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Tendo−Achilles injury: An observational study in a tertiary care hospital

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ABSTRACT

Objective: To report demographic and injury characteristics of tendo-Achilles (TA) injury, and determine its association with the use of Indian style commode seat (ISCS), the clinical and functional outcomes.

Methods: This observational study was conducted between 1 January 2016 and 31 December 2019, and a total of 44 patients with TA injury were included in the study. Their demographic profile, etiology, operative details, and functional outcomes were studied. All patients underwent primary repair followed by standard postoperative management and follow-up for 6 months.

Results: Out of 44 patients, 7 (15.9%) sustained closed injuries while 37 (84.1%) sustained open injuries. In open injury cases, 30 (81%) patients suffered an injury due to slipping in ISCS, 4 (11%) from road traffic accidents, and 3 (8%) due to falling of a heavy object. Besides, 20.45% of cases of ISCS injury had associated neurovascular injury. Twenty (45%) patients took more than 90 days to start independent ambulation. At 6 months follow-up, no one could reach pre-injury fitness status.

Conclusions: Open TA injury by ISCS is an important, under-reported, and preventable cause of loss of physically active manpower in institutional setups.

KEYWORDS: Tendo-Achilles; Open injuries; Indian style commode; Preventable morbidity

1. Introduction

Tendo-Achilles (TA) is one of the strongest tendons in the human body, and an intact TA is essential for a normal gait. Injury to TA can be open or closed, and irrespective of type it has a profound effect on both the personal and professional lives of the affected individual. Closed TA injuries are generally documented in people of a sedentary lifestyle as compared to the open type[1]. Open TA injuries are not frequent though their incidences are on the rise[2]. Even after recovering from an injury, it is very difficult for these individuals to reach pre-injury physical activity levels[3]. This is vital in defense personnel who lead a highly active physical life.

A variety of mechanisms have been reported for open injuries, including cut injury by Indian style commode seat (ISCS) which

Significance

This study demonstrated that injury by Indian style commode seat is an important, under-reported, and preventable cause of tendo-Achilles injury. Even after standard treatment and physiotherapy sessions for months, not all cases can reach their pre-injury fitness status, which has financial implications and leads to avoidable attrition of manpower. Increasing the awareness amongst Indian style commode seat users along with its replacement with Western style commode seat are viable solution to decrease this preventable morbidity.

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has been described as one of the causes in few reports[4-6]. This prospective observational study aims to report demographic and injury characteristics of TA injury and its association with the use of ISCS, clinical and functional outcomes.

2. Patients and methods

2.1. Study design

This single-center observational study was conducted in a tertiary care hospital from 1 January 2016 to 31 December 2019.

2.2. Patients

A total of 46 patients with acute injuries around the ankle due to any activity or sports events were referred to the plastic surgery department during the period. Two patients were excluded from the study, of which one patient was lost to follow up and other found to have haematoma around ankle joint. Thus, the remaining 44 patients with open as well as closed TA injuries were included in this study. The diagnosis of TA injury was made on basis of history and standard clinical examination.

2.3. Ethical consideration

Informed consent was obtained from all patients, and this study was approved by the Ethical Committee of Command Hospital Kolkata (0039A dt 15 Nov 2017).

2.4. Treatment and follow-up

A standard treatment protocol was followed for all cases. For open injury cases, the wounds were irrigated with a copious amount of saline, and intravenous antibiotics were started. Both open and closed injury cases were given plaster of paris slab to keep the foot in plantar flexion attitude, and all were taken up for definitive surgery within the next 24 h. The surgery was performed in a prone position under spinal anesthesia. All open wounds were irrigated with a copious amount of saline and were debrided judiciously before tendon repair[7]. Primary repair was done with modified Kessler's core suture technique and epitenon sutures in all cases[7] (Supplementary Figure 1). Postoperatively, the ankle was immobilized in 20° plantar flexion position for 3 weeks and a neutral position for a further 3 weeks. At 6 weeks cast was removed and non-weight bearing ambulation was started. Full weight-bearing was encouraged after 8 weeks. All patients were assessed at 3 and 6 months for independent ambulation status, range of motion at ankle joint, motor power of repaired TA, and pain status.

2.5. Data collection

The data collected included patients' demographic and injuries characteristics, surgery details, and clinical and functional outcomes at 3 and 6 months postoperatively. Pain status will be assessed using Visual Analog Scale (VAS) score that was explained to the patient preoperatively (0=no pain and 10=worst possible pain)[8,9]. Motor power of repaired TA was assessed using 05 grade Medical Research Council (MRC) grade scale (0=no contraction and grade 5=normal power)[10].

2.6. End points

The primary outcome of this observational study was to report severity of TA injury cases caused by ISCS, and secondary outcome was to evaluate the outcome of surgical treatment of these injuries.

2.7. Statistical analysis

The statistical analysis was done using SPSS Version 2.0. Categorical variables were expressed as numbers and percentages and compared across the groups using Fisher's Exact Test. Continuous variables were expressed as mean and standard deviation and compared across the groups using Student's t-test and Analysis of Variance. The significant level of this study was set at α=0.05.

3. Results

A total of 44 patients reported TA injury during the study period, and the majority among these patients were young males. At 3 months, 29.5% of cases had MRC grade Ⅳ while at 6 months 68.2% had MRC grade Ⅳ. At 3 months, 72.7% of cases had a VAS score<2 while at 6 months 95.5% of cases had a score<2 (Table 1).

Out of 44 patients, 37 (84.1%) sustained open injuries. In 37 open injury cases, 30 (81.1%) gave a history of slipping of the foot into ISCS, 4 (10.8%) had road traffic accidents, and 3 (8.1%) were injured by a fall of the heavy object. Among 7 closed injury cases, 4 (57%) sustained an injury when playing sports; while the rest 3 (43%) got injured due to stumbling when running. Thirty patients (68.2%) presented within 48 h after injury, and 6 cases (13.6%) had pre-existing co-morbidities, out of which 4 had diabetes mellitus and 2 had hypertensive.

Out of 35 cases of the complete cut of the TA, 27 (77%) showed a history of injury from ISCS, and the difference in severity among 5 modes were significant (P=0.001). Out of 44 cases, 20 (45.4%) took more than 90 d to start independent ambulation, and in these 20 cases, 19 had ISCS injury (P=0.002) (Table 2).

There were 9 (20.5%) cases of associated neurovascular injury, and all these cases had a history of slipping of the foot into ISCS (Table 2). Post-operative wound complications were also more frequently observed in cases of injury caused by ISCS. There were 4 cases with wound healing problems (3 had skin margin necrosis and 1 had wound dehiscence). Among these, 3 patients had a history of a slip in ISCS while 1 had a road traffic accident.

Table 1. Demographic profile and characteristics of the study population.

Variables	Numbers	Percentage, %
Age, years		
11-20	3	6.8
21-30	20	45.5
31-40	15	34.1
41-50	4	9.1
51-60	2	4.5
Gender		
Female	2	4.5
Male	42	95.5
Time of presentation, h		
<48	30	68.2
≥48	14	31.8
Loss of tendon length, cm		
Nil	9	20.5
<1	12	27.3
1-2	21	47.7
>2	2	4.5
Associated neurovascular injury		
Yes	9	20.5
No	35	79.5
MRC grade of TA at 3 months		
II	7	15.9
III	24	54.5
IV	13	29.5
MRC grade of TA at 6 months		
III	14	31.8
IV	30	68.2
Pain assessment (VAS scale at 3 months)		
0	6	13.6
1	1	2.3
2	25	56.8
4	10	22.7
6	2	4.5
Pain assessment (VAS scale at 6 months)		
0	19	43.2
2	23	52.3
4	2	4.5

TA: Tendo-Achilles; VAS: Visual analogs scores; MRC: Medical Research Council.

The mean hospital stay was (18.07±8.46) d (Table 3). The patients with ISCS injury had statistically significant longer mean hospital stay (20.60±8.39) d in comparison to cases of other etiologies (12.64+2.65) d (t=−2.47, P=0.017) (Table 3).

Table 3. Comparison of length of hospital stay and range of motion at the ankle joint in various modes of TA injury cases.

Mode of injury	Hospital stay, d	ROAJ at 3 months, degree	ROAJ at 6 months, degree
ISCS	20.60±8.39	18.10±4.03	56.67±6.74
Sports	8.50±3.11	21.25±4.79	56.25±4.79
RTA	16.25±0.50	21.25±2.50	57.50±5.00
Running	7.33±1.15	18.33±2.89	53.33±2.89
FHO	18.67±6.43	18.33±2.89	58.33±2.89
F	4.150	1.040	0.290
P	0.007	0.390	0.880

ISCS: Indian style commode seat; ROAJ: Range of motion at the ankle join; FHO: Fall of a heavy object.

The mean range of motion at the ankle joint was (18.70±3.90) degrees at 3 months and (56.59±5.98) degrees at 6 months. Though all cases showed improvement, none of them reached to normal level at 6 months. Besides, the range of motion at the ankle joint, motor power of TA, and pain status in cases of different etiologies remained comparable (P>0.05).

4. Discussion

In this observational study over 3 years, the most common cause of TA injury reporting to hospitals was injury due to ISCS, accounting for 81.1% of total cases of TA injury. ISCS is embedded in the ground at the same level as of surrounding floor. Because of the high user to commode ratio, there is a high turnover of individuals in a limited period. Due to which floor remains wet and chances of slipping off the foot into the lavatory pan increases. All these factors contribute to high chances of TA injury due to ISCS. Once the foot slips into the commode, the individual gets frightened and he tries to remove it reflexly, thereby the taut TA gets injured by a sharp rim of the undersurface of the posterior edge of the commode seat (Supplementary Figure 2)[4-6,11]. The majority of our cases also gave this explanation when they described the events leading to injury caused by ISCS.

In our study, most cases were in the age bracket of 21-30 years. This profile of our study matches with the study reported by Chatterjee *et al.*[4]. The number of females sustaining open injuries

Table 2. Mode of injury of TA injury, management, and rehabilitation time.

Indicators	Mode of injury, *n* (%)					Total	*P*
	ISCS	Sports	RTA	Running	Fall of a heavy object		
Severity							0.001
Complete cut	27 (90.00)	1 (25.00)	4 (100)	Nil	3 (100)	35 (79.55)	
Partial cut	3 (10.00)	3 (75.00)	Nil	3 (100)	Nil	9 (20.45)	
Rehabilitation time							0.002
<90 d	11 (36.67)	4 (100)	4 (100)	3 (100)	2 (66.67)	24 (54.55)	
≥90 d	19 (63.33)	Nil	Nil	Nil	1 (33.33)	20 (45.45)	
Management							0.91
Modified Kessler's with epitenon repair	28 (93.33)	4 (100)	4 (100)	3 (100)	3 (100)	42 (95.45)	
Modified Kessler's with epitenon repair with turns down flaps	2 (6.67)	Nil	Nil	Nil	Nil	2 (4.55)	

ISCS: Indian style commode seat; RTA: Road traffic accident.

of TA is very less reported and even rare in the group of open TA injuries due to ISCS. The reason for this may be the cautious approach of females.

The patients are usually in remote locations where specialized medical facilities are required to treat TA injury are not available. So, these patients need to be transferred to the higher medical center for definitive treatment. In our study, 31.8% of cases took more than 48 h to reach our center from peripheral hospitals. The late presentation of these cases can affect wound condition and healing. In our study, it was observed that TA injury caused by ISCS is more severe. Around 77% of cases of the complete cut of TA and all cases with associated neurovascular injury in our study were because of ISCS. It may be explained by the mechanism of this injury.

The primary repair of the cut tendon and supervised physiotherapy with early passive mobilization produce satisfactory outcomes[12]. We also followed this standard practice, and all the tendons were repaired primarily. The main complications of TA open surgery are skin edge necrosis, superficial wound infections, seroma, and hematoma formation, re-rupture, deep vein thrombosis, and rheumatoid arthritis[13,14]. We had minor skin edge necrosis in 3 patients, wound dehiscence in 1 patient. The wound dehiscence case came to our center after 72 h of injury which further emphasizes the role of the timely evacuation of the injured patient to the center having the facility of definitive surgery.

Duration of hospital stay is one of the known parameters to assess morbidity of an injury. The average hospital stay in our prospective observational study was around 18 d while earlier published studies had a hospital stay of around 7 d[13]. We also noticed that ISCS injury cases had longer hospital stays as compared to other cases of TA injury. This difference in length of hospital stay observed in our study as compared to previously published study may be because of a great share of ISCS injury cases in our study. Moreover, most of our cases belonged to far areas of the country and no immediate family support was available to them.

The time taken to return to independent ambulation is an important parameter for outcome evaluation in cases of TA injury. In our study, 45.45% of cases took more than 90 d to start independent ambulation. In a study by Jallageas *et al.* where half of their cases were treated by percutaneous surgery and half by open surgery, the average time taken for independent ambulation was 70 d[15]. In our study, all the cases were treated by open surgery.

At our 6 monthly follow-up, all the cases were able to do normal daily activities but none of them reached the pre-injury physical fitness level. In a study published by Lansdall *et al.*, only 77% of patients returned to sports and 23% of their cases abandoned all physical activity after minimally invasive surgery for a rupture of TA after a one-year follow-up[16]. There is no consensus on how many patients will return to play outdoor games after TA injury[17], and there is no universally applicable cut-off time for the start of active physical life after TA injury. A longer follow-up and further research are required to comment on the time taken to reach the pre-injury fitness level in cases of TA injury.

Among all the causes of TA injury, injury due to ISCS is avoidable. Institutions, where ISCS is still in common use, need to increase awareness among its users. The user to commode ratio must be limited, which will help decrease the turnover rate and will help in keeping the floor dry. All broken commodes and footrest should be replaced. Replacement by a western-style commode seat can be another viable solution. All these measures will reduce the chances of slipping off the foot and consequently reduce TA injury and morbidity associated with it.

One limitation of this study was the observational study restricted to mostly young surgical males within one tertiary care hospitals which prevented significant associations between patient variables and outcomes, and therefore may not represent the general population. Secondary, sample with greater variation of patient basal demographics and injury details would be useful for the identification of predictors of outcome. Thirdly, we only observed patient for six months, which required least 24-month follow-up.

Injury by ISCS is an important, under-reported, and preventable cause of TA injury. It includes financial implications in form of transferring the individual to higher medical centers and longer hospital stays. More importantly, the injury leads to avoidable attrition of manpower. Even after standard treatment and physiotherapy sessions for months, not all cases can reach their pre-injury fitness status.

Conflict of interest statement

The authors report no conflict of interest.

Authors' contributions

P.M. and M.T. collected and curated the data; P.M. and O.S. guide and concept of Study; S.S., N.G., and M.S. contributed to writing the manuscript; All authors read and approved the final manuscript.

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