Original Research Article

Spectrum of hand injuries and their management at a tertiary care hospital using the hand injury scoring system

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ABSTRACT

Background: Hand injuries are a major health problem all around the world; both in developing as well as developed countries. There are various causes of hand injuries which include occupational injuries, leisure activities, road traffic accidents, falls and other domestic injuries. The aim of the present study was to create a database of hand injury patterns in PIMS for assessing and scoring the severity of hand injury.

Methods: This was a descriptive study that analyzed 442 hand injuries that presented to the department of emergency services and the out-patient departments of plastic and general surgery in the PIMS, Puducherry, India. The demographics of the hand injuries have been analyzed and studied. Scoring of the hand injuries has been done by the hand injury severity scoring system (HISS). The management that was carried out for these patients has been documented and recorded.

Results: A total 442 patients were included in the study. Among them 379 (85.75%) cases were male and 63 (14.25%) patients were female. Female subjects were more commonly affected in two age groups (1-15, 45-60). The distribution of the nature and etiology of injuries in both genders was similar, Occupational and crush injuries being the dominant mode of injury in both genders. 237 (53.6%) patients sustained injuries to their dominant hand, while 205 (46.4%) sustained injuries to their non-dominant hand. 31.09% of dominant hand injuries were found to be mild in severity. 28.43% of non-dominant hand injuries were found to be major in severity. There was an even distribution of injuries between severity scores among all the patients. The duration of hospital stay was increased with severity of hand injury. 221 (50%) patients followed up for less than one month following their hand injuries whereas 69 (15.61%) cases were lost to follow up. Among the followed up patients, 126 (74.12%) subjects said they were normal at follow up and 44 (25.88%) said they had some residual impairment following their hand injuries. Of them, daily activities of 33 patients were affected depending upon the severity of injury. 409 (92.53%) patients required some form of surgical treatment, whereas 33 (7.47%) patients required only conservative treatment for their hand injuries.

Conclusions: HISS presented to be the important system for assigning the patients according to the score, in directing the patients to the precise management and seems to be popular for excellent functional outcome.

Keywords: Hand injury, Handinjury severity scoring system, Management protocols

INTRODUCTION

Hand injuries form a substantial part of the workload of all accident and emergency departments and have a serious economic impact because they can significantly

affect the ability to carry out useful employment.¹ After forearm fractures, fractures in the hand are the second most common fracture, accounting for up to 20% of all fractures.² The objective assessment of hand injuries is a complex and challenging subject. However, the potential

benefits of an objective assessment and scoring system can be manifold, varying from explanation of prognosis to a patient to comparing the results of two different treatment methods.³

The hand injury severity score (HISS) is a score devised by Campbell and Kay and is a score specific for hand injuries distal to the carpal bones.¹ It can evaluate all the severities of the injuries and provides appropriate weightage to the different rays and surfaces of the hand as per their functional importance.³

The present study exclusively relates with hand injuries distal to the carpal bones. The injuries vary in type and severity with respect to the tissue damage involved. The purpose of this study was to create a database of hand injury patterns in PIMS for assessing and scoring the severity of hand injury there by facilitating in proper utilization of services, prompt and cost-effective treatment to the patients and to avoid unnecessary delay in treatment.

METHODS

This was a descriptive study conducted during the period of December 2006 to November 2011 for 5 years on the hand injuries at PIMS, Puducherry, India. 442 patients who presented to the department of emergency services and out-patient department with hand injuries were included. Exclusion criteria were patients who were severely ill and were admitted under other departments, comatose patients, patients in severe sepsis, suffering from multi-organ failure, who died before any intervention was possible, who were not assessed by the general/plastic surgery teams because they left prior to assessment, patients with any proximal injuries in the same limb.

The severity of injury was rated and scored according to the hand injury severity score (HISS) system. Demographics and factors contributing to the hand injuries were analyzed. The management that was carried out for these patients has been documented and recorded. Patients included in the study were sent postcards with self-addressed reply cards or were contacted on phone whenever possible, for follow up information.

Figure 1 was the schematic representation of HISS by Campbell and Kay.¹ The scoring system is divided into 4 broad aspects – Integument, Skeleton, Motor and Neural. Each digit has a weightage factor. The final score is attained after totaling the sum of all individual scores and multiplying the appropriate weightage factors.

Statistical analyses

Data were entered and analyzed using SPSS version 16. Descriptive statistics were recorded. Percentages and diagrammatic presentation of the findings of the study have been done.

Figure 1: Methods for assessing HISS.

RESULTS

Table 1 describes demographic characteristics and Table 2 presents injury related aspects of the study. A total 442 patients were included in the study. Among them 379 (85.75%) cases were male and 63 (14.25%) patients were female. 333 (75.34%) patients' injuries were related with legal cases, while 109 (24.66%) cases were not medico legal cases. In our study 209 (47.29%) patients were in the age group of 16-30 years. 12 (2.71%) patients gave history of alcohol intake prior to their hand injuries or were found to be intoxicated at the time of examination. Right handed injuries were seen in 433 (97.96%) cases, while 9 (2.04%) cases were left handed injuries. 237 (53.6%) patients sustained injuries to their dominant hand, while 205 (46.4%) sustained injuries to their non-dominant hand. 31.09% of dominant hand injuries were found to be mild in severity. 28.43% of non-dominant hand injuries were found to be major in severity. In this study, occupational related hand injuries were reported in both dominant and non-dominant hands. The p-value for this etiology was found to be highly statistically significant ($\chi^2 = 30.348$, $p < 0.001$). 234 (52.94%) patients required one admission to the hospital. 112 (25.34%) patients did not require admission and were treated on an out-patient basis or they left against medical advice. 35 patients required more than one admission in the hospital. Of them, 30 required 2 admissions and 5 required 3 admissions. It was observed that there was an even distribution of injuries between severity scores. 36 (8.14%) patients left against medical advice, while 406 (91.86%) did not leave against medical advice. 170 (38.46%) patients were asked for follow up in this study. 221 (50%) patients followed up for less than one month following their hand injuries whereas 69 (15.61%) cases were lost to follow up. Over half of the patients required hospital stay for the first week and 93 (21.04%) patients did not require hospital stay. 409 (92.53%) patients required some form of surgical treatment, whereas 33 (7.47%) patients required only conservative treatment for their hand injuries.

Table 1: Demographic characteristics.

Characteristics	No. of patients (%)
Age (years)	
1 - 15	68 (15.38%)
16 - 30	209 (47.29%)
31 - 45	107 (24.21%)
45 - 60	53 (11.99%)
61 and above	5 (1.13%)
Gender	
Female	63 (14.25%)
Male	379 (85.75%)

Table 2: Assessment and management of cases of hand injury.

Characteristics	No. of patients (%)
Medico legal case	
Yes	333 (75.34%)
No	109 (24.66%)
Alcohol intake	
Yes	12 (2.71%)
No	430 (97.29%)
Dominant hand among patients	
Left	9 (2.04%)
Right	433 (97.96%)
Injury to dominant versus non-dominant hand	
Dominant	237 (53.6%)
Non-dominant	205 (46.4%)
Severity of hand injury in dominant hand	
Mild	74 (31.09%)
Moderate	54 (22.69%)
Severe	52 (21.85%)
Major	58 (24.37%)
Severity of hand injury in non-dominant hand	
Mild	53(25.98%)
Moderate	39 (19.12%)
Severe	54 (26.47%)
Major	58 (28.43%)
Etiology of dominant hand injuries	
Occupational injuries	102 (43%)
Fall	15 (6.3%)
Road traffic accidents	47 (19.8%)
Fire cracker injuries	15 (6.30%)
Knife	6 (2.5%)
Glass	9 (3.8%)
Others	43 (18.1%)
Etiology of non-dominant hand injuries	
Occupational injuries	97 (47.3%)
Fall	8 (3.9%)
Road traffic accidents	25 (12.2%)
Fire cracker injuries	9 (4.4%)
Knife	32 (15.6%)
Glass	4 (2%)

Others	30 (14.6%)
Number of admissions in the hospital	
0	112 (25.34%)
1	234 (52.94%)
2	30 (6.79%)
3	5 (1.13%)
Information not available	61 (13.8%)
Severity scores	
< 20	122 (27.60%)
21 - 50	95 (21.49%)
51 - 100	106 (23.98%)
>100	119 (26.93%)
Leaving against medical advice	
Yes	36 (8.14%)
No	406 (91.86%)
Follow-up for patients	
Yes	170 (38.46%)
No	272 (61.54%)
Follow-up in months	
0	69 (15.61%)
< 1	221 (50%)
1 - 3	109 (24.66%)
> 3	43 (9.73%)
Duration of hospital stay (in days)	
< 1	93 (21.04%)
1 - 7	248 (56.11%)
8 - 14	70 (15.84%)
15 - 21	14 (3.17%)
22 - 28	12 (2.71%)
29 - 35	2 (0.45%)
> 36	3 (0.68%)
Management	
Conservative	33 (7.47%)
Surgical	409 (92.53%)

Table 3 demonstrates distribution of age, nature and etiology of injury according to gender. Female subjects were more commonly affected in two age groups. In the 1-15 age groups, 21.54% of females were affected as compared to only 14.32% of males for the same group. In the 45-60 age groups, 15.38% of female patients were affected as compared to only 11.41% of their male counterparts. The distribution of the nature and etiology of injuries in both genders was similar, occupational crush injuries being the dominant cause and mode of injury in both genders.

Table 4 represents hospital stay of the patients according to severity of injury. The duration of hospital stay was increased with severity of hand injury. This was found to be statistically significant. 71 (28.63%) patients with mild hand injuries stayed in hospital within the first week following their injuries. Patients staying in hospital for more than 28 days belonged to the 'severe' and 'major' groups.

Among the followed up patients, 126 (74.12%) subjects said they were normal at follow up and 44 (25.88%) said they had some residual impairment following their hand

injuries as given in Table 5. Of them, daily activities of 33 patients were affected depending upon the severity of injury as shown in Table 6.

Table 3: Distribution of gender according to nature and etiology of injury.

	No. of female (%)	No. of male (%)	Total	p-value
Nature of injury				
Cut	13 (20.63%)	67 (17.67%)	80 (18.09%)	$\chi^2 = 8.28$, df = 3, p = 0.0405
Crush	39 (61.90%)	256 (67.54%)	295 (66.74%)	
Puncture	6 (9.23%)	42 (11.14%)	48 (10.85%)	
Avulsion	7 (11.11%)	12 (3.17%)	19 (4.29%)	
Etiology of hand injuries				
Occupational injuries	22 (34.9%)	177 (46.7%)	199 (45%)	p < 0.001
Fall	4 (6.3%)	19 (5%)	23 (5.2%)	
Road traffic accidents	8 (12.7%)	64 (16.9%)	72 (16.3%)	
Fire cracker injuries	2 (3.20%)	22 (5.8%)	24 (5.4%)	
Knife	6 (9.50%)	32 (8.4%)	38 (8.6%)	
Glass	2 (3.20%)	11 (2.9%)	13 (2.9%)	
Others	19 (30.20%)	54 (14.2%)	73 (16.5%)	

Table 4: Hospital stay according to severity scores.

Severity scores	Hospital stay (in days)						Total (%)
	1 - 7	8 - 14	15 - 21	22 - 28	29 - 35	>36	
Mild	71 (28.63%)	7 (10.00%)	6 (42.86%)	1 (8.33%)	0 (0%)	0 (0%)	85 (24.36%)
Moderate	60 (24.19%)	13 (18.57%)	2 (14.29%)	1 (8.33%)	0 (0%)	0 (0%)	76 (21.78%)
Severe	62 (25.00%)	22 (31.43%)	0 (0%)	1 (8.33%)	1 (50.00%)	2 (66.67%)	88 (25.21%)
Major	55 (22.18%)	28 (40.00%)	6 (42.86%)	9 (75.00%)	1 (50.00%)	1 (33.33%)	100 (28.65%)
Total	248 (71.06%)	70 (20.06%)	14 (4.01%)	12 (3.44%)	2 (0.57%)	3 (0.86%)	349 (100.00%)

Yates' Chi-square value = 28.846; $df = 9$; p -value = 0.00068; ($p < 0.001$) highly Significant.

Table 5: Functional outcome.

Followed up patients	No. of patients(%)
Normal	126 (74.12%)
Impaired	44 (25.88%)
Total	170 (100.00%)

Table 6: Severity of injuries in patients with impaired function.

Activities of daily living affected	Severity of injury				Total percent
	Mild	Moderate	Severe	Major	
No	3 (27.27%)	0 (0%)	3 (27.27%)	5 (45.46%)	11 (25.00%)
Yes	5 (15.15%)	7 (21.21%)	10 (30.30%)	11 (33.33%)	33 (75.00%)
Total	8 (18.18%)	7 (15.91%)	13 (29.55%)	16 (36.36%)	44 (100.00%)

DISCUSSION

In our study, of 442 cases, 379 (85.75%) patients were male and 63 (14.25%) were female. This was consistent with most of the studies. Packer and Shaheen found that most of the fracture cases in their study were found to be males between the ages of 10 to 40 years.⁴ Hill et al

found that the male to female ratio of patients in their study was 2.2:1.5 Skov found that the incidence of occupational hand injuries in their study was found to be higher among men than women in all age groups below 60 years.⁶ Gupta et al in their study, found an expected male dominance in economically viable individuals of 21

to 30 years, which formed 50% of the patients of which 22.9% were laborers and students each.⁷

In this study, we found that among the total 442 patients, 209 (47.29%) were in the age group of 16-30 years. Trybus et al found the average age to be 37.0 years (± 15) in their study.⁸ Packer and Shaheen found that hand fractures in their study were most commonly found in the age group of 10 to 40 years.⁴ Sorock et al found that in their study, patients ranged in age from 18 to 77 years, with a mean of 37.2 years and approximately 75% were men.⁹ We also noted that in the 45-60 age group, 50% of females sustained domestic hand injuries. This could probably be due to the fact that in our Indian culture, a higher number of women in this age group are involved in domestic chores.

The present study reported that 12 (2.71%) patients had taken alcohol prior to their hand injuries or were intoxicated at the time of examination. Trybus et al documented that up to 26.7% of injuries occurred after alcohol consumption. This was significantly different to our results.⁸

Further, we found that 237 (53.6%) patients sustained injuries to their dominant hand, while 205 (46.4%) sustained injuries to their non-dominant hand. This was similar to the findings of another study. Gupta et al also found in their study that the majority of hand injuries were sustained in the dominant hand.⁷ We also studied the distribution of dominant and non-dominant hand injuries with respect to aetiology of hand injuries among patients. When assessing the severity of hand injury among dominant hand injuries in our study, it was found that 31.09% of the dominant hand injuries were found to be mild in severity. 28.43% of non-dominant hand injuries were found to be major in severity. These findings were found to be not significant.

Hung et al documented that in their study, crush injuries occurred in 37.8% of the patients.¹⁰ Bazroy et al also conducted a study in Puducherry, India in a glass bottle manufacturing plant. They found that the commonest types of injuries were cuts and lacerations (50.1%).¹¹ In this study we found that 66.74% of the total hand injuries were crush injuries and also the dominant mode of injury in both genders.

In our study, out of the total cases of 442, 234 (52.94%) required one admission to the hospital. 112 (25.34%) patients did not require admission and were treated on an out-patient basis or they left against medical advice. Larsen et al found in their study that only a small proportion of the victims were admitted into hospital. They went on to state that most of the injuries in their study were due to leisure activities and the severe injuries were due to occupational accidents.¹² This was clearly in sharp contrast to the findings in our study in which well over half of the patients required admission to hospital and most of the injuries were occupational injuries.

Hand injury severity scoring system (HISS) by Campbell and Kay has been found to be useful by various researchers.¹ HISS has been used in various studies in assessment of various aspects of consequences of hand injury such as return to work, post-traumatic stress disorder, functional outcome, workers compensation in industrial injuries, patterns of injuries and residual impairment. In all these studies, the scoring system correlated well with the proposed study results. In the present study, we found that of the total patients, 27.6% of the patients sustained mild injuries, 21.49% of the patients sustained moderate injuries, 23.98% of the patients sustained severe injuries and 26.93% of the patients sustained major injuries. From our findings, we could infer that the distribution of severity scores among our patients was not significant.

In this study, a total of 170 (38.46%) patients were followed up. Of the 44 impaired patients, all returned to pre-morbid employment, 33 patients said their activities of daily living were affected on follow up. Further, we went on to assess the initial severity scores of the impaired patients and found that among the 44 impaired patients, 19 (43.18%) had major injuries initially. We also assessed hospital stay according to severity scores. We found that 71 (28.63%) patients with mild injuries stayed in hospital within the first week following their injuries. Patients staying in hospital for more than 28 days belonged to the severe and major groups.

It is noted that the psychological impact of a visible injury is significantly higher than non-visible disability. Plastic surgery has a huge role in reducing the patient's psychological stress by correcting and improving the appearance of the injured hand wherever possible. However, this parameter was not included in our study. In our study, we found that 409 (92.53%) patients required some form of surgical treatment, whereas 33 (7.47%) patients required only conservative treatment for their hand injuries.

Improvement in health and safety practices and legislations have reduced the incidence of mangling hand injuries in developed countries, however in developing countries, such recommendations are often flaunted. In our study on analyzing the aetiology of hand injuries, we found that 199 (45%) patients sustained occupational hand injuries. These were the most common cause of hand injuries in our study. These were the most common cause of hand injuries in both male and female patients of our study. The pattern of hand injuries in the developed world differs from the pattern of hand injuries in the developing world. In developed countries, leisure activities and sports are the leading cause of hand injuries. In developing countries like India, the leading cause of hand injuries is by far occupational injuries.

Limitations of the study were most significant limitation of this study was the lack of proper and adequate follow up of the study subjects.

The other major drawback of the study was the presence of incomplete records in our Medical Records Department of our institution. Some files had been destroyed. Many files did not have adequate contact information in the form of the patients' addresses and telephone numbers.

CONCLUSION

HISS included in the present study was ascertained to be the important system for assigning the patients according to the score, in directing the patients to the correct management and seems to be successful in predicting functional outcome.

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