LONG TERM FOLLOW UP RESULTS OF RUPTURE TENDO CALCANEUM TREATED BY LINDHOLM TECHNIQUE

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ABSTRACT: INTRODUCTION: Rupture of tendon calcaneum is a common problem.There are proponents of both conservative and operative methods.Inadequate strength and re ruptures are frequent. To address both the problems we have chosen Lindholm technique and doing it for last 20 yrs with very good results.
MATERIALS AND METHODS: From January 1994 to August 2013, 112 consecutive patients were treated by this method, 85 cases were fresh ruptures, 23 were neglected ruptures and four cases were re rupture after operation done elsewhere. Torn tendo calcaneum was repaired by Kessler suture, it was then augmented with two 8cm by 1cm turn down flap of gastrosoleus apponeurosis. Skin suture was done with utmost care. BK pop cast was done in equinus position of ankle for four weeks, followed by gradual weight bearing with heel raised shoe for six months.
RESULTS: All patients went back to their pre injury activity level. In four patients there were superficial skin infection which healed without skin necrosis. One patient needed rotation flap. Evaluation was done by modified Rupp score. It was found to be excellent in 47% cases good in 43% cases and fair in 8% cases.
CONCLUSION: Lindholm technique was originally described for neglected cases, we used it in all cases to avoid any complication in fresh cases and found it universally successful.

KEYWORDS: Tendo calcaneum rupture, Fresh, Neglected and failed, Lindholm procedure.

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INTRODUCTION: Ambroise Parı in 1575 first described this condition and reported in the literature in 1633, Rupture of the Achilles tendon has received increasing attention since then. [1] As Achilles tendon rupture is both a serious injury and one of the most common tendinous lesions, more often associated with some pre-existing problem in the tendon it generates various treatment procedures. [2],[3]

The treatment of Achilles tendon rupture includes conservative management and surgical intervention, but surgical repair seems to have been the preferred treatment in the late 1980s and 1990s.[4],[5],[6],[7] Non-operative treatment begins with an initial period of immobilization of the ankle in plantar flexion for 6 and 8 weeks using plaster cast or splints.[8] Although non-operative treatment avoids the risk of surgery and decreases patient cost, this may result in a lengthened tendon with reduced power of the gastrosoleus muscle [9],[10] and a high rerupture rate. [4],[6] The main advantages of open repair are that it lowers the rerupturing rate and is convenient for patients who demand a short rehabilitation time due to work or sports requirements. Augmentation of end-to-end repair has been recommended for acute injury by many authorities, with fascia flaps or adjacent tendon.[7],[11],[12], Lindholm et al. described the method of augmentation that reinforces the repair and prevents adhesion of the repaired tendon to the overlying skin.[13] The two-sided gastrosoleus fascial flaps are rotated 180º and then twisted and sutured additionally to direct repair so that the smooth external surface faces the subcutaneous tissue.

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PATIENTS AND METHODS: 112 consecutive cases were treated by us from 1994 to 2013 by this method. 85 cases were fresh rupture,23 neglected rupture, four cases were failed repair done elsewhere. 69 patients were male and 43 were female. Neglected cases came to us three to six months after the rupture and failed cases came to us eight months to one year after the initial surgery.

Mode of Injury: Fresh injury 19 cases, fall in toilet pan 14 cases, sharp cut injury 5 cases.
Unaccustomed activities.
Middle aged persons playing with children in picnic - 54 cases.
Jumping in the railway tract from the platform - 13 cases.
Hurriedly getting down from rickshaw/stool - 20 cases.
Following repeated injection of steroid for TA bursitis - 4 cases.
With no apparent trauma, suddenly filling a snap - 2 cases, both of them elderly lady.

Clinical Picture: In fresh cut injury diagnosis was obvious, in other cases gap was filled in continuity of tendo calcaneum, they were unable to stand on tiptoe and calf squising test was positive. For mediclaim and medico legal purposes X-Ray and USG were needed. Sometimes X-Ray shows calcification in the tendon. (Fig. 1)

Surgical Procedure: The tendon was repaired under regional (n=101) or general anesthesia (n=11) After tourniquet application to the thigh, patients were placed prone on the operating table and the ruptured tendon was approached through an incision just along the medial border of the Achilles tendon. This incision avoids injury of sural nerve. The peritenon was then incised in the midline to avoid scarring of the peritenon to the skin incision. The sural nerve was included in the lateral flap. During the operation, it was observed that all patients had a complete midsubstance tear of the Achilles tendon, 2-6 cm proximal to its insertion on the calcaneus. In many cases there were pre-existing lesion in the tendon (Figure 2).

The ends of the tendon were lightly debrided and reapproximated with a Kessler stitch with No. 1 Vicryl suture. A running circumferential suture with 3-0 Vicryl augmented the core suture.

The repair was then reinforced with a 7-8cm-long and 75 to 1 cm wide of gastrosoleus fascia taken from either edge of gastrosoleus tendon that was twisted 180º on its distal pedicle so that its smooth surface underlies the subcutaneous tissues. The two flaps were also sutured together. The defect in the gastrosoleus fascia and the Achilles tendon sheath were repaired with No. 3-0 Vicryl before the closure of the wound[Figure 3 and,Figure 4]. Tourniquet was deflated before wound closure in order to control bleeding and hemostasis. A suction drain was used. Fascial and skin closures were done. Skin closure was done with Vicryl rapide 2-0, utmost care was taken particularly in the distal part of the incision.(Figure 5)

After skin closure it was covered with thin dressing with topical antibiotic then over a sterile cotton wool padding a below knee cast was done in equinus position of ankle.(Figure 6)

The drain was removed after 48 hours and patient discharged with advise.

- Non weight bearing crutch walking.
- NSAID,PPI and antibiotic for five days.
- Review two weeks.

Post-Operative Care: Four weeks after the surgery, the cast was removed, it did not require skin suture removal. The wound was examined and the patients were allowed weight bearing progressively on extremity with 2cm heel raise shoe. Active and active-assisted range of motion exercises were started. They were asked to wear heel raise shoe for six months.

Follow Up: At 4 weeks, 8 weeks, 12 weeks every 2 months for one year, every 6 months for 3 years.

- Clinical examination.
- Wound condition.
- Any Hypoesthesia in sural nerve distribution.
- Range of movement.
- Gastrosoleus power.
- Calf muscle girth.
- Ability to stand and walk tip toe.
- Whether they can resume pre injury activities.

EVALUATION: After completion of two years the patients were evaluated. Evaluation was rated according to modified Rupp score.

1. Subjective satisfaction.

Excellent	5
Good	1
Satisfactory	-1
Poor	-5

2. Do you experience pain on weight bearing.

None	5
With extended weight bearing	1
With slight weight bearing	-2
Continuous pain	-5

3. Do you experience pain in independent of bearing weight?

None	5
Pain associated with weather change	1
Pain sometimes at rest	-2
Continuous pain	-5

4. Has the ankle function decreased since operation?

No	±2
Reduction of muscle strength	±2
Tendency to swelling	±2
Tendency to cramp	±2

5. Do you fear rerupture?

Yes	-1
No	1

6. Do you have limitations in your work?

Does not apply	0
None	5
Minor	-1
Major	-3
Changed profession due to Achilles tendon problem	-5

7. Do you have limitations in sporting activities?/ can do everything you used to do before the injury?

Does not apply	0
None/ can do everything	5
Minor	-1
Major	-3
Stopped with activity due TA problem	-5

Total:

>30	Excellent
15-30	Good
5-15	Fair
<5	Poor

In our series there were five cases of superficial skin infection, in one case there were significant skin slough and the wound healed with rotation flap done with help of plastic surgeons.Four patients could not be followed beyond six months. Of the 108 patients followed results were excellent in 51 patients, good in 47 patients, fair in nine patients and poor in one patient only. (Figure 7 to Figure 10)

DISCUSSION: The etiology of the Achilles tendon rupture remains unclear, but some of the investigations have supported the theory of chronic degenerative changes (Figure 2) based on histological examination of material obtained from the ruptured area during the operation. [14] On the other hand, Inglis and Sculo have performed histological examination of acute Achilles tendon rupture and have found evidence of acute pathological changes like hemorrhage and inflammation rather than chronic tendonitis. In our group of 112 patients 81 patients related with tendonitis before injury.

There are many treatment options for Achilles tendon rupture, such as non-operative closed methods, open surgical repair or percutaneous sutures, which have long been a matter of controversy. The disadvantages of closed procedures are high rerupture rate of 10-30% and less strength and endurance compared with open surgical repair. The proper indications for surgical repair appear to be an active patient who demands to return to functional status at the earliest day with a short rehabilitation program. Meanwhile, the operation techniques have been well progressed and the complications of open repair have become less frequent. However, Nistor[15] found only minor differences between the results of surgical and non-surgical treatment. Simple end-to-end suture is easier to perform and requires a less-extensive dissection, but to approximate a poor quality tendon with only end-to-end suture is not safe. Also, less-invasive techniques have been developed to perform end-to-end suture of the Achilles tendon percutaneously.[10],[16] The incidence of sural nerve injury and rerupture rate seems to be higher with these popular techniques.[16]

Augmented repairs provide stronger reconstruction and give more biomechanical stability to the repair. In the recent past, regardless of the treatment methods - non-operative closed methods, open surgical methods or percutaneous procedures - casting in equinus without weight bearing for a minimum of 6-8 weeks has been widely accepted. Nevertheless, augmented repair of the Achilles tendon rupture has certain handicaps. The major disadvantages of augmented reconstruction are increased rate of wound complication and infection due to the more extensive approach.[17] A deep infection after surgical repair of an Achilles tendon rupture is a relatively rare but devastating problem as the skin and soft-tissue defects the around ankle are a major challenge for the surgeon. Deep infection and skin loss occurred in one of our patients and was managed with sharp debridement and rotational flap. In our series utmost care while closing the distal part helped us to overcome this problem. Another problem is enlargement of the posterior site of the ankle. In our series none of our patient complained of difficulty in in wearing shoes. Zell and Santoro reported no rerupture in their augmented repair series of 25 acute Achilles tendon rupture,. However, rerupture is a troublesome complication that is difficult to manage for both the surgeon and the patient. There were no cases of re rupture in our seies. The sural nerve injury can also overshadow the success of the operation even if most of the injuries are transient. [17] In order to prevent this complication, the sural nerve can be protected in the lateral skin flap of the posteromedially placed skin incision.

CONCLUSION: Augmented repair of acute Achilles tendon ruptures using gastrosoleus fascial flaps are strong and stable, does not require above knee cast, chance of re rupture is almost nil. The disadvantages of the procedure have to be shared in detail with patients before the operation. Skin suture particularly in the distal part of the wound should be done with utmost care.

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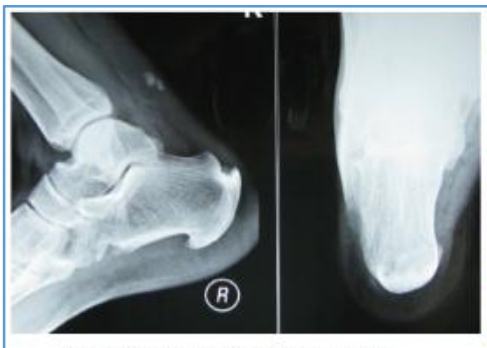

Fig. 1: X-Ray showing rupture tendo Calcaneum with calcification

Fig. 2: Showing intrasubstance lesion leading to rupture due to trivial strain

Fig. 3: Rupture TA repaired, two augmentation flaps harvested

Fig. 4: Repair and augmentation, Paratenon before closure

Fig. 5: Meticulous closure of incision

Fig. 6: POP Cast in equinus, also shows the suction drain

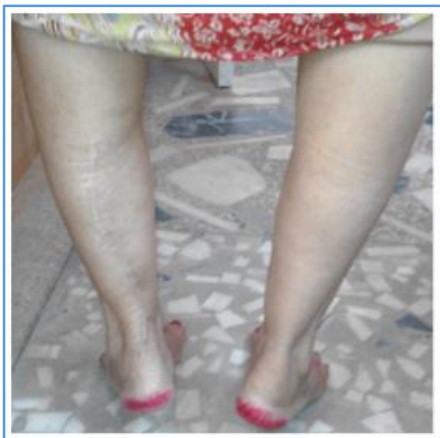

Fig. 7: One year follow up result

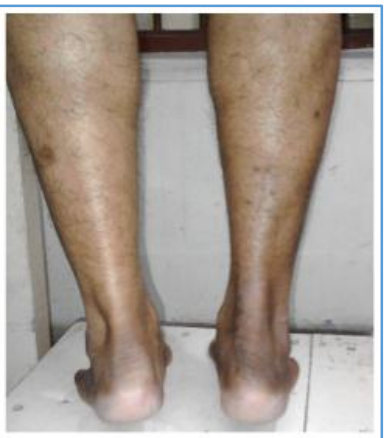

Fig. 8: Two years follow up result

Fig. 9: One year follow up in a case of neglected rupture with superficial infection

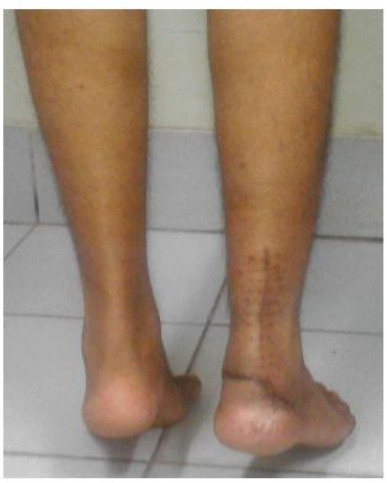

Fig. 10: Two years follow up in a case of failed repair in cut injury tendo calcaneum