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Functional outcome of open Tendo-achilles injury: A study in Dhaka medical college hospital, Dhaka, Bangladesh

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Abstract
Introduction: Achilles, the warrior and hero of Homer's Iliad, lends his name of the Achilles tendon. The thickest and strongest tendon in the human body. Thetis, Achilles's mother, made him invulnerable to physical harm by immersing him in the river Styx after learning of a prophecy that Achilles would die in battle.
Objective: To assess the functional outcome of open Tendo-Achilles injury.
Methods and Materials: This prospective study was done in casualty and orthopaedic surgery department of Dhaka Medical College Hospital in the period of December 2011 to June 2013. Fifty patients were selected randomly, who came to casualty department. All cases were open Tendo- Achilles injury, without associated injury of other leg muscles, posterior tibial artery and nerve within 12 hours. 10 patients were lost to follow up and finally the study was done on 40 patients. All patients were undergone primary end to end repair by Modified Kessler's method.
Observation and Results: This prospective study of The Evaluation of the Result of Early Repair of Open Tendo Achilles Injury was carried out to evaluate the result of early repaired tendon and to find out the common causes of cut injury, age & sex incidence, level of injury and to propose a protocol for treating such cases in comfortable, cheap and convenient way for the patient. The final result was as follows: Excellent in 24 cases (60%), Good in 12 cases (30%), Fair in 3 cases (7.5%), Poor in 1 case (2.5%). So the result of this study was acceptable in 36 (90%) cases, which was comparable with the result described in others (Nada, 1985- 90%, Strauss, E. J. *et al*., 2006-96%). In this series it was found that most of the results of the early repair of the Tendo Achilles injury were satisfactory.
Conclusion: Repair of open Tendo Achilles is not difficult but early diagnosis, proper surgical toileting, meticulous repair, adequate post-operative immobilization and physiotherapy is important part of management.

Keywords: Tendo-achilles injury, risk fectors, repair of open Tendo Achilles

1. Introduction

Achilles, the warrior and hero of Homer's Iliad, lends his name of the Achilles tendon. The thickest and strongest tendon in the human body. Thetis, Achilles's mother, made him invulnerable to physical harm by immersing him in the river Styx after learning of a prophecy that Achilles would die in battle. However, the heel by which he was held remained untouched by the water and thus Achilles had a vulnerable point. Achilles led the Greek military forces, which captured and destroyed Troy after killing the Trojan prince Hector. However, hector's brother Paris killed Achilles by firing a poisoned arrow into his heel. ''this tendon, if bruised or cut, causes the most acute fevers, induces chocking, deranges the mind and at length brings death'' [1] Hippocrates' view of injury to the Achilles tendon, stated that [8]. The injury of the Achilles tendon is a disabling condition, which is difficult to treat if there is a gap or defect between the two ends of the disrupted tendon. Such a gap may result from several factors acting single or in combination: open laceration followed by infection; delay in diagnosis, allowing retraction and degeneration of the tendon, fraying of the ends etc [6]. Patients with a rupture of the Achilles tendon should be operated on and operated on without delay [2]. The gap between two ends of the injured tendon due to contracture of the calf muscles occurs very rapidly, within three or four days, so that difficulty may be experienced in regaining coaptation of the ruptured ends of the tendon. Furthermore, following rupture, the tendon ends may be so shredded, that an actual loss of length has been established in the tendinous apparatus so that if coaptation is to be gained, repair must be accomplished with shortening of the tendinous structure to less than its original length. Therefore even in immediate repair of fresh rupture will need reconstruction [3]. In Bangladesh most cases, come to hospital with open type of Tendo Achilles injury, occur in all age group of people and both sexes. In contrast to western countries, most people in our country uses flat pan in the latrine, which are at a same level of the toilet floor. Many people use a common latrine, so that surroundings of the latrine remain wet and slippery. Moreover bathroom and latrine are placed in same small room, so it remains always wet and slippery. Maximum people are barefooted or using sandal, which cause them to slip and fall on the toilet pan. Surface of the toilet pan

breaks down and cause sharp cut injury when they try to lift up the plantar flexed foot. Some cases of open tendon injuries occur due to road traffic accident, cut by broken glass and assault.

2. Rationale of the study

Open tendo Achilles injury by broken toilet pan with gross contamination are common Tendo Achilles injury in our country now a days. Early repair of open Tendo Achilles injury within 12 hours after proper surgical toileting and cleaning of the wound gives a good result for healing, the least chance of infection to patient. Because it will need hospital stay not more than one or two days, short period of post-operative inactivity (only 6-8 weeks), it also lessens the cost of hospital. Besides these, end to end repair is easy and early recurrent rupture is less. In delayed case or delayed repair contracture of the gastrocnemius and soleus muscle is developed for this why the injured tendon become shorten. In delayed case repair is difficult because there is a gap between two ends which then fills with scar tissue, so reconstruction is needed and need long period of post-operative inactivity (Minimum 16 weeks). So the study will help to establish early repair of contaminated open Tendo Achilles injury which will be very much effective with less complications than delayed repair. It will help to return a Tendo Achilles injured patient to his normal work early as well as reduce burden of hospital and his family.

3. Objective

To assess the functional outcome of open Tendo-Achilles injury.

4. Methods and Materials

This prospective study was done in casualty and orthopaedic surgery department of Dhaka Medical College Hospital in the period of December 2011 to June 2013. Fifty patients were selected randomly, who came to casualty department. All cases were open Tendo- Achilles injury, without associated injury of other leg muscles, posterior tibial artery and nerve within 12 hours. 10 patients were lost to follow up and finally the study was done on 40 patients. All patients were undergone primary end to end repair by Modified Kessler's method. After thorough surgical toileting with sterile water and soap and a mixture of Hexiscrub, Povidone-iodine, Hydrogen-peroxide and normal saline (ratio-10 ml: 10 ml: 10 ml: 1000 ml) and with 4-5 liter normal saline. After final wash wound swab for every cases were send for culture and sensitivity test. All patients were immobilized by short leg anterior slab for 2 weeks followed by short leg cast in ankle gravity equinus for the period of another 4 to 6 weeks. All the short leg anterior slab were removed and short leg cast were applied during stitch removal at second week post operatively. All of the patients used heel raise shoe after removal of cast at 8 weeks post operatively for the period of next 4 to 8 weeks. All the patients were evaluated after 12-16 weeks of surgery. In the follow up, patients were evaluated by ability to stand on affected tip toe, Range of ankle motion of affected side, power of plantar flexion, calf muscle wasting, and number of complications.

The final result of treatment of open Tendo Achilles injury based upon the above parameters. Results were acceptable in 90% and unacceptable in 10% cases. So, most of the results of the early repair of the Tendo Achilles injury were satisfactory. Calculated p value was >.05. So, there was no significant ($p>0.05$) difference regarding functional outcome between injured limb and healthy limb after early repair of open Tendo Achilles injury (Within 12 hours). Open Tendo Achilles injury is common in our country. The common cause found in my study is cut by the sharp edge of broken toilet pan. Most of the low socio-economic group of people in our country use toilet pan instead of commode. Many people use one toilet and proper hygiene is not maintained. Toilet size is small and toilet & bathroom places in the same room. So it remains slippery. When people move in small toilets they accidentally fall on the pan, causes break it and when try to lift out their leg, and then the tendon is severed. So it can be possible to reduce these incidences of this disabling cut injury by increasing awareness of the people about the injury and changing the design of the toilet.

Data analysis

Data will be compiled and analysed by following standard bio statistical procedure. Pre and post-operative scoring system will be followed to assess functional out comes as well as merits and demerits.

Data analytical frame

Descriptive statistics & calculation of mean, SD, comparison by z-test etc will be used. In all levels significance will be set up at 0.05 ($P<0.05$).

5. Observation and Results

This prospective study of The Evaluation of the Result of Early Repair of Open Tendo Achilles Injury was carried out to evaluate the result of early repaired tendon and to find out the common causes of cut injury, age & sex incidence, level of injury and to propose a protocol for treating such cases in comfortable, cheap and convenient way for the patient. The final result was as follows: Excellent in 24 cases (60%), Good in 12 cases (30%), Fair in 3 cases (7.5%), Poor in 1 case (2.5%). So the result of this study was acceptable in 36 (90%) cases, which was comparable with the result described in others (Nada, 1985- 90%, Strauss, E. J. *et al*., 2006-96%). In this series it was found that most of the results of the early repair of the Tendo Achilles injury were satisfactory.

Table 1: Age and Sex distribution (N=40)

Age	Number of Sex				Total	Mean Age± SD
	Male		Female			
	Number	Percentage	Number	Percentage	Percentage	
18-25	5	50	5	50	100%	29.90 ±6.24
26-35	18	90	2	10	100%	
36-45	9	90	1	10	100%	
Total	32	80%	08	20%	100%	

Among 40 patients 32(80%) were male and 08(20%) were female. Mean age was 29.90 years with standard deviation of ± 6.24.

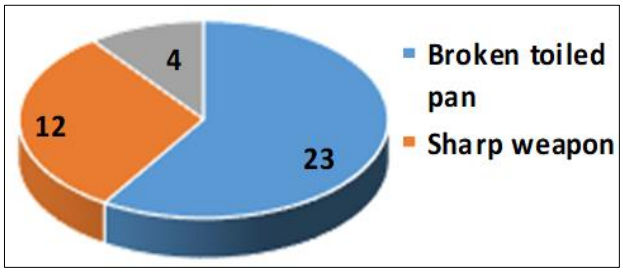

Fig 1: Showing causes of injury

57% injury was due to sharp edge of broken toilet pan following slip on Indian type of toilet pan.

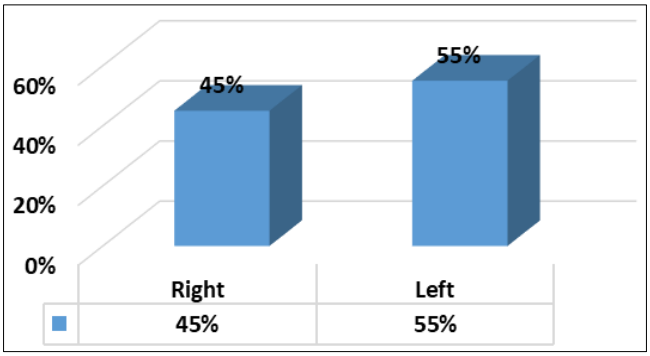

Fig 2: Showing side involvement.

Left side was more affected about 22(55%) and right side was18 (45%).

Table 2: Level of cut due to acute injury (N=40)

Level of cut	Number	Cumulative frequency	Median level of cm	Inter quartile range(IQR)
2-3 cm	19	47.5	3.5	2.5 to 3.5
3-4 cm	15	85.0		
4-5 cm	5	97.5		
>5 cm	1	100		
Total	30			

In this series median level of cut was 3.5 cm where interquartile range was 2.5-3.5 cm.

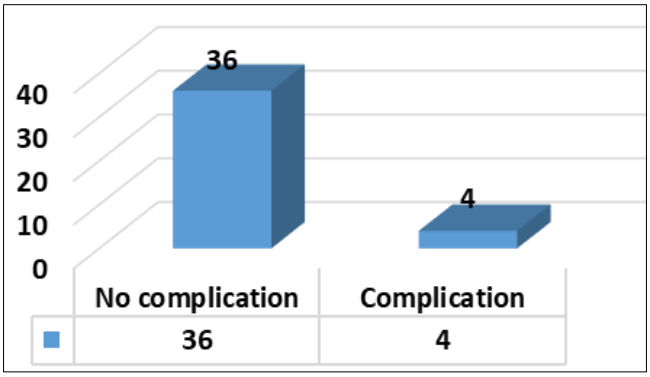

Fig 5: showing various complications.

In 36(90%) cases found no complications and another 4(10%) cases found different types of complications.

Table 7: Distribution of final outcome (N=40)

Grade	No of cases	Percentage
Excellent	24	60%
Good	12	30%
Fair	3	7.5%
Poor	1	2.5%
Total	40	100%

Satisfactory = Excellent + Good = 60% +30% = 90%, Mean satisfactory result 86 with SD= ± 0.8, Unsatisfactory = Fair + Poor = 7.5% +2.5 = 10%Mean unsatisfactory result 56 with SD= ± 0. 58. In this study it was found that 85% satisfactory result among 40 patients of acute open tendo Achilles injured patient by immediate repair. If this procedure put in total population then satisfactory result will be found in following confidence interval (at 95% level). According to Juhana Leppilahti Modified Score at 95% Confidence Interval satisfactory outcome = 80.70 % to 99.30 %. So, early repair of open Tendo Achilles injury provided an effective outcome.

Table 8: Comparison of between ability to stand on tip toes, Range of motion of ankle joint and Power of planter flexion (N=40)

Outcome	Injured limb Mean± SD	Healthy limb Mean± SD	P-value
Ability to stand on tip	1.12±0.483	1.05±0.221	P>0.5
Range of motion of ankle joint	12.15±3.193	12.50 ±0.362	P>.05
Power of planter flexion	13.35±2.348	13.95±1.449	P>.05

Range of motion of ankle joint and Power of planter flexion of injured and healthy sides were measured at the last follow up. Two samples Z-test was done for calculation of test statistic and we found that there were no significant difference between range of motion of ankle joint and power of planter flexion of injured and healthy sides.

6. Discussion

Most the literatures were published in journal on calcaneal tendon rupture which were mostly deals with spontaneous closed rupture [4]. Only in three papers, diagnosis and early treatment of a few cases of open lacerations of Tendo Achilles [10, 14] were reported. In our country open Tendo Achilles injury is common. In this series of 40 patients, 23 cases (57.5%) were caused by sharp edge of the broken toilet pan, 13 cases were (32.5%) caused by sharp weapons, 4 case (10%) was caused by machinery injury. All these patients included in this study treated within 12 hours of injury. In a similar study [15] showed that, fall on the slippery toilet pan causes its break down and by the broken edge of the pan most of the tendon was cut. This is a rare incidence in western world. No literature was available that report such type of injury. In one paper [14] 6 cases of open tendon injury occur by sharp object usually from farm equipment were reported. Another paper [10] reported 2 cases of lacerated injury [16], published a study and showed that the site of the rupture was generally located 3-5 cm proximal of the distal insertion of the tendon. They found 85 % good to very good subjective results. In our study the median cut level was 3.5 cm proximal to the insertion of Tendo Achilles. It was found excellent or good results those cut occurred within 3-4 cm proximal from the insertion. In a study [8] found rupture of the Achilles tendon is more common in males with a male female

ratio ranging from 1.7:1 to 12:1. The left Achilles tendon is ruptured more frequently than right side. In our study we found left side predominance 22 (55%). Male were common sufferer in our study 32 (80%) [17]. Devised Post-operative rehabilitation protocols for the classic end-to-end repair included plaster cast immobilization for 6 to 8 weeks, initially in equines position and, after 2 to 3 weeks in neutral position, followed by active mobilization under intensive physiotherapy until optimal function was regained. In our study all patients were immobilized by plasters casts for the period of 6 to 8 weeks. Short leg anterior slab were given in all cases for 2 weeks post operatively with ankle in gravity equinus. In one paper [1] it is shown that, there is no relationship between a long leg cast and improved result. All the tendons were repaired by Modified Kessler's method. Paratenons were repaired as much as possible with no.2-0 vicryl. 26 patients were (65%) treated within 6 hours of injury. The rate of infection was less in those patients who received treatment within 6 hours of injury [15]. Published their study of acute Tendo Achilles injury of 18 patients. The follow up of the 15 patients ranged from 5 months to 10 years. In our study mean follow up period was about 9 months (range 5-16 months) due to time limitation. Reduction of calf circumference is usual, even many years after rupture. In this study it was found reduction of calf circumference was as little as described by other [14]. Ankle motion were normal in 24 (60%) cases and change of motion were up to 6-10 degree in 15 (37.5%) patients in this series, which was very much acceptable in comparison to above studies. Only 1 patient (2.5%) had more than 10 degree of motion restricted. The power of plantar flexion was normal or near normal in 36 (90%) cases. Various types of complications were encountered among the patients of this study. In this series it was found that most of the results of the early repair of the Tendo Achilles injury were satisfactory.

7. Conclusion

Repair of open Tendo Achilles is not difficult but early diagnosis, proper surgical toileting, meticulous repair, adequate post-operative immobilization and physiotherapy is important part of management. If this procedure put in total population then satisfactory result will be found in following confidence interval level. So from the encouraging result of this study, treatment protocol used here can be followed, which is easy for surgeon and convenient and cheap for the patient.

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