International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 12-10-2019; Accepted: 13-11-2019
www.medicalsciencejournal.com
Volume 5; Issue 12; December 2019; Page No. 42-49

Evaluation of the results of early repair of open Tendo Achilles injury: A study in Dhaka medical college hospital, Dhaka, Bangladesh

Md. Mohiuddin Aslam[1*], Muhammed Shahiduzzaman[2], Md. Zakir Hossain[3]

[1] Assistant Professor, Ortho-Surgery, Pabna Medical College, Pabna, Bangladesh

[2] Professor, Head of the Department of Orthopaedics and Traumatology, Dhaka Medical College Hospital, Dhaka, Bangladesh

[3] Associate Professor and Classified Specialist, Department of Otolaryngology and Head-Neck Surgery, MBBS, MCPS, DLO, FCPS, FACS (USA), Central Medical Board and Combined Military Hospital, Dhaka Cantonment, Dhaka, Bangladesh

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 find out the Evaluation of the results of Early Repair of Open Tendo Achilles Injury.

Materials & Methods: 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.

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. This study was done at Orthopaedics Department of DMCH, cases were operated at Casualty OT. Then patients were followed up at orthopaedic surgery OPD and orthopaedic surgery indoor routinely. Among them 36(90%), patients were able to stand on tip toes , 3 (7.5%) patients could not stand on tip toes of affected foot unsupported but were able to stand on affected foot unsupported and 1 (2.5%) patient failed to stand on affected foot unsupported due to severe infection and wound gap. 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%).

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. 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.

Keywords: Tendo achilles injury, posterior Tibial artery, casualty OT

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. Many papers already published on early repair of Tendo Achilles, but most of them are on close rupture due to degenerative changes [4]. About a week after rupture, the space between the tendon ends fills with scar tissue. If left untreated, the tendon will not heal, leaving the patient unable to push off in the affected side. Running, jumping and activities such as ascending or descending stairs are severely compromised. If there is gap or functional impairment foot or disabling, for this case reconstruction is indicated [5]. 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 performed 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 patients [10]. It is generally accepted that surgical repair of fresh ruptures of the tendoachillis 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 tendon [9].

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. Review of literature

The literatures concerning treatment of ruptures were confusing. Lea and Smith, 2, and others advocated conservative treatment because of similar results obtained with conservative and operative treatment when range of motion, strength, power, and functional level were evaluated. Other authors, including [10], and others, recommended surgical repair in athletic individuals because of a low rerupture rate of 2% to 3% compared with 10% to 30% with conservative treatment, greater power after operative treatment, and a low infection rate when good surgical technique is used. 2, in a review of the literature, found a significant complication rate of 8% in 2647 surgical repairs, including deep infection (1%), fistula (3%), skin necrosis (2%), and rerupture (2%) [5]. Described that repair of defects in the tendo achillis by replacement with fibrous tissue is unsatisfactory. He recognized that a sharp line of distinction must be drawn between immediate repair of fresh ruptures of the tendo-achillis and delayed repair or repair of old ruptures. Actually, contracture of the calf muscles occurs very rapidly, so that within three or four days difficulty may be experienced in regaining cooptation of the ruptured ends of the tendon. Following ruptures, the tendon ends may be so shredded that an actual loss of length has been established in the tendinous apparatus so that if cooptation is to be gained, repair must be accomplished with shortening of the tendinous structure to less than its original length. Delayed repair or repair of old defects presents an entirely different problem [11]. Advocated the use of strips of fascia and others tissues, including the plantaris tendon, to reinforce the repair of a ruptured Achilles tendon. The repair effected by these methods not infrequently is bulky and not too secure. The plantaris tendon which was fanned out to make a membrane 2.5 cm or more wide for reinforcing the repair. The method is useful for injuries less than about ten days old. Follow up studies of eleven out of eighteen patients so treated was revealed excellent results. [10] presented a comparative study of seventy-nine patients with rupture of the tendo Achilllis, forty-eight of whom were treated surgically and thirty-one, non-surgically, with one exception, all were healthy, athletic individuals. The patients treated surgically were more satisfied with the results of their treatment. Strength, power, and endurance as measured on the Cybex II dynamometer revealed that the patients treated non-surgically attained only 72 percent of normal strength and 70 percent of normal power and endurance as compared with the surgically treated patients. Wound complications occurred in only two patients and no reruptures occurred in the surgically treated group, whereas there were nine re-ruptures in the group not treated surgically. Greater power achieved after operative treatment and a low infection rate occur when good surgical technique is used [2] studied 150 consecutive patients with a closed acute rupture of the Tendo Achilles were assigned randomly for surgical and non surgical treatment. After treatment, the patents were evaluated clinically and with static and dynamic measurements of plantar flexion strength. Only minor difference was noted between the final results in the two groups. Non surgical treatments have the advantage of shorter morbidity and no hospital stay. Two re-rupture and

two deep infections in patients who had operations as compared with five re-rupture in the conservatively treated patients [4] treated thirty cases with complete ruptures of the calcaneal tendon by external fixation. In thirty patients the results were excellent or good. There was no infection or re-rupture. Two patients with fair results had sural nerve injury. The only patient with poor result had Sudeck's atrophy. It is felt that this operation satisfies the need for a new technique which is simple and combines the advantages of both surgical and non-surgical treatment without their major complications [1] have reviewed 106 patients after treatment for spontaneous rupture of the calcaneal tendon and assessed the clinical results including the power of plantar flexion. The patients treated within 48 hours of injury the results was very similar in conservatively and in operatively treated patients. The incidence of major complications was higher after operation (17%) than in those treated conservatively (4%). Patients, who were treated more than one week after injury, however had an inferior result with respect to power of plantar flexion after conservative management. The result was excellent or good in six patients and fair in one. Post operatively, two patients needed an adjuvant procedure one a local rotation flap and the other a split thickness skin graft. Both patients had excellent restoration of function. The patient who had a fair result has a persistent limp and residual discomfort. There were no re-rupture.the results of their study indicate that transfer of the tendon of the flexor digitorum longus is an effective and durable operation for reconstruction of the Achilles tendon in patients in whom the rupture has been neglegted or treatment has failed. However, injuries due to lavatory pans are peculiar to the third world, crowded urban set up in South Asia where the population and available toilet facility ratio demands quick turnover and therefore hurry. The design of the pan and need to squat invites slipping of foot into the hole of pan. World literature has no mention of this type of injury [12] described forty seven cases with fresh open Achilles tendon injuries were treated by pull down of the proximal tendon. Average dorsiflexion was 20 degrees at 12 weeks after surgery, was quite close to the normal range of motion. This method is effective in reducing postoperative dorsiflexion limitation. No infection related long term effect is found in any case. All the patient return to normal daily activity without any physical limitation. Greater loss of strength in the injured leg was seen in the Mitek- group. They do not advocate the use of Mitek-anchors for the repair of acute ruptured Achilles tendons. Now a days, more evidence is produced in favour of operative treatment over non-operative treatment [13] described that Tendo Achilles injuries commonly occur following cycle spoke injuries or after a fall into Indian style closets. If patient present within 6 to12 hours of the injury a thorough wash followed by primary or delayed repair of the tendon can be done.

Anatomy of Tendo Achilles

The Tendo Achilles is the largest and strongest human tendon is about 15 long beginning near mid level in the leg and is formed by the gastrocnemius and soleus muscle. The tendinous portions of the Gastrocnemius and Soleus muscles merge to form Achilles Tendon. Over 90% cases Plantaris muscle is present medial to the tendon. The Gastrocnemius tendon originates as a broad aponeurosis at the distal margin of the muscles bellies, whereas the Soleus tendon begins as a band proximally on the posterior surface of the soleus muscle. Distally the tendon become progressively rounded in cross section, to a level 4 cm proximal to Calcaneal tuberosity, where it can become relatively flatter before inserting on the superior aspect of calcanean tuberosity. The fibers of the Achillies tendon spiral through 90 degrees during it's descent, such that fibres that lies medially in the proximal portion become posterior distally. In this way elongation and elastic recoil within the tendon are possible and stored energy can be released during the appropriate phase of locomotion. Also this stored energy allows the generation of higher shortening velocity and greater instantaneous muscle power than could be achieved by contraction of Triceps surae alone. The calcaneal insertion of the Achilles tendon is highly specialized, as it is composed of attachment of the tendon; a layer of hyaline cartilage and an area of bone not cover by periosteum. A subcutaneous bursa may lie between the tendon and the skin to reduce friction between the tendon and the surrounding tissues. A retro calcanean bursa lies between the tendon and the calcaneus [8]

Structure of the Tendon

Tendons act as transducers of the force produced by muscle contraction to bone. Collagen accounts for 70 percent of the dry weight of a tendon. Approximately 95 percent of tendon collagen is type-I collagen, with a very small amount of elastin. Elastin can undergo as much as 200 percent strain before failure. If it were present in the tendon in high proportions, there would be a decrease in the magnitude of force transmitted to bone.Collagen fibrils are bundled into fascicles containing blood and lymphatic vessels as well as nerves. The fascicles are grouped together, surrounded by epitenon, and form the gross structure of the tendon, which is further enclosed by paratenon, separated from the epitenon by a thin layer of fluid to allow tendon movement with reduced friction. Although the normal Achilles tendon consists almost entirely of type-I collagen, a ruptured Achilles tendon also contains a substantial proportion of type-III collagen. Fibroblasts from ruptured Achilles tendons produce both type-I and type-III collagen on culture.

Type-III collagen is less resistant to tensile forces and may therefore predispose the tendon to spontaneous rupture. The normal Achilles tendon shows a well organized cellular arrangement in stark contrast to one that is ruptured. Tenocytes, which are specialized fibroblasts, appear in transverse sections as stellate cells and are arranged in rows in longitudinal sections. This orderly arrangement probably is due to the uniform centrifugal secretion of collagen around the column of tenocytes,which produce both the fibrillar and the nonfibrillar components of the extracellular matrix and may also reabsorb collagen fibers.

Blood Supply

Tendons can receive their blood supply from vessels originating from three sources: the musculo tendinous junction, the surrounding connective tissue, and the bone tendon junction. The blood flow of the Achilles tendon depends on age, with a higher blood flow in younger individuals. The Achilles tendon is poorly vascularized, especially in its midportion , with blood vessels running from the paratenon into its substance. There is a dispute concerning the distribution of blood vessels in the tendon.

Some investigations have shown that the density of blood vessels in the middle part of the Achilles tendon is low compared with that in the proximal part. Others have shown, with use of laser Doppler flowmetry that blood flow is evenly distributed throughout the Achilles tendon and may vary according to age, gender, and loading conditions [8].

Biomechanics of the Tendon

Actin and myosin are present in tenocytes, and the tendon itself may have an active contraction-relaxation mechanism, which could regulate the transmission of force from muscle to bone. Fukashiro *et al*. measured a peak force of 2233 newtons within the human Achilles tendon *in vivo*. Komi *et al*. used buckle-type forcetransducers attached to the ankles of volunteers to show that, during walking, force builds up within the tendon before the heel strikes the ground. The force is then suddenly released for ten to twenty milliseconds during early impact. Thereafter, force builds up relatively fast until it reaches a peak at the end of the push-off phase, in a pattern similar to that observed during running. More recently, Arndt *et al*. showed that the Achilles tendon can be subjected to non uniform stresses through modifications of individual muscle contributions. An injury therefore can be produced by a discrepancy in individual muscle forces caused, for example, by asynchronous contraction of the various components of the triceps surae or by uncoordinated agonist-antagonist muscle contraction due to impaired transmission of peripheral sensory stimuli. At rest, a tendon has a wavy configuration, a result of crimping of the collagen fibrils. Tensile stresses cause the loss of this wavy configuration, accounting for the toe-region of the stress-strain curve (. As collagen fibers deform, they respond linearly to increasing tendon loads. If the strain placed on the tendon remains at less than 4 percent — that is, within the limits of most physiological loads — the fibers regain their original configuration on removal of the load. At strain levels between 4 and 8 percent, the collagen fibers start to slide past one another as the intermolecular cross links fail. At strain levels of greater than 8 percent, macroscopic rupture occurs because of the tensile failure of the fibers and inter fibrillar shear failure.The compliance of the tendon is dependent at least in part on intratendinous waviness, which may affect the ability of the gastrocnemius-soleus muscle complex to generate force at the extremes of joint motion. Ultimately, it may also influence the forces exerted by muscle contraction on the tendon and, hence, the propensity [8].

4. Objectives

General objective

- To assess the results of early repair of open Tendo-Achilles injury and evaluate the outcomes.

Specific objectives

1. To assess the functional outcome of open Tendo-Achilles injury.
2. To find out the common complications like rate of infection, joint stiffness, calf muscle wasting, loss of power of planter flexion of ankle joint.

5. Materials & Methods

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 ($P<0.05$).

6. 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. This study was done at Orthopaedics Department of DMCH,

cases were operated at Casualty OT. Then patients were followed up at orthopaedic surgery OPD and orthopaedic surgery indoor routinely.

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.

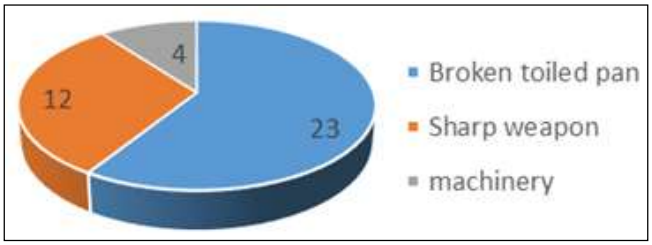

Fig 1: Showing causes of injury 57% injury was due to sharp edge of broken toilet pan following slip on Indian type of toilet pan.

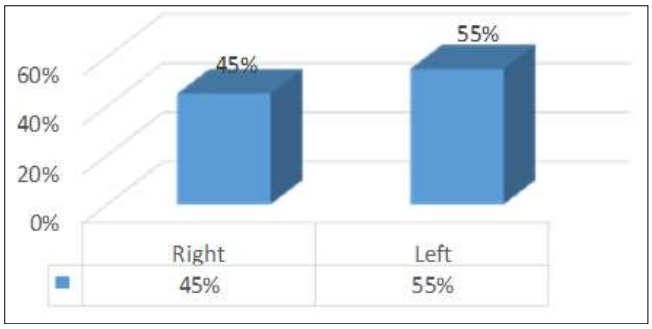

Fig 2: Showing side involvement. Left side was more affected about 22(55%) and right side was18 (45%).

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.

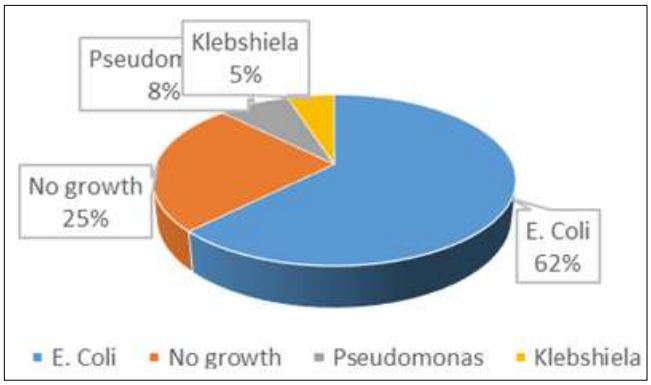

Fig 3: showing result of swab culture

After final toileting wound swab was sent for culture sensitivity and found in 62% cases E. coli, 8% pseudomonas, 5% klebshiela and in 25% cases no growth.

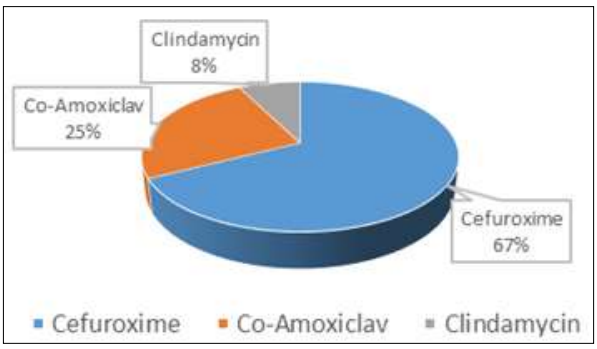

Fig 4: Showing different antibiotics found sensitive to microorganisms.

In 67% cases I had not to change my prescribed antibiotics at first time, because of 67% organism were sensitive to cefuroxime axetil others changed accordingly.

Table 3: Treatment delay (N=40)

Delay	Number	Mean delay	Standard deviation
< 4 hours	4	6 hours 17 minutes	± 2.630
4-6 hours	22		
6-8 hours	7		
10-12 hours	7		
Total	40		

Time of repair: All the cases were operated on emergency basis after admission through emergency department. Most of the cases were operated within 6 hours of injury. Mean delay of repair was 6 hours 17 minutes, with standard deviation ± 2.630 minutes.

Table 4: Showing total follow up period after surgery (N=40)

Follow up period in months	Frequency	Minimum Period (In month)	Maximum Period (In month)	Mean follow up period (In month)	Standard deviation
5-8	17	5	16	9	± 1.76
9-12	21				
>12	2				
Total	40				

All the patients advised for regular follow up at Orthopaedics out door or in Orthopaedics indoor of DMCH. One or 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 5 and 16 months respectively. Mean follow up period was 9 months with standard deviation was ± 1.76.

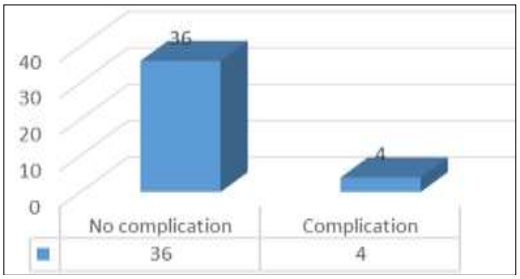

Fig 5: showing various complications.

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

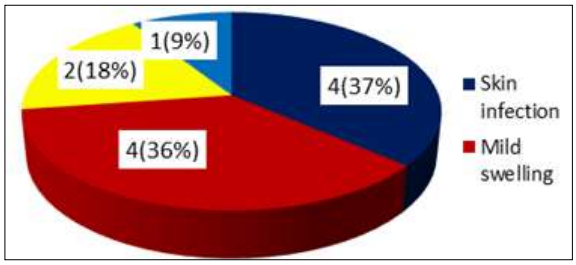

Fig 6: Showing various minor complications

Minor complication were superficial skin infection 4(36.5%) Wound gap 1(9%) Mild Swelling 4(36.5%) Ugly scar 2(18%)

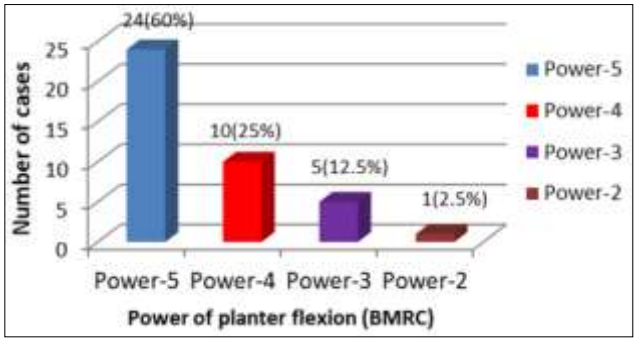

Fig 7: Showing power of planter flexion (BMRC)

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

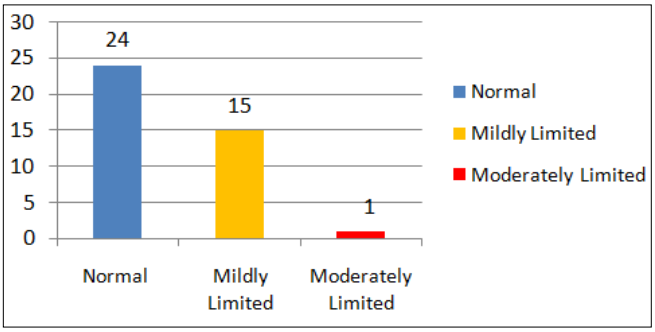

Fig 8: showing range of motion of ankle joint

Range of motion: Dorsi-flexion and plantar flexion at the ankle joint on the injured side compared with the non-injured side. Difference in either direction (degree) was measured. A full range of motion was regained in 24 cases. A change of 5 degree or less was found in 15 cases. In 1 case more than 5-degree movement was restricted.

Table 5: Calf muscle wasting (N=40)

Level of wasting	Frequency	percent	Valid percent	Cumulative percent
None (15)	22	55	55	100
Mild (10)	17	42	42.5	45
Moderate(5)	1	2.5	2.5	2.5
Total	40	100	100	

Calf muscle wasting: Calf muscle wasting measured as maximum calf circumference as a ratio between injured and non-injured side.

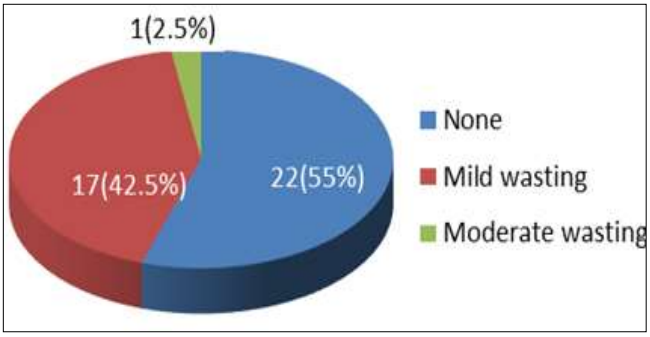

Fig 9: Showing Calf muscle wasting

Table 6: Ability to stand on affected tip toes or foot (N=40)

Ability to stand	No of cases	Percentage
Can stand on affected tip toes unsupported	36	90%
Cannot stand on tip toes but able to stand on affected foot	3	7.5%
Cannot stand on affected foot unsupported	1	2.5%
Total	40	100%

90 % patient showing ability to stand on tip toes without support.

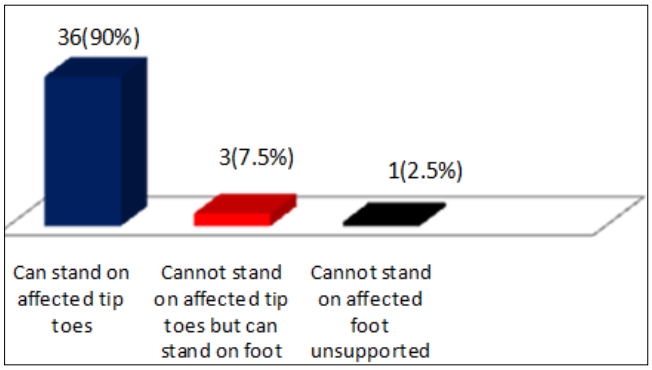

Fig 10: Showing Ability to stand on affected tip toes or foot. Final outcome measured according to Juhana Leppilahti modified scoring scale.

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. Common complications were superficial skin infection (9 cases), pain persists for months (17 cases), swelling persists for months (4 cases), ugly scar (2 cases) and wound gap (1 case) [1] Described re-rupture of tendon and deep venous thrombosis as major complication and minor plaster sore, sural nerve lesion, delayed wound healing as a minor complication. In our study no major complication occurred but minor complication like superficial skin infection, delayed wound healing occurred which were successfully managed with an oral antibiotic regimen with no long term sequelae. One patient with wound gap had to re - admit in hospital for sural island flap. All patients returned to their normal activities after a variable period of 6-16 months without complaints. There was no re-rupture case in this study. In this series we used 5 parameters according to Juhana Leppilahti Modified Scoring System to assess the final outcome of the patient functionally. These were stand on affected tip toe unsupported, range of motion of affected side ankle, power of plantar flexion, calf muscle wasting and complications. These parameters were also used in various study described in various literatures [18]. 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 forty acute open Tendo Achilles injured patients after 16 weeks of treatment. Among them 36(90%), patients were able to stand on tip toes , 3 (7.5%) patients could not stand on tip toes of affected foot unsupported but were able to stand on affected foot unsupported and 1 (2.5%) patient failed to stand on affected foot unsupported due to severe infection and wound gap. 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 [4]. 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. 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.

8. Limitation of this study

1. One methodological limitation of this study was the use of purposive sampling of the participants the entire sample was collected from the emergency and casualty department. This sampling may bias the generalization of findings.
2. The sample size was small.
3. The work was done on only one group of population.

References

1. Carden DG, *et al*. Rupture of the Calcaneal Tendon-The early and late management. J Bone Joint Surgery [Br], 69(B), 1987, 416-20.
2. Nistor L. Surgical and non-surgical treatment of Achilles tendon rupture-A prospective, randomized study. J Bone Joint Surgery [Am], 63-A, 1981, 394-98.
3. Bosworth DM. Repair of defects in the Tendo Achilles. J Bone Joint Surgery [AM]. 1956; 38-A:111-14.
4. Nada A. Rupyure of the Calcaneal Tendon. J Bone Joint Surgery [Br]. 1985; 67(B):449-53.
5. Azar MF. Traumatic Disorder. In: S.T. Canale, J. H. Beaty, eds. 2008. Campbell's Operative Orthopedics, 11th edition. Philadelphia, Pennsylvania: Mosby Elsevier, 2008, 2748-51.
6. Mahmud SW, *et al*. Repair of Calcaneal Tendon-An improved technique. J Bone Joint Surgery [Br]. 1992; 74-B:114-17.
7. Inglis AE, *et al*. Ruptures of the Tendo Achilles-An objective assessment of surgical and non-surgical treatment. J Bone Joint Surgery [AM], 1986; 58-A:990-93.
8. Maffulli N. Current concept review-Rupture of the Achilles tendon. J Bone Joint Surgery Am. 1989; 81:1019-39.
9. Gillies H. The management of fresh rupture of Tendo Achilles. J Bone Joint Surgery. 197; 52(A):337-42.
10. Inglis AE, *et al*. Ruptures of the Tendo Achilles-An objective assessment of surgical and non-surgical treatment. J Bone Joint Surgery [AM].1976; 58-A:990-93.
11. Lynn TA. Repair of the Torn AchillesTendon using the Plantaris tendon as a reinforcing membrane. J Bone Joint Surgery [Am]. 1996; 48-A:268-72.
12. Ahmed S. Surgical repair of open Achilles tendon injuries using No.1 prolene to pull down the proximal tendon; A safe technique. The Journal of Teachers Association RMC. 2008; 21(2):132- 34.
13. Oommen AT, *et al*. Management of open chronic Tendo Achilles injuries: A case report. The Foot and Ankle Online Journal. 2010; 3(1):2
14. Mahmud SW, *et al*. Repair of Calcaneal Tendon-An improved technique. J Bone Joint Surgery [Br]. 1992; 74-B:114-17.
15. Chatterjee SS, *et al*. Management of acute open Tendo-Achilles injuries in Indian lavatory pans. Indian J Plast Surg. 2006; 39:29-33.
16. Franke MK., *et al*. Surgical treatment of the Achilles tendon: a review of long- term results. Br. J. sports medicine. 1995; 29(2):121-25.
17. Schönberger TJA, *et al*. Operative Treatment of Acute Achilles tendon Rupture: Open End-to-End-Reconstruction versus Reconstruction with Mitek-Anchors. Acta chir belg 2008, 108:236-39.
18. Aldam CH. Repair of Calcaneal Tendon ruptures. J Bone Joint Surgery [Br]. 1989; 71(B):486-88.