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Research Article

The Compliance of Patient of Reconstruction in Respect of Increment of Thickness of Reconstructed Tendon and Calf Muscle Wasting

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Abstract: ***Background:*** Tendon repair presents a unique set of obstacles to the reconstructive hand surgeon, and in the most severe cases, limb salvage may be difficult in and of itself. Tendon repair efforts may have a variety of functional outcomes with major financial and psychological consequences. ***Objective:*** To assess the compliance of patient of reconstruction in respect of increment of thickness of reconstructed tendon and calf muscle wasting. ***Methodology:*** This study conducted from July 2006 to December 2007, Dhaka Medical College Hospital (DMCH) conducted this prospective research. 20 patients who visited the DMCH outpatient department were chosen using a non-randomized purposive sample approach. Each instance was determined to be an old, untreated tendoachilles injury, and it was all treated surgically using the Bosworth approach. Finally, 18 participants participated in the trial. The information was acquired by taking a history, doing a clinical examination, and conducting an investigation. It was then entered into the SPSS software program. ***Results:*** The oldest patient was 47 years old, with patients ranging in age from 17 to 47. The patients were 31.7 years old on average, with a 9.8-year standard deviation. There were around five males for every one woman. Nearly two-thirds of the patients (67%) had a left tendo-achilles involvement, whereas the remaining third (33%) had a right tendo-achilles involvement. Nearly two-thirds of the patients (67%) had a left tendo-achilles involvement, whereas the remaining third (33%) had a right tendo-achilles involvement. Final outcome showed the majority of patients (83.3%) had positive results, whereas 16.7% had negative results. After-surgery complications revealed that the majority of patients (83.3%) had positive results, while 16.7% had negative results. ***Conclusion:*** The outcome of this procedure depends on a variety of factors. Therefore, it is still difficult for an orthopaedic surgeon to treat a tendoachilles injury that has been neglected for a long time.
Keywords: Reconstruction, Tendon Repair, Limb Injuries, Tendo-achilles.

INTRODUCTION:

According to the National Trauma Data Bank Annual Report 2013, 29.77% of all trauma patients in the United States had upper limb injuries.[1] In the most severe instances, limb salvage may be challenging in and of itself, and tendon repair provides a distinct set of challenges to the reconstructive hand surgeon.[2,3] Tendon repair attempts may result in varying functional results with significant economical and psychological effects.[4] The primary concerns in these patients are bone stability and well-vascularized tissue covering, but anatomical intricacy, cosmetic and functional considerations, and simultaneous life-threatening injuries create unique reconstructive problems. Tendon reconstruction is perhaps the most challenging undertaking due to the requirement to re-establish not just tendon continuity, but also gliding environments and surrounding structures with prehension restoration. As a result, both surgeons and patients often underestimate the complexity of tendon restoration in severe injuries.

The most major issue in flexor tendon repair is a scarcity of donor tendon materials for grafting and post-operative flexor tendon adhesions.[5] Although palmaris, plantaris longus, and toe extensor tendon autografts are regularly employed, the tissue needed in the most intricate and catastrophic injuries often surpasses availability. Potenza initially characterized adhesions in 1963, and they are by far the most frequent complication after reconstruction. Adhesions are generated by various factors, including the location and kind of damage, the surgical method, and the nature of the wound healing response.[6,7,8] This is particularly common in zone II injuries, as both deep and superficial flexor tendons slide in a narrow fibro-osseous tunnel. Intrasynovial tendons exhibit intratendinous neovascularization rather than the peripheral vascular adhesions found in extrasynovial tendons, resulting in superior functioning in intrasynovial grafts.[9] This implies that intrasynovial tendons mend on their own, but extrasynovial tendons rely on peripheral

neovascularization, which increases adhesions. Due to donor site morbidity and a scarcity of donor intrasynovial tendons, this information has not been incorporated into clinical practice in the management of severe injuries.

Cadaveric allograft tendons may be a rare alternate choice for grafts when the patient does not desire an autograft or when the availability of tendon autografts is insufficient.[10] However, because to the scant cellularity of tendons, this approach has the same problems as any other allogeneic transplant, such as the risk for disease transmission and the necessity for immunosuppression, although to a smaller level than other tissue types. These difficulties have prompted researchers to look for new transplant sources. In terms of postoperative strength and healing, synthetic tendon made of silastic sheets and Dacron has thus far lagged behind human tendon.[11,12] Significant progress has been achieved in creating decellularized cadaveric flexor tendon allografts in recent years, as detailed in the New Directions section below. Tang and colleagues, on the other hand, have shown good outcomes using tendon allografts that were sterilized and stored by deep freezing without decellularization.[13] A pilot trial of 22 patients revealed that this approach produced functional results equivalent to autografting while causing no immunogenic response. Proximal and distal interphalangeal joint stiffness and volar-based contractures are common complications of tendon reconstruction, as are pulley failure with resultant bowstringing, repair ruptures, triggering, lumbrical plus deformities, and quadriga phenomena. Patients with extensively polluted wounds, concurrent thermal or chemical traumas, or simultaneous fractures or crush injuries are at a much higher risk of infection.[14,15,16] These problems almost often lead to inferior functional results.

Objective: To assess the compliance of patient of reconstruction in respect of increment of thickness of reconstructed tendon and calf muscle wasting.

METHODOLOGY:

Study design: This is a Quasi-experimental study.
Study place: DMCH, Dhaka
Study duration: From July 2006 to December 2007
Study subjects: For this study, 18 individuals with a history of neglected tendoachilles injuries were chosen.
Sample size: Total sample size were 18
Sampling method: Purposive sampling using a non-random process was used in accordance with the inclusion and exclusion criteria.

Inclusion criteria

- Any sex 16–48-year-olds were chosen.
- All cases had tendo Achilles injuries, either cut or ruptured, that were either untreated or inadequately treated for 2–32 weeks.
- Trouble walking, running, leaping, and descending stairs
- All Thompson tests positive.
- Injury 2–6 cm from tendo Achilles insertion.

Exclusion Criteria:

- Age 16–50
- Infected, partially ruptured, poor scar, and adhesion around the wounded tendon.
- This series excluded open or closed injuries.
- Involved limb tibia/fibula fracture.
- Tendon-insertion injuries between 2 and 6 cm.

Abandoned cases: It means those treated after 2 weeks without prior therapy.

Study protocol: The study protocol considered age, sex, level of injury, side of involvement, causes of injury, delay from injury to operation, gap between two ends of injured tendon, reduction of calf muscles circumference, ability to stand on tiptoe of affected side, power of calf muscle contraction, thickness of reconstructed tendon, and post-operative complications. Tape measured calf muscle circumference. A measuring scale assessed the patient's tiptoe heel height. BMRC assessed planter flexion power. Slide calipers measured rebuilt tendon thickness.

Data collection: The data were gathered by getting a history, doing a clinical examination and investigation, finding out what happened during the surgery, finding out what happened after the surgery, and keeping track of what happened after the surgery. The information was written down on an organized data gathering sheet that had already been made.

Data analysis: The facts collected were adjusted by hand. The data was then put into the SPSS software program. The information that was put in was checked and confirmed. The same tool was used to look at the data.

Ethical clearance: After explaining the therapy, expected outcomes, pros, drawbacks, and ethical problems, patients or legal guardians gave informed permission.

RESULTS:

Age distribution

According to Table 1, approximately 17% of the patients were 20 years old or younger, 38.9% were between the ages of 21 and 30, 27.8% were between the ages of 31 and 40 years old, and the remaining 16.7% were older than 40 years old. The patients' ages ranged from 17 to 47 years, with 47 being the oldest. The patients' mean age was 31.7 years, with a standard deviation of 9.8 years.

Table 1. Distribution of patients by age (n = 18)

Age (yrs)*	Frequency	Percentage
≤20	03	16.7

21-30	07	38.9
31-40	05	27.8
>40	03	16.7

*Mean age = (31.7 ± 9.8) years; range = (17-47) years.

Figure 1 depicts the gender distribution of the patients, revealing that the vast majority (83%) were men. The proportion of men to women was around 5:1.

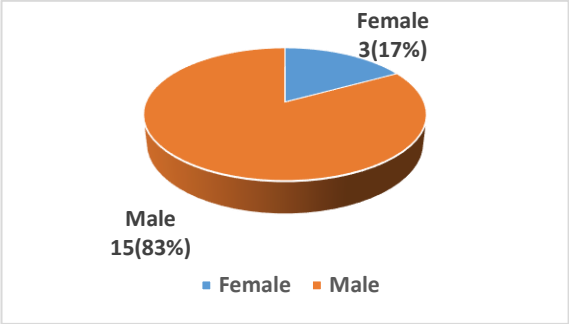

Fig.1 Distribution of patients by sex (n=18)

Figure 2 demonstrates that the left tendo-achilles was implicated in almost two-thirds of the patients (67%) whereas the right tendo-achilles was involved in the remaining third (33%) of the patients.

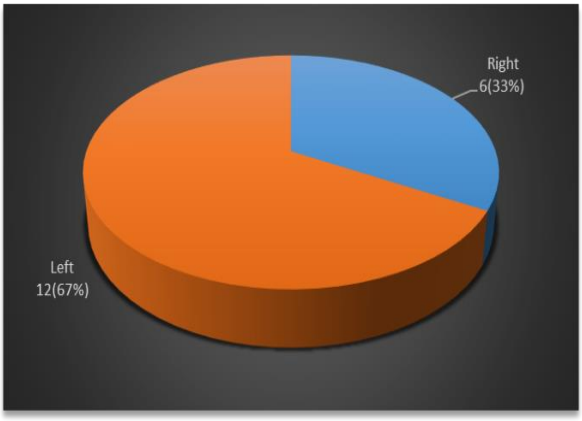

Fig.2 Distribution of patients by side involved

In terms of the severity of the injuries, more than sixty percent of the patients had injuries within five centimeters of the tendoachilles insertion. The remaining 38.9% suffered damage at a distance of 5 or more than 5 cm above the insertion. The lowest degree of damage was 2.5 cm, while the maximum level measured 6 cm (Table 2). The median level of injury measured 4.5 cm above the insertion point.

Table 2. Distribution of patients by level of injury (n = 18)

Level of injury	Frequency	Percentage
< 5 cm	11	61.1
≥ 5 cm	07	38.9

Delay between injury and operation: Half of the patients had their operations within 10 weeks of receiving their injuries, whereas the other half of the patients had their operations either 10 weeks after their injuries or later. The minimum amount of time that had passed between the injury and the procedure was six weeks, whereas the maximum amount of time that had passed was thirty-two weeks (Table III).

Table 3. Delay between injury and operation (n = 18)

Delay between injury and operation	Frequency	Percentage
< 10 weeks	09	50.0
≥ 10 weeks	09	50.0

Assessment of the patient following surgery:

According to the standards set forth by Howerd et al. (1984), Table IV demonstrates that the mean power of plantar flexon, mean calf width, and mean score of ability to stand on tiptoe on the injured side were 85.6%, 87.9%, and 64.8% and 132.1% respectively. These values ranged from 60 to 100%, 68.9 to 95.4%, 15.4 to 85.7%, and 120 to 157.

Table 4. Assessment of patient after surgery (n = 18)

Outcome variables	Score after operation (%)	
	Mean	Range
Power of plantar-flexon	85.6	60-100
Diameter of the calf	87.9	68.9-95.4
The ability to stand on tiptoe	64.8	15.4-85.7
Thickness of the tendon	132.1	120-157.9

The final decision was made based on a scientific analysis. Patients who had a great or good outcome were considered to have a satisfactory outcome. Patients who had a bad or poor outcome, on the other hand, were considered to have an unacceptable outcome. Table V shows that most of the patients (83.3%) had good outcomes, while 16.7% had bad outcomes.

Table 5. Distribution of patients by final outcome

Final outcome	No of cases	Percentage
Satisfactory	15	83.3
Unsatisfactory	03	16.7

Table 6 lists the post-operative problems that the patients experienced. 22.2% of the patients reported prolonged ankle edema, 11.1% had skin that had shed, 5.6% had sensory deficits throughout the sural nerve distribution, and the other 5.6% experienced ankle discomfort.

Table 6. Distribution of patients by complication (n = 18)

Complications	Frequency	Percentage
Skin sloughed out	02	11.1
Sensory deficit along the sural nerve distribution	01	5.6
Persistent swelling of the ankle	04	22.2
Ankle pain	01	5.6

DISCUSSION:

This is an observational research that involves 18 individuals who had a previous injury to their Achilles tendon that had been ignored. The Bosworth approach was used to do surgery on each and every patient. Patients were followed for a range of 4–15 months, with a mean period of follow up of 9.73.9 months (range: 4–15 months). The therapy of late presentation of ruptured calcaneal tendons has scarce published findings, and the majority of these results are subjective.

Any age is at risk for sustaining a tendoachilles injury caused by trauma. In this particular study, the patients' ages ranged from 17 to 47 years, with a mean of 31.7 years and a standard deviation of 9.8 years. There were three patients who were 20 or younger, seven who were between 21 and 30, five who were between 31 and 40, and three who were older than 40. The frequency of ruptures was at its highest point in the fourth decade. [2] 68 cases diagnosed with tendoachilles rupture. The average age of a patent held by them was 42 years. [11]

In all, there were 15 male patients (83%) and 3 female patients (17%) in this series. The ratio of men to women was five to one. In all, there were 107 instances, with 96 men and 11 women affected.[12] There were ten men and two females in the study group of twelve cases, and the male-to-female ratio in the study group of forty-eight cases was five to one.[13] Male predominance in tendoachilles injury due to lower levels of physical activity in females compared to men; out of 43 patients, they identified 4 females and 39 males.[14]

The left side was responsible for 12 injuries (67%) whereas the right side was responsible for 6 injuries (33%). out of 106 instances, there were 58 cases on the left side and 48 cases on the right side.[12] Out of 41 patients, there were 27 instances on the left side and 14 cases on the right side.[16] Out of the total of 44 instances, there are 28 on the left side and 16 on the right side.[15] Out of 46 patients, 29 instances were found on the left side, while 17 were found on the right side.[10]

In this study, the shortest time between the injury and the procedure was 6 weeks, while the longest

was 32 weeks. 9 patients, or 50%, had surgery within 10 weeks after receiving their injuries, while the other 9 cases, or 50%, underwent surgery 10 weeks or later after their injuries. Our patients had injuries at a level that was between 2.5 and 6 centimeters above the insertion of the tendoachilles. 61.1% of patients had damage within 5 centimeters of the insertion point, whereas 38.9% experienced harm more than 5 centimeters above the insertion point. The area that is most hypovascular and, as a result, the most typical location of rupture is between 2 and 6 centimeters proximal to the insertion of the tendoachilles. [2] Eight instances in which the lesion was located immediately proximal to the insertion, and five cases that fell between 2.5 and 3.5 cm in distance. Lynn (1966) discovered that the amount of harm occurred between 1.25 and 5 centimeters away from the insertion.[17] The typical location of the lesion is around 3.8 centimeters away from the insertion point.[10] Even many years after the rupture, it is common for the calf circumference to have decreased.[14]

According to the findings of this research, the afflicted side had a mean calf width that was 87.9% (with a range from 68.9% to 95.4%) of the width of the unaffected side. The operated side had a calf width that was 94% (ranging from 89% to 98%) of the normal side on average.[3] After a period of immobility after a rupture of the tendoachilles, the calf muscle quickly atrophys, and a biopsy of the soleus muscle shows a specific reduction in type-1 fiber in comparison to type II b fibre.[20] When compared to the normal side, the afflicted side had a mean score of 64.8% when it came to being able to stand on its toes (range: 15.4%-85.7%) 5 cases of tendoachilles injuries that presented late and were repaired with the use of carbon fiber to create a neotendon.[3] The percentage of his unaffected side on which he was able to stand on his afflicted toe varied from 79% to 87.5%. He demonstrated this skill. The rebuilt tendon now has a greater thickness all the way through. The rebuilt tendon had a mean thickness of 132.1% of the thickness of the unaffected side, with a range of 120-157.9%.

According to Howard's research, the thickness of the repaired tendon was, on average, 148% of the thickness of the unaffected side, with a range of 120% to 167%. In every case, the tendon was seen to be ruptured at the location of the injury.[19] He discovered a 5–9 mm greater thickness compared to the unaffected location. Patients whose outcomes were considered exceptional or good are suggested as acceptable, whilst patients whose results were considered fair or bad are advised as unsatisfactory. We discovered an acceptable result in 15 patients, accounting for 83.3% of the total, and an unsatisfactory outcome in 3 patients, accounting for 16.7% of the total. The satisfactory outcome of this series (83.3%), which is equivalent to the result as 91%, 92%, 85.7%, and 93% of patients were happy with their operational therapy, indicates that this series has a satisfactory outcome. [11,19,21-26]

Patients in this group had a wide range of problems throughout their course of treatment. The significant complication of skin slough over the repaired tendon occurred in 2 individuals (11.1%) of the total. It's possible that this is because to increased strain in the skin closure. When the equinus angle of the ankle is more than 15 to 20 degrees, it is difficult to close the skin without creating undue stress. A full thickness skin transplant was performed on one patient, while a sural artery island flap was performed on the other patient. 4 patients, representing 22.2% of the total, experienced chronic ankle edema, and 1 patient, representing 5.6% of the total, had sensory deficits along the distribution of the sural nerve. Another patient was complaining of discomfort in their ankle. Two re- rupture in 44 patients, one in 48 patients, 7 re-rupture out of 32 patients. We did not discover any new ruptures.[11,12].

92 patients who had tendoachilles injuries repaired experienced major complications such as wound infection in three patients, skin slough in eleven cases, sinuses in four cases, and re-rupture in four cases. These patients also experienced minor complications such as adhesion of tendon to skin in 23 cases and sural nerve injury in 16 cases.[7] The open surgical repair was performed on 45 patients, and complications such as wound infection in two instances, re-rupture in two cases, attachment of tendon to skin in nine cases, and damage to the sural nerve in nine cases were identified.[12] In 74 patients who had open surgical repair performed, there were 2 cases of wound infection, 2 cases of tendon rupture, 20 cases of adhesion of tendon to skin, and 9 cases of sural nerve damage.[26] In sixteen patients, there were two cases of post-operative skin slough.[27]

CONCLUSION:

The final result of this operation is contingent on a number of different circumstances. When there is a delay in either the diagnosis or the presentation of a tendoachilles injury, treatment may be challenging. In the event that treatment is delayed for two to three weeks, a rupture in the tendoachilles becomes constricted, and a big gap is established in the wounded tendon. It was discovered that the Bosworth approach was quite helpful in overcoming this significant post-operative problem. Because marlex mesh and carbon fiber are not readily available, we have been forced to do the repair by extracting healthy tendon or fascia as the donor. Achilles tendon defects should be considered in the context of orthoplastic reconstruction. The use of specialized digital imaging methods makes flap surgery easier and lowers the possibility of flap problems.

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