Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Orthopaedic Surgery

The Functional Outcome of Boswarth Technique in terms of Ability to Stand on Tip Toes of Affected Side and Power of Planter Flexion

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DOI: https://doi.org/10.36347/sjams.2024.v12i09.010 | **Received:** 11.07.2024 | **Accepted:** 15.08.2024 | **Published:** 21.09.2024

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Abstract **Original Research Article**

Background: Bosworth healed an Achilles tendon rupture by wrapping a wide strip of the proximal aponeuros is around the proximal and distal tendon stumps. ***Objective:*** To find out the functional outcome of Boswarth Technique in terms of ability to stand on tip toes of affected side and power of planter flexion. ***Methodology:*** DMCH conducted this prospective research from July 2006 to December 2007. Non-randomized purposive sampling chose 20 DMCHF outpatients.18 patients were first studied. Data was hand-edited. After that, SPSS data was entered. ***Results:*** The youngest patient was 17 years old and the oldest 47 years old.5:1 male-female ratio. Nearly 40% of patients were injured by an overhanging toilet pan, 27.8% by traumatic rupture, and 11.1% by a sharp weapon. The median injury level was 3.5 cm above the tendoachilles insertion, whereas the lowest and highest were 2.5 and 6 cm. Objective examination shows 45% of patients had excellent functional outcomes, 38.9% good, 11.1% fair, and 5.6% poor. This study's results were good in 83.3% and unsatisfactory in 16.7%. ***Conclusion:*** The Bosworth approach was simple to learn, making it potentially appropriate for foot and ankle surgeons with less training.

Keywords: Boswarth Technique, Planter Flexion, Achilles.

INTRODUCTION

By cutting a large strip of the proximal aponeurosis and weaving it around the proximal and distal tendon stumps, Bosworth was able to heal an Achilles tendon rupture. From the calcaneal insertion to 2 cm above it, the Achilles tendon's Zone I is located. Patients with chronic tendinitis, peritendinitis, retrocalcaneal bursitis, and a history of steroid injection at that level are more likely to have ruptures and avulsions in this region. Long-term ignored Achilles tendon ruptures in zone II (2–6 cm from the calcaneal insertion) produce a distal stump that is unsuitable for treatment. The considerable separation of the ruptured tendinous ends, which prevents end-to-end anastomosis from being used to treat neglected Achilles tendon ruptures, is another challenging issue.

A number of surgical techniques have been reported with the goal of grafting this gap and restoring the tendon's continuity. The grafts used in these surgeries included one or more Achilles tendon strips [1], the fascia lata [2], and tendons from the plantaris [3], peroneus brevis [4], flexor digitorumlongus [5], flexor hallucislongus [6], or posterior tibial [7] tendons. As scaffolding for the repair, synthetic materials like Dacron polyester [8] and carbon fiber [9] have also been employed. These studies all discussed zone II Achilles tendon restoration. The majority of research discussed repairing the Achilles tendon using smaller tendons. The surgical repair jeopardized the Achilles tendon's original functionality since these little tendons are weaker than the original tendon.

Following rupture or surgical division, tendinous tissue fails to spontaneously bridge the space between the divided ends.The tendon graft filling the deficiency is just strong enough to serve as a continuous bridge of tendinous tissue with the same texture as the original tendoachilles between the split ends [10]. It is not strong enough to withstand the stresses exerted by calf muscles. After six weeks of non-weight bearing and plaster encasement with the foot in plantar flexion, there is a noticeable hypertrophy of the tendinous framework [11]. It is seen that the size of this reparative tendinous mass progressively reduces over the course of the subsequent six weeks when weight bearing is gradually

resumed. Three months following surgery, full weight bearing is allowed [12].

There is a clear differential between the tendoachilles' quick healing of a recent rupture and delayed repair or the repair of an older rupture. In fact, rigidity of the calf muscles happens extremely quickly, making it impossible to coap the torn tendon ends within two to four days. Additionally, after a rupture, the tendon ends may be so severely torn that the tendinous tissue has actually lost length. Therefore, in order to achieve coaption, the tendinous structure must be repaired by being cut down from its original length. Therefore, in addition to its re suturing, some kind of tendon structure transplanting across the region of rupture is necessary even in the immediate repair of new instances [13]. Any open region between the tendon ends closes with scar tissue around a week after the rupture. If the tendon is not addressed, it will grow longer during healing, making it impossible for the patient to push off with the afflicted side. Activities like climbing or descending stairs are considerably hampered, as are running and leaping [14]. Reconstruction or delayed repair are recommended if posterior heel discomfort, swelling, or functional impairment are incapacitating. Treatment for ruptures older than three months is based on the patient's physiologic age, level of activity, and degree of functional impairment [15].

If there is a gap or defect between the two ends of the ruptured tendon, it makes recovery from Achilles tendon rupture difficult. This gap may be caused by a number of events operating alone or in concert. Infected after an open wound, delayed diagnosis, tendon retraction and degeneration, frayed ends, etc. The Achilles tendon may be repaired and rebuilt using a variety of surgical techniques. The proximal tendon is used to create two flaps that cover the tendoachilles [14]. Plantaris tendon is used to release the tendocalcaneus. Where there is a remote chance that a torn tendon can be sutured from end to end [15]. His technique makes use of the peroneus brevis tendon as a reinforcing graft as well as a dynamic transfer. Using a lengthy tendon strip from the gastrosoleus complex's median raphe, the tendoachilles is created [15] V-Y tendinous flap for tendoachilles chronic rupture repair [16].

Objective: To find out the functional outcome of Boswarth Technique in terms of ability to stand on tip toes of affected side and power of planter flexion.

METHODOLOGY

Study Design: This is a Quasi-experimental study.

Study Place: This study was carried out at DMCH, Dhaka.

Study Duration: From July 2006 to December 2007

Study Population: 18 patients with old neglected tendoachilles injury were selected for this series.

Sample Size: Total sample size were18

Sampling Method: Non randomized, purposive sampling technique was followed as per inclusion and exclusion criteria.

Inclusion Criteria:

A. Cases of any sex between the ages of 16 and 48 were chosen.
B. All instances had tendo Achilles injuries that were at least 2 weeks old and up to 32 weeks old, either cut or ruptured, and they had either had no prior therapy or insufficient care.
C. Difficulty climbing or descending stairs as well as difficulty walking, sprinting, or leaping.
D. A positive result on every Thompson test.
E. Injury site between 2 and 6 cm from the tendon Achilles insertion.

Exclusion Criteria:

A. Age between 16 and 50 years old
B. A damaged tendon that is partially sliced or ruptured, infected, has a poor scar and adhesions in and around it.
C. This series did not feature any recent (open or close) injuries.
D. Tibia/fibula of the afflicted limb associated fracture.
E. Injuries that occur between 2 and 6 cm from the tendoachilles' insertion.

Ethical Clearance: Following proper disclosure of the treatment plan, projected outcomes, potential benefits, drawbacks, and complications of all ethical problems, informed permission was obtained from patients or legal guardians.

Study Design: The study protocol was created taking into account important factors such as 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 the affected side's tiptoe, power of calf muscle contraction, thickness of reconstructed tendon, and post-operative complications. The circumference of the calf muscle was measured using a measuring tape. A measuring scale was used to determine the patient's maximum heel-to-toe height. The BMRC scale was used to quantify planter flexion's power. Using slide calipers, the thickness of the repaired tendon was assessed.

Data Collection:

The following methods were used to gather the data: a medical history, a clinical examination and investigation, preoperative findings, postoperative complications, and postoperative follow-up. In a

predesigned structured data collecting sheet, the collected data were recorded.

Data Analysis: Hand editing was done on the collected data. Following that, information was input into the SPSS computer program. Checks and double-checks were made on the entered data. The same application was used for data analysis.

RESULTS

Table 1 reveals that roughly 17% of the patients were 20 or younger, 38.9% were between 21 and 30 years old, 27.8% were between 31 and 40 years old, and 16.7% were beyond 40. The patients' ages ranged from 17 to 47 years old, with 31.7 9.8 as the mean and lowest and highest, respectively.

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

Figure 1 shows that majority (83%) of the patients was male. The male to female ratio was roughly of 5:1.

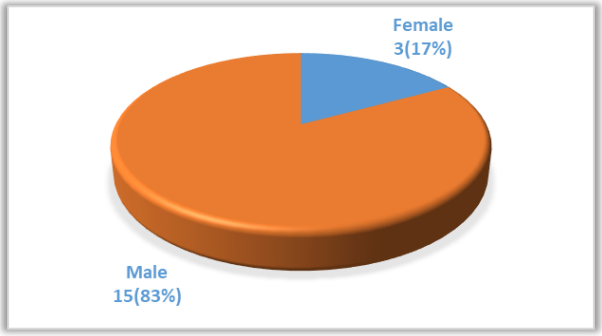

Figure 1: Distribution of patients by sex (n=18)

Toilet pan injuries accounted for around 40% of patient injuries, followed by traumatic rupture at 27.8%, sharp weapon assault at 11.1%, sharp edge of a metallic plate at 11.1%, sharp cutting injury at 5.6%, and broken glass at 5.5% (Figure 2).

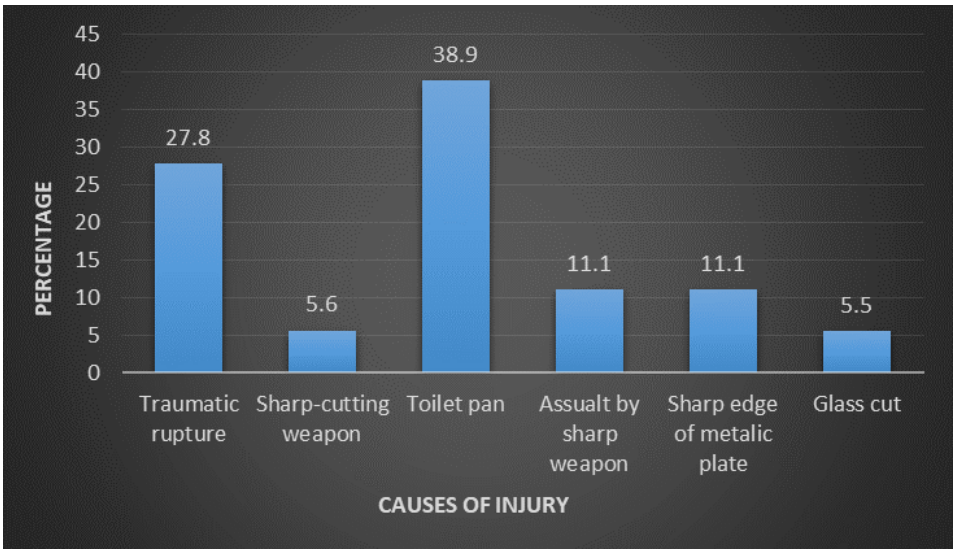

Figure 2: Distribution of patients by causes of injury

Table 2 showed the level of injury. Near the tendoachilles' insertion, more than 60% of patients experienced injuries. The remaining 38.9% of patients experienced an injury 5 cm or more above the site of insertion. The lowest and greatest degrees of damage were 2.5 and 6 cm, respectively, whereas the median amount of injury was 4.5 cm above the point of insertion.

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

Nearly 28% of the ankle movement of the patients was within the normal range, as shown in Table 3. The range of ankle mobility for more than one-third (33.3%) of the patients reduced by 5° on the unaffected side, by 10° for 22.2%, and by more than 100° for 16.7%.

Table 3: Changes in ankle movement (Dorsiflexion & Plantarflexion)

Change in movement	No of cases	Percentage
Normal range	05	27.8
No more than 5° decrease or increase	06	33.3
No more than 10° decrease or increase	04	22.2
More than 10° decrease or increase	03	16.7

Table 4 shows that the mean power of plantar-flexon, mean calf width, and mean score of ability to stand on tiptoe on the injured side and mean thickness of tendon on the reconstructed side relative to unaffected side were 85.6%, 87.9%, 64.8%, and 132.1 %, respectively, and ranged from 60 to 100%, 68.9-95.4%, 15.4-85.7%, and 120-157.9%.

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

Clinical examination shows 45% of patients had good functional outcomes. 39.9% good, 11.1% fair, 5.6% bad (Figure 3).

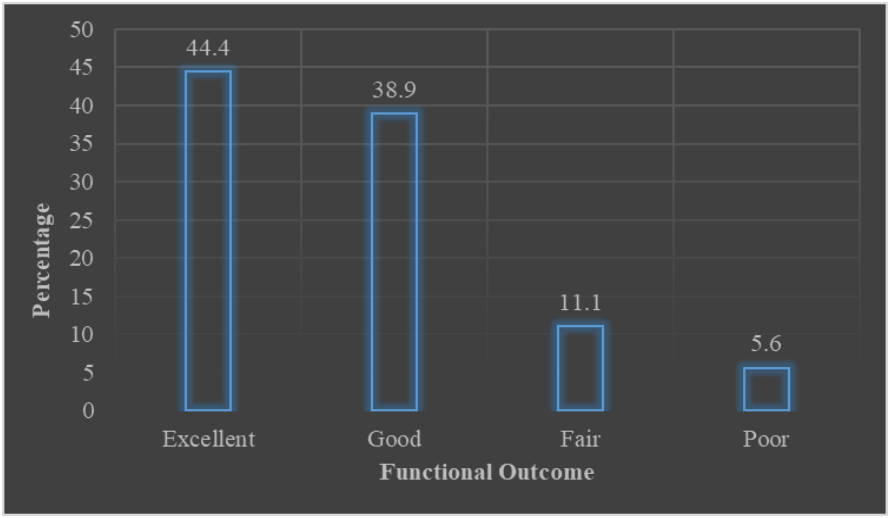

Figure 3: Distribution of patients by functional outcome of the study

The verdict was objective. Fair and bad outcomes were unacceptable, whereas exceptional and good outcomes were satisfying. The majority (83.3%) of patients had good outcomes and 16.7% had bad outcomes (Table 5).

Table 5: Distribution of patients by final outcome

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

DISCUSSION

This observational research covers 18 individuals with elderly neglected tendoachilles injuries. All patients had Bosworth surgery. Patients were followed for 9.73.9 months (range: 4–15 months). Late-presentation ruptured calcaneal tendon therapy findings are few and subjective. Any age may cause tendoachilles trauma. In this series, 3 patients were 20 or younger, 7 were 21-30, 5 were 31-40, and 3 were beyond 40. The mean age was 31.7+9.8 years (range 17 to 47 years). 4th decade rupture peak.68 ruptured tendoachilles sufferers. Their patent averaged 42 years [11]. 15 patients (83%) were men and 3 (17%) were women. 5:1 male-female ratio. 107 cases—96 male and 11 female [12]. 10 males and 2 females in 12 instances, 5:1 in 48 cases [13]. In this series of 18 patients, 40% were injured by an overhanging toilet pan, 27.8% by traumatic rupture, 11.1% by a sharp weapon, 11.1% by a sharp metallic plate, 5.6% by an accidental cut, and 5.6% by broken glass. Our folks utilize squatting toilet pans and share bathrooms. Toilet floor usually moist. That's why they often fall into toilets. Victims panic and aggressively withdraw foot, lacerated tendoachilles by toilet pan edge. Westerners utilize high commodes, therefore this injury is rare. Athletic tendoachilles injuries are widespread in western nations [10,14,17]. Two of five traumatic rupture instances received local steroid injections in the tendoachilles for posterior heel discomfort 1–2 months before rupture. Our patients were injured 2.5–6 cm above tendoachilles insertion. 61.1% of patients were injured within 5 cm of insertion and 38.9% more than 5 cm above. The most hypovascular area is 2–6 cm proximal to tendoachilles insertion, when ruptures occur. 8 instances had lesions immediately proximal to the insertion and 5 cases between 2.5 and 3.5 cm. Lynn (1966) discovered damage 1.25–5 cm from the insertion [17]. Common lesion 3.8 cm from insertion [18].

Ankle mobility indicates tendon lengthening or shortening [10,18]. 5 (27.8%) of our patients had normal ankle mobility. 6 patients (33.3%) reduced ankle mobility by 5° of unaffected location, 4 patients (22.2%) by 10°, and 3 patients (16.7%) by more than 100°. 11 of 33 patients had normal mobility.[19] In 20 individuals, plantarflexion decreased in 9 and dorsiflexion in 11. Two patients had range of movement changes above 100.Power plantar flexion, calf diameter, capacity to stand on tiptoe, and repaired tendon thickness evaluated treatment outcomes. In this series, planter flexion power averaged 85.6% (60-100%). 8 (44.4%) instances restored normal power as BMRC score 5; 7 (38.9%) regained score 4; and 3 (16.7%) scored 3. The damaged side has 70%–99% plantar flexion power.25 external fixetor patients.[19] Three patients recovered power. 19 patients had 90-95% power on the damaged side, two had 85-87%, and one had 50%.

CONCLUSION

Different variables determine this surgery's result. Orthopaedic surgeons still struggle to treat untreated tendoachilles injuries. The modified Bosworth method for the infected Achilles tendon rupture allowed for radical debridement, provided powerful strength, and achieved excellent functional improvement without the usual complications of infection, skin necrosis, or spinal nerve injury. In addition, this technique was simple to learn and may therefore be suitable for foot and ankle surgeons with less experience.

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