

Evaluation of Results of Primary Repair of Open Tendo-Achilles Injury in the Department of Casualty, MMCH, Bangladesh

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Achilles tendon injury has been increasing over recent years due to a variety of causes. 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. Patients with a rupture of the Achilles tendon should be operated without delay. Most of the people in our country use flat pan in the latrine, which are at a same level of the toilet floor. Surface of the toilet pan breaks down and cause sharp cut. Some of the cases of open tendon injuries occur due to road traffic accident, cut by broken glass and also assault. It is generally accepted that surgical repair of fresh ruptures of the Achilles tendon gives excellent results. Objective of the study was to find out the evaluation of the results of primary repair of Open tendo-achilles injury (OTAI). This prospective study was done in the department of Casualty of Mymensingh Medical College Hospital, Bangladesh in the period of July 2021 to June 2022. Patients who came with OTAI in casualty department were selected randomly. All cases were selected as OTAI, without associated injury of other leg muscles, posterior tibial artery and nerve within 12 hours. All patients underwent primary end to end repair by Modified Kessler's method. Evaluation of the results of primary repair of OTAI were carried out and were find out the common causes of injury, age and sex incidence, level of injury and to proposed a protocol for treating such cases in comfortable, cheap and convenient way for the patients. Operations were done at Casualty operation theatre (COT). Then 48 patients were followed up at the Department of Casualty. Among them 43(89.58%) of patients were able to stand on tip toes, 4(8.33%) of patients were not stand on tip toes of affected foot unsupported but able to stand on tip toes supported, 1(2.08%) of patients failed to stand on affected foot unsupported due to severe infection and wound gap. Final result were Excellent - 29(60.0%), Good - 14(30.0%), Fair - 4(8.0%), Poor - 1(2.0%). Repair of OTAI is not difficult but early diagnosis, proper surgical toileting, meticulous repair; adequate post-operative management is the key of success. So, the result of this study, treatment protocol can be followed, which is easy for surgeon and convenient and cheap for the patients.

[Mymensingh Med J 2024 Oct; 33 (4): 1047-1053]

Key words: Tendo Achilles, Primary repair, Open tendo-achilles injury

Introduction

Achilles tendon is an important tendon which is responsible for planter flexion and ankle stability in the human body located behind the ankle and lower leg. If this tendon is injured that causes the most acute condition affects on walking and daily activities. This condition is difficult to treat if there is a gap between two ends of the injured 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 etc⁶. Patients with a rupture of the Achilles tendon should be operated without delay². The gap occurred between two ends of the injured tendon due to contracture of the calf muscles that occurs very rapidly, within 3 or 4 days, so that causes difficulty in regaining apposition 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

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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 early repair of fresh rupture may need reconstruction³. In Bangladesh most cases of tendo-achilles injury come to hospital with OTAI that occurs in all ages and both sexes. In western countries use high commode pan but most people in our country use flat pan in the latrine, which are at the level of the toilet floor. Many people use a common latrine, for this reason surroundings of the latrine become wet and slippery. Moreover bathroom and latrine are placed in same small room, so it remains mostly wet and slippery. Many people are barefooted or using slippery sandal which cause the users 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 in our country due to road traffic accident, glass cut and assault. Many papers already published on early repair of tendo-achilles, but most of them are on close rupture due to degenerative changes⁴. About one week following rupture, gap between the ends of tendon fills with scar tissue. If treatment is not done the tendon will not heal and the patient will not able to push off in the affected side. Running even walking and daily activities are compromised. If there is gap that is not possible to appose the cut ends of tendon, reconstruction is indicated⁵. Surgery has been proposed as the treatment of choice for achilles-tendon ruptures since Quenu and Stoianovitch stated that "rupture of the Achilles-tendon should be operated on without delay". After the comparison by Christensen and Arner and Lindholm of patients treated operatively and conservatively, which showed better results in the former group, surgical treatment has become increasingly popular. Artificial tendon implants, with use of material such as absorbable polymer carbon fiber composites, Marlex mesh (Monofilament knitted polypropylene) and collagen tendon prosthesis sometimes required. End to end suturing which can perform with local anaesthesia or regional anaesthesia^{7,8}. Delay in surgical treatment of more than one month accounted for a 20 percent decrease of endurance in the triceps surae muscle-tendon unit. Functionally patient treated surgically have less satisfactory subjective and objective results when

compared with surgically treated patients. Surgical treatment is the treatment of choice and certainly should be recommended for more active patients⁷. It is generally accepted that surgical repair of fresh ruptures of the tendo-achilles gives excellent results. The complications of operative intervention, however, are not infrequent and include adherence of the scar, keloid formation, wound infection, and, most important, sloughing of the overlying skin and tendon⁹.

Rationale of the study

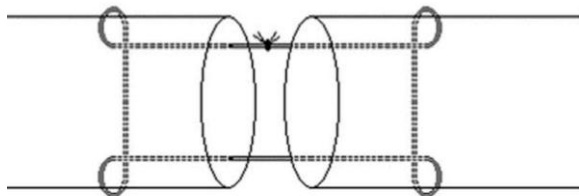
Now a days Open tendo-achilles injury (OTAI) by broken toilet pan with gross contamination was common tendo-achilles injury in our country. Primary repair of open tendo-achilles injury within 12 hours after proper surgical toileting and cleaning of the wound gives a good result for healing, the least chance of infection to patient. Because it will need hospital stays not more than one or two days; short period of post operative (after 6-8 weeks) return to normal activity, 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 primary repair of contaminated open tendo-achilles injury which will be very much effective with less complications than delayed or secondary repair. It will help to return a tendo-achilles injured patients to his normal work early as well as reduce burden of hospital and his family.

Methods

This prospective study was done in the department of Casualty, Mymensingh Medical College Hospital, Bangladesh in the period of July 2021 to June 2022. Ethical clearance was obtained from the Institutional Review Board (IRB) of the MMC, Mymensingh, Bangladesh (Memo no: MMC/IRB/2022/506 dated: 04/07/2022). Patients were selected randomly, who were attended in Casualty department. All cases of OTAI were within 12 hours of occurrence without associated injury of other leg muscles, posterior tibial artery. All cases of tendo-achilles injury underwent

primary end to end repair by Modified Kessler's method after thorough surgical toileting with sterile water and soap and a mixture of hexiscrub (chlorhexidine), povidone-iodine, hydrogen-peroxide and normal saline (ratio-10 ml: 10 ml: 10 ml: 1000 ml) and with 2-3 litres normal saline with intravenous antibiotic coverage. All patients were immobilized by long leg anterior slab with knee flexion 60°, Ankle full equinus for 2 weeks followed by short leg cast in ankle gravity equinus for the period of another 2 weeks followed by ankle at plantigrade for another 2 to 4 weeks. The entire short leg anterior slab was removed and short leg cast were applied during stitch removal at second week post operatively. All of the patients should be used heel raised shoe after removal of cast at 8 weeks post operatively for the period of next 4 to 8 weeks. All the patients functional outcome 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 results of treatment of OTAI were based upon the above parameters. P value was calculated.

The common causes were finding out in this study. In our country, most of the low socio-economic group of people use toilet pan instead of commode. So, it is necessary to aware the people about the cut injury by toilet pan to reduce the incidence of this disabling condition. So we can suggest changing the design of the toilet.



Schematic diagram of modified Kessler Methods for tendon repair

Study procedure

Total 48 cases of OTAIs were enrolled as a study sample. All the patients were operated in the department of casualty. Relevant findings concerning the case history and current intensity of open tendo-achilles pre and post operative period were prospectively evaluated by interview and clinical examination. Aim, objective, procedures, risk and benefits of the treatment were

explained to the selected patients. The patient was encouraged for voluntary participation. They were assured about the secrecy of information and records. An informed written consent in both English and Bangla were taken from the patients or patient's attendant. Data were collected, compiled and tabulated according to key variables and functional assessment. The analysis of different variable was done according to standard statistical analysis. Quantitative data were analysed by paired t-test and qualitative data by chi-square test as needed were processed and analyzed using SPSS (Statistical Package for Social Science) software version 25.0. For all analyses level of significance were set at 0.05 and p-value <0.05 will be considered significant. For data appropriateness significance test were done as deemed necessary.

Results

This study was done at Casualty Department of MMCH, 48 cases were operated at Casualty OT. Patients were followed up at Casualty department.

Table I: Age distribution (n=48)

Age of the patients (years)	Number of patients (n)	Percentage (%)	Mean±SD (years)
0-10	04	08.33	
11-20	06	12.50	
21-30	15	31.25	
31-40	10	20.83	29.80±6.24
41-50	07	14.58	
51-60	04	08.33	
61-70	02	04.16	
Total	48	100.0	

Table I shows the age distribution (n= 48) which shows more percentages of all. Mean age and standard deviation was 29.80±6.24 years.

Table II: Gender distribution of the study patients

Gender of the patients	Number of patients (n)	Percentages (%)
Male	30	62.50
Female	18	37.50
Total	48	100.0

Original contribution

Table II shows among 48 patients 30(62.50%) were male and 18(37.50%) were female.

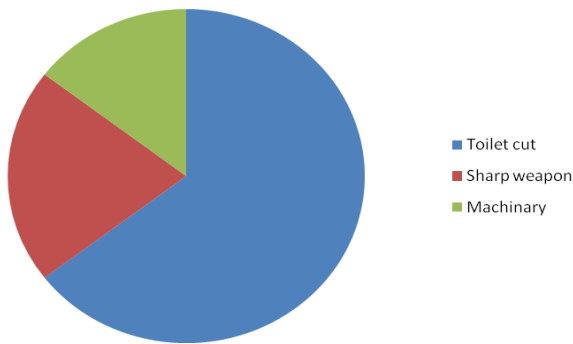


Figure 1: Causes of the injuries in the study

Figure 1 shows causes of injury- 31 patients 64.58% injury was due to slip on toilet pan, 10 patients 20.83% injury by sharp weapon, 7 patients 14.58% by machinery injury due to RTA.

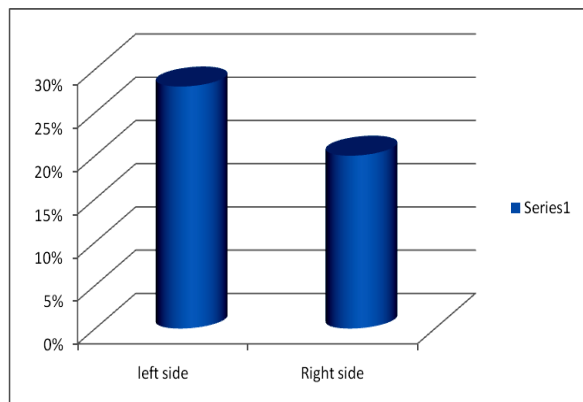


Figure 2: Side involvement of the injury in this study

Figure 2 showed the side involvement of the injury- Left side was more affected about 28(56.33%) and right side was 20(41.67%).

Table III: Delay of repair the injuries of the study

Delay of treatment (hours)	Number of patients (n)
<4	06
4-6	23
6-8	10
8-12	09
Total	48

Shows treatment delay (n=48). Most of the cases were operated within 6 hours of injury. Mean

delay of repair was 6 hours 20 minutes, with standard deviation ± 2.71 minutes.

Table IV: Follow up the period in the study

Follow up period in months	Number of patients (n)	Mean \pm SD (months)
6-8	18	
9-12	25	9.8 \pm 1.92
>12	05	
Total	48	

Shows total follow up period after surgery (n=48) Follow up period in months. All the patients advised for regular follow up at Casualty department of MMCH. One to two visits for initial two weeks then regular visits at four weeks interval upto total return of normal day work. Minimum and maximum follow up period was 6 and 16 months respectively. Mean follow up period was 9.8 months with standard deviation was ± 1.92 .

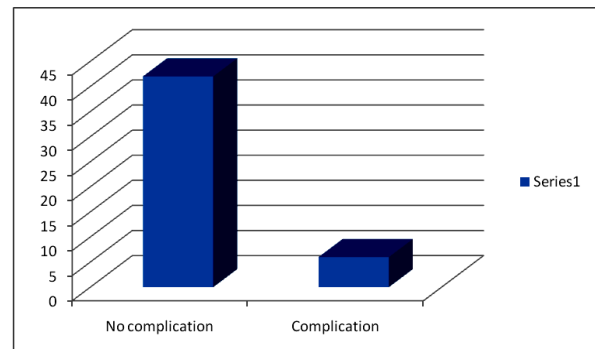


Figure 5: Complications of the study (n=48)

Figure 5 shows the rate of complications. In 48, 42(87.5%) cases found no complications and another 6(12.5%) cases found different types of minor complications.

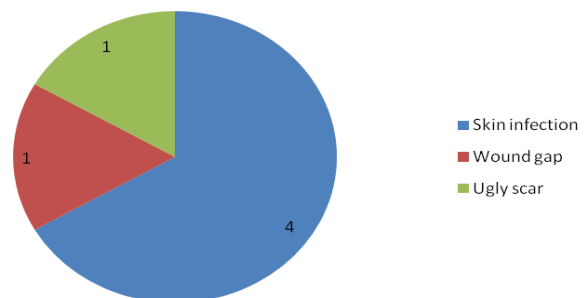


Figure 6: Minor complications of the study

Figure 6 shows minor complications were superficial skin infection 4(66.65%) Wound gap 1(16.66%) Ugly scar 1(16.66%). No failure of repair.

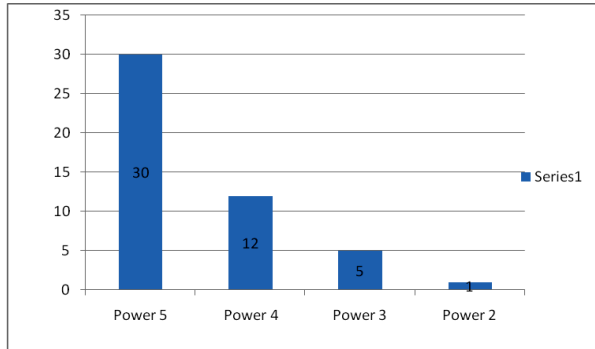


Figure 7: Power of planter flexion and number of cases

The power of planter flexion (according to BMRC scale) Power of plantar flexion: The power of plantar flexion was recorded for each patient till final follow up. In most of the cases power of plantar flexion regained to normal (according to BMRC scale), or near to normal were shown in Figure 7.

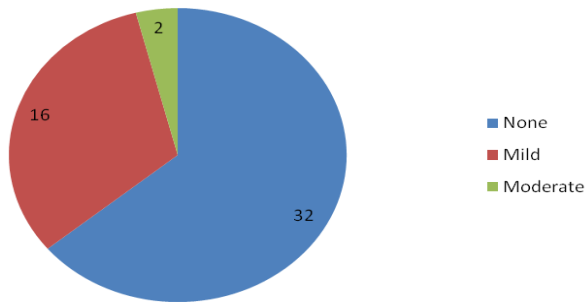


Figure 8: Calf muscle wasting in international research

Shows calf muscle wasting International Journal of Medical and Health Research 48.

Table V shows the ability to stand on affected tip toes or foot. Final outcome measured according to Juhana Leppilahti modified scoring scale. Able to stand on affected tip toes unsupported 89.58%. Figure 9 shows the final outcome of primary repair of tendo-achilles Grade: Excellent - 29(60.41%), Good - 14(29.16%), Fair - 4(8.33%) and Poor - 1(2.08%). And satisfactory = Excellent + Good = 60.41% + 29.16% = 89.58%;

Unsatisfactory = Fair + Poor = 8.33% + 2.08% = 10.41%.

Table V: The ability to stand on affected tip toes or foot

Ability to stand	Number of cases (n)	Percentage (%)
Able to stand on affected tip toes unsupported	43	89.58
Not able to stand on affected tip toes unsupported but able to stand on affected foot	04	08.33
Not able to stand on affected foot unsupported	01	02.08
Total	48	100.0

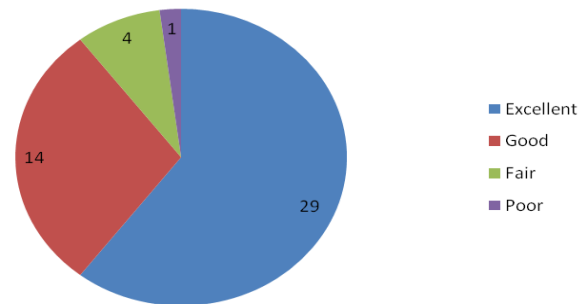


Figure 9: Final outcome of primary repair of tendo-achilles (n=48)

In this study 89.58% satisfactory results found. Among 48 patients of acute open tendo-achilles injured patient by immediate primary repair. So, early primary repair of open tendo-achilles injury provided an effective outcome.

Discussion

Open tendo-achilles injury (OTAI) is common in our country due to fall in toilet pan. In this study of 48 patients, 31 cases (64.58%) were caused by sharp edge of the broken toilet pan, 10 (20.83%) were caused by sharp weapons, 7 cases (14.58%) was caused by machinery injury due to RTA. All patients were repaired within 12 hours of injury. In Chatterjee SS et al. study¹⁴ showed that, most of the tendon was cut fall on the slippery toilet pan caused by its broken edge of the pan. This is a rare incidence in western countries. Mahmud SW et al.¹³ found 6 cases of open tendon injury occur by sharp object usually from farm equipment were reported. They found 85.0% good to very good

subjective results. Maffulli N⁸ 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 side is ruptured more frequently than right side. In this study we found left side predominance 28(58.33%) and right side 20(41.66%). Male patients were common sufferer in this study 30(62.50%) which is almost similar to the study of Schönberger TJA et al.¹⁷. In this 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 with ankle in gravity equinus. In a study by Carden DG et al.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. 29(6+23) patients were (60.41%) treated within 6 hours of injury. Infection rate was less in those patients who received treatment within 6 hours of injury¹⁴. A study of acute Tendo Achilles injury of 18 patients. The follow up of the 15 patients ranged from 5 months to 10 years. In this study mean follow up period was about 8.8 months (range 5-16 months). Reduction of calf muscles circumference was as little as described by International Journal of Medical and Health Research 49 other¹³. The power of plantar flexion was normal or near normal in 43(89.58%) cases. Some complications were encountered among the patients of this study. Common complications were superficial skin infection (4 cases), swelling persists for months (4 cases), ugly scar (2 cases) and wound gap (1 case)¹ In this study no major complication was found but minor complication like superficial skin infection, delayed wound healing occurred which were successfully managed. All patients returned to their normal activities after a variable period of 8-16 months without complaints. In this study, no re-rupture case found. In this study we used parameters according to Juhana Leppilähti Modified Scoring System to assess the final functional outcome of the patient. These were stand on affected tip toe unsupported, power of plantar flexion, calf muscle wasting and complications. These parameters were also used in various study found in various literatures¹⁷. The patients were asked about their sporting activities before and after treatment and whether they had any complaints; they were also asked to evaluate their own results as excellent,

good, fair or poor. In this series we assessed 48 acute open Tendo Achilles injured patients after 16 weeks of treatment. Among them 43(90.0%), patients were able to stand on tip toes, 4(8.33%) patients could not stand on tip toes of affected foot unsupported but were able to stand on affected foot unsupported and 1(2.08%) patient failed to stand on affected foot unsupported. The final result was as follows: Excellent in 29 cases (60.0%), Good in 14 cases (30.0%), Fair in 4 cases (8.0%), Poor in 1 case (2.0%). So the result of this study was acceptable in 43(90.0%) cases, which was comparable with the result described in others⁴. Most of the results of the primary repair of the Tendo Achilles injury were satisfactory.

Conclusion

Repair of open tendo-achilles with early diagnosis, proper surgical toileting, meticulous repair, adequate post operative immobilization and physiotherapy is important part of management. 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 patients.

Limitation of this study

One methodological limitation of this study was the use of purposive sampling of the participants the entire sample will be collected from the Emergency and Casualty department. This sampling may bias the generalization of findings. The sample size is small. The work was done on only one institute.

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