daily routine life and for that normal integrity of bones, joints, tendons and neurovascular structures is required.[9] The treating surgeon should be familiar with anatomy of all these structures in order to ovoid stitching a nerve with a tendon. The results of tendon repair depend on many factors like nature of injury, technique of sutures, surgeon's experience and post-operative protocol.[10]

For better results proper suturing techniques and post op rehabilitation is necessary.[11-13] The position of post-surgical splint is also crucial. The dorsal splint is applied with wrist in 30 degree flexion, MP joint in 30-60 degree flexion and IP joints in extension. Early mobilization also improves tendon healing and sometimes at 5 postoperative day the active and passive movements are started. The concerned hand physiotherapist should be properly instructed about the protocol and per operative suturing techniques.[14] The objectives of this study were to determine the frequency, distribution and results of treatment of acute flexor tendon injuries of hand in our population.

MATERIAL AND METHODS

This descriptive cross-sectional was conducted in the Department of Orthopedic, Gomal Medical College, D.I.KHAN, Pakistan from January 2015 to December 2017. Sample size was 30, selected through consecutive technique. Patients having flexor tendon injuries, admitted through emergency department were included in this study. Medically unfit patients, old and complex injuries were excluded. Data collections site was DHQ Teaching Hospital, D.I.Khan. Detailed history and thorough examination were done. Approval from hospital ethical committee was taken for this study and an informed consent was taken from all patients at the start of study.

Necessary investigations were done and all patients were operated accordingly to the patient's need. General anesthesia and pneumatic tourniquet were used in all cases. Modified Kessler technique using 4-0 prolene and augmented with 6-0 Epitendinous continuous suture was done in all cases. Associated vascular injuries were dealt according to the time since injury and status of the other artery. Median and ulnar nerve injuries were repaired with 7-0 prolene with the help of 2+ optical loupes. Long arm dorsal splint was applied with wrist and metacarpophalageal joints in 40 and 30 degree flexion respectively, while fingers were held in extension. Passive flexion and active extension were encouraged in the splint on first postoperative day. Stiches were removed at 2 weeks, while splint was discontinued at 4th week and at that time patients were referred to hand physical therapist. The patients were then followed up at 1, 3, 6, 9 and 12 months. The results were compiled according to Buck- Gramcko score.

Demographic variable were sex and age-groups (<20, 21-40, >41 years). The research variable were tendon involved (FDS, FCR, FPL, FCU, FDP), nerves involved (median, ulnar, nil), artery involved (radial, ulnar, nil), mechanism of injury (glass, knife, machine), wound size in cm (upto 2, >2), duration between injury and presentation in hours (<12, ≥12), season of presentation (summer, winter), type of injury (self-inflicted, other), hand involved (non-dominant , dominant) and results of treatment (excellent, good, fair, poor). All variables, being categorical were analyzed by frequency and percentages using SPSS version 16.0.

RESULTS

Out of 30 patients having flexor tendon injuries of hand, 22 (73.33%) were male and eight (26.66%) were female. Twenty four (80%) patients were between 21 to 40 years, four (13.33%) from 0-20 year and two (6.66%) from 41-60 years of age. Figure 1

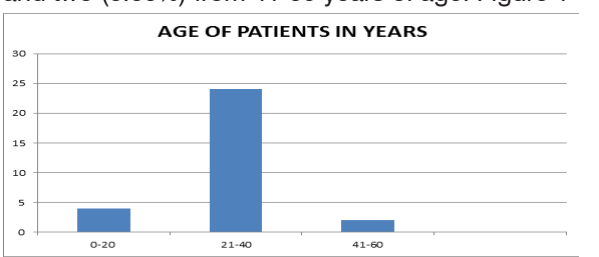

Figure 1 Age groups of patients with acute flexor tendon injuries in zone V of hand in D.I.Khan, Pakistan (n=30).

Mechanism of injury was glass in 16 (53.33%) cases, knife in 10 (33.33%) cases and machine in four (13.33%) cases. Figure 2

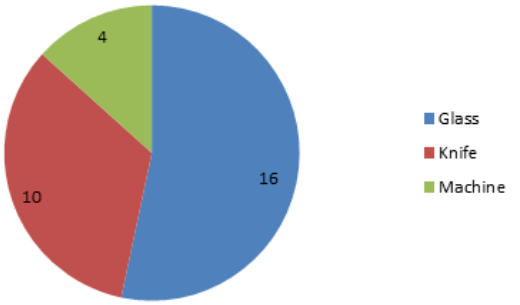

Figure 2: Mechanism of injury in patients with acute flexor tendon injuries in zone V of hand in D.I.Khan, Pakistan (n=30).

Twenty (66.66%) cases presented in summer whereas six (33.33%) in winter. Figure 3

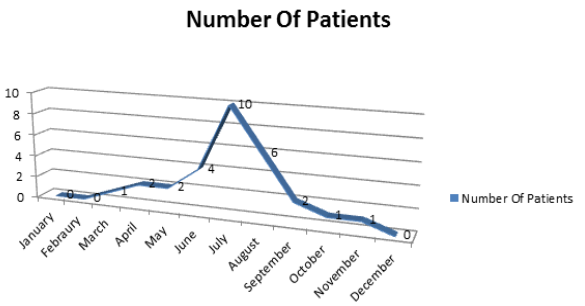

Figure 3: Season of presentation of patients with acute flexor tendon injuries in zone V of hand in D.I.Khan, Pakistan (n=30).

Frequency of tendons involved shown in Table 1.

Table 1: Frequency of tendons in zone V of hand involved

Numbers of tendons involved	Number of patients
One	14
Two	10
Three	4
Four	2

FDS was injured in 21 (70.0%), FCR in 11 (36.66%), FPL in 8 (26.66), FDP in 6 (20.0%) and FCU in 4 (13.33%) cases. Median nerve was involved in nine (30%) cases, ulnar in six (20%) cases and no nerve in 15 (50%) cases. Radial artery was involved in eight (26.66%) cases, ulnar in six (20%) and nil in 16 (53.33%) cases. Wound size was 2 cm in 24 (80%) cases and >2 cm in six (20%) cases. Sixteen (53.33 %) cases came with self-inflicted injuries and 14 (46.66%) due to other reasons. All (100%) of self inflicted injuries were on non-dominant side. Only 10 (33.33%) patients came within 12 hours of injury and 20 (66.66 %) came after 12 hours. Twenty five (83.33%) patients achieved good to excellent results of treatment, fair results occurred in three (10.0%) patients while poor results in only two (6.66%) patients. Table 2

DISCUSSION

Among the two poor results, one patient was having ulnar nerve injuries which couldn't recover even in 12 months of follow-up, and treated accordingly. The second patient was 54 years old diabetic patient with poor control of sugar level and later on infection occurred, for which multiple debridements required. In study by Hudson et al., 15 out 76 patients resulted in poor results due to sepsis, noncompliance on patient side and associated neurovascular injuries.[15] Despite many surgical techniques and appropriate program of rehabilitation, tendon adhesions and loss of hand function is a major problem in flexor tendon injuries.[16-18] In three patients we performed tenolysis and hence the results became better in all of them. Rigo et al report in his article 13 % reoperation rate in his patients due to rupture, adhesion and contractures.[7]

The dexterity of the hand in different social, psychological and professional activities exposes it to a multitude of dangers social as well as occupational.[7,8] That is why hand injuries are usually seen in young working class. In literature most of the research is on zone 2 tendon repair and very few articles are related to our study. In Cigdem study 5 out of 18 patients were of suicidal nature with glass, but seasonal effect was not mentioned in that study.[9] Also in Mehdi's study 25 out 42 patients were due to glass injury in zone 5.[3] Gretchen et al mentioned in his study that there is 1.3 % ratio of self-inflicted injuries in adolescents presented to an emergency department and in females 4.8 % are due to cut or pierce.[19] Chou also correlates a depressive disorder

Table 2: Results of treatment of patients with acute flexor tendon injuries in zone V of hand in D.I.Khan, Pakistan (n=30).

S.No	Results	Number of patients	Percentages
1.	Excellent	15	50.0
2.	Good	10	33.3
3.	Fair	03	10.0
4.	Poor	02	06.7
	Total	30	100 %

in 23 years old female patient having self-inflicted injuries on her volar and dorsal aspect of forearm.[20]

CONCLUSIONS

Flexor digitorus sublimus was the most common tendon injured in non-dominant hand, especially in young males. Median nerve and radial artery were commonly injured structures mostly with glass. Majority patients presented more than 12 hours after injury, having wound size of 2cm. Mostly the injuries were self-inflicted and occurred in summer season.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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