

NEGLECTED PATELLAR TENDON RUPTURE: RECONSTRUCTION USING IPSILATERAL SEMITENDINOSUS AND GRACILIS TENDON GRAFTS AND ETHIBOND AUGMENTATION

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ABSTRACT: INTRODUCTION: Neglected rupture of the patellar tendon is a rare disabling injury that is technically difficult to manage. Many different surgical techniques have been described for reconstruction of the disrupted extensor mechanism of the knee. In this study we describe an improved technique for the reconstruction of patellar tendon using semitendinosus and gracilis tendon grafts preserving their tibial insertion distally and Ethibond suture augmentation instead of stainless steel wire having the added advantage of no further operative intervention needed for removal. **MATERIALS AND METHODS:** The study included 9 patients (7 male & 2 female) with mean age of 40.2 years (+/- 2 SD) presented with pain, instability, difficulty in carrying out Activities of Daily Living (ADL) associated with neglected patellar tendon injury. The time since injury ranged from 3months to 2years. All the patients had loss of active extension, extensor lag between 30° to 50° with an average of 41.1° (+/- 2 SD) and severe functional limitation of ADL. All the patients underwent patellar tendon reconstruction using semitendinosus and gracilis tendon grafts. The functional outcome was assessed using Lysholm Knee Score, Visual Analogue Score (VAS) and IKDC scoring system. **RESULTS:** Post-operatively with an average follow-up of 19 months (+/- 2 SD) all the patients had decreased amount of pain, stable knee with active extension of knee without any extension lag with flexion up to 110° (90°-125°). Out of 9 patients 7 had good and two had fair functional outcome with improvement in ADL with the IKDC score of 83.5 (+/- SD), Lysholm Knee Score 90.8 (+/- SD) and no/little pain on Visual Analogue Scale. **CONCLUSION:** The results of our study shows that the use of ipsilateral semitendinosus and gracilis tendon grafts preserving their insertions on tibia distally for reconstruction of neglected patellar tendon ruptures along with Ethibond suture augmentation provides good knee stability and functional improvement in ADL without need for allograft or prosthetic material. The use of Ethibond suture instead of stainless steel wire has added advantage of no further operative intervention needed for its removal.

KEYWORDS: patellar tendon, semitendinosus and gracilis tendon grafts, Ethibond suture, Extensor mechanism of knee.

INTRODUCTION: Neglected rupture of the patellar tendon is a rare disabling injury that is technically difficult to manage and the exact incidence of this injury is not known. Many different surgical techniques have been described for reconstruction of the disrupted extensor mechanism of the knee. In this study we describe an improved technique for the reconstruction of patellar tendon using semitendinosus and gracilis tendon grafts preserving their tibial insertion distally. Initially we used stainless steel wire for augmentation of the construct later we shifted to use

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Ethibond suture having the added advantage of no further operative intervention needed for removal.

MATERIALS AND METHODS: The study included 9 patients (7 male & 2 female) with mean age of 37.6 years (+/- 2 SD) presented with pain, instability, difficulty in carrying out Activities of Daily Living (ADL) associated with neglected patellar tendon injury. The time since injury ranged from 3 months to 2 years. All the patients had loss of active extension, superiorly displaced patella, extensor lag between 300 to 600 with an average of 460 (+/- 2 SD) and severe functional limitation of ADL. Most of the patients recall history of trauma. Investigation modalities; radiograph of the both knees in identical position, patellar height can be assessed on the normal knee, ultrasound and Magnetic resonance imaging can be used when in doubt. All the patients underwent patellar tendon reconstruction using semitendinosus and gracilis tendon grafts. The functional outcome was assessed using Lysholm Knee Score, Visual Analogue Score (VAS) and IKDC scoring system.

SURGICAL TECHNIQUE: Pre-operatively lateral radiographs of both knees were performed in order to estimate the Insall-salvati ratio and use the measurement from the uninjured side as guide during the reconstruction.¹ The patient was consented for patellar tendon reconstruction using hamstring graft and possible Z lengthening of the quadriceps tendon.

The patient was placed under combined spinal epidural anaesthesia in a supine position on the operating table and intravenous antibiotic prophylaxis was administered. Examination under anaesthesia for mobility of the patella and the need for quadriceps tendon lengthening if any. An anterior midline incision given in order to fully¹expose the patellar tendon remnant distally and the patella proximally. Assess the ability to move the patella distally without significant tension from the quadriceps. The pes-anserinus was identified and the semitendinosus and gracilis tendons were harvested with an open tendon stripper and leaving the tendons attached distally at their tibial insertion. Two trans osseous tunnels were subsequently drilled following the general principles as described by Ecker et al², one oblique tunnel at the level of tibial tuberosity in order to bring the tendons laterally and one tunnel across the patella at the junction of middle third and distal third of patella. The tendon edges at the site of original rupture were repaired using Ethibond suture. After the repair was completed, the knee could be flexed to near 90° passively without gapping at the repair site. The wound was closed in layers after repair and reefing of the extensor retinaculum.

Post-operative rehabilitation protocol; the knee was immobilized in a plaster cast at 20° flexion and advised non-weight bearing. At the two week follow up the cast and sutures were removed and the knee was placed in removable slab or brace allowing flexion from 0° to 20°. Follow-up consultations were done at two weekly intervals with a 20° increase in flexion. At the end of 6 weeks able to do straight leg raise and flexion up to 70°. At three-month follow-up initiation of weight bearing with walker support and at 6 months follow up walk unaided without any limp.

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Patient number	1	2	3	4	5	6	7	8	9
sex	M	M	M	F	M	M	F	M	M
Age in years	36	40	48	34	41	38	44	42	39
Co-morbidities	No	No	yes	No	No	No	yes	yes	No
H/O trauma/previous surgery	yes	yes	yes	yes	yes	yes	yes	yes	yes
Delay in presentation months	3	7	9	5	14	18	8	6	11
Extension lag	30 ⁰	35 ⁰	40 ⁰	40 ⁰	45 ⁰	50 ⁰	45 ⁰	50 ⁰	35 ⁰
Quadriceps wasting	++	++	+++	++	+++	+++	+++	++	+++
Functional disability									
Pain	yes	yes	No	yes	No	No	yes	yes	yes
Instability	yes	yes	yes	yes	yes	yes	yes	yes	yes
Limitation of ADL	yes	yes	yes	yes	yes	yes	yes	yes	yes

Table I

RESULTS: Post-operatively with an average follow-up of 19 months (+/- 2 SD) all the patients had decreased amount of pain, stable knee with active extension of knee without any extension lag with flexion up to 110⁰ (90⁰-125⁰). Out of 9 patients 7 had good and two had fair functional outcome with improvement in ADL with the IKDC score of 83.5 (+/- SD) and Lysholm Knee Score 90.8 (+/- SD).

Number	PAIN, ROM & STABILITY	EXTENSOR LAG Pre-operative	EXTENSOR LAG Post-operative	Semi-T & Gracilis tendon graft	Quadriceps Z lengthening
Case 1	Improved	30 degree	NIL	yes	No
Case 2	Improved	35 degree	NIL	yes	No
Case 3	Improved	40 degree	NIL	yes	No
Case 4	Improved	40 degree	NIL	yes	No
Case 5	Improved	45 degree	NIL	yes	yes
Case 6	Improved	50 degree	NIL	yes	No
Case 7	Improved	45 degree	5 degree	yes	yes
Case 8	Improved	50 degree	5 degree	yes	No
Case 9	Improved	35 degree	5 degree	yes	No

Table II

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Number	VAS	IKDC SCORE	Lysholm knee score	Overall functional outcome ADL
Case 1	NO PAIN	88.8	96	Good
Case 2	NO PAIN	84.6	94	Good
Case 3	NO PAIN	86.4	92	Good
Case 4	LITTLE PAIN	84.8	88	Fair
Case 5	NO PAIN	80.8	90	Good
Case 6	NO PAIN	78.6	86	Fair
Case 7	NO PAIN	82.8	86	Good
Case 8	LITTLE PAIN	84.2	90	Good
Case 9	NO PAIN	80.6	88	Good

Table III

VAS – Visual Analogue Scale.

IKDC score – International Knee Documentation Committee.

ADL – Activities of Daily Living.

Technique	Graft material	Functional outcome	
Casey & Tietjens	Simple reapproximation of torn ends and direct repair	satisfactory	Limitation of flexion, Re-rupture
Milankov et al	Contralateral BTB autograft	satisfactory	Donor site morbidity, Patella fracture
EL Guindy A et al	BTB allograft	satisfactory	Availability of graft, Immune reactions, Sterile serous discharge
Lewis PB et al	Achilles tendon allograft	satisfactory	Availability of graft, Immune reactions, Sterile serous discharge
Fukuta S et al	Synthetic graft material	satisfactory	Availability, Higher cost, Cyclical Load failure
Chen B et al	ST-G autograft + SS wire augmentation	Good	Need for further operative intervention for wire removal

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Our study (Modified Ecker et al)	ST-G autograft with preservation of distal insertion+ Ethibond suture augmentation	Excellent - good	Augmentation for the reconstruction, No further operative intervention needed
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Table IV

BTB – Bone patellar Tendon Bone graft.

ST-G – Semi Tendinosus Gracilis graft.

DISCUSSION: The neglected rupture of the patellar tendon is a rare occurrence and the exact incidence remains unknown. Several methods have been described, simple re-approximation of torn ends and direct repair augmented by cerclage wire was successfully employed by Casey and Tietjens,³ other authors⁴ have used circular wire through patellar and tibial tunnels. Milankov et al⁵ used contralateral bone-patellar tendon- bone graft, further more used bone-patellar tendon-bone allografts, Lewis P et al⁶ used Achilles tendon allografts⁷ and Fukuta S et al⁸ used synthetic materials in reconstruction of patellar tendon yielding satisfactory results.

In our study the improved method follows the principles of the technique described by Ecker et al.² We have used ipsilateral semitendinosus and gracilis tendon grafts preserving their insertion on the tibia distally, thus obviating the need and reactions associated with Allografts and synthetic materials. Initially we used stainless steel wire later modified our technique using Ethibond suture which serves a dual purpose; initially it establishes a satisfactory height for the semitendinosus-gracilis tendon graft reconstruction, then it serves as augmentation for the reconstruction; another added advantage is further operative intervention for its removal is not required.

The other important consideration during treatment of neglected patellar tendon rupture is the difficulty in achieving correct patellar height^{9,10}; due to adhesions, quadriceps contracture or atrophy leading to proximal migration of patella. During management of our case we adequately cleared the adhesions to mobilise the patella out of 9 cases only 2 required Z lengthening of the quadriceps tendon. We recommend that every patient should be informed and this should be included in the consent form and the rehabilitation protocol is same in either of the patients.

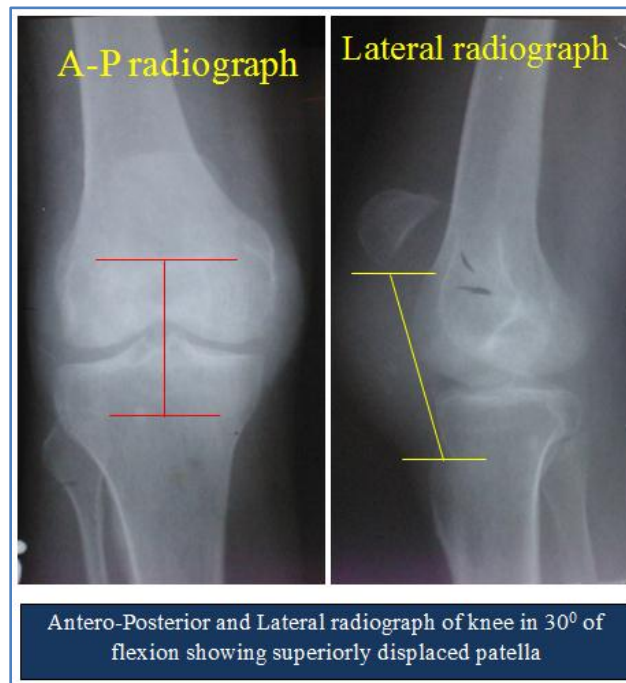
CONCLUSION: The results of our study shows that the use of ipsilateral semitendinosus and gracilis tendon grafts preserving their insertions on tibia distally for reconstruction of neglected patellar tendon ruptures along with Ethibond suture augmentation provides good knee stability and functional improvement in ADL without need for allograft or prosthetic material. The use of Ethibond suture instead of stainless steel wire has added advantage of no further operative intervention needed for its removal.

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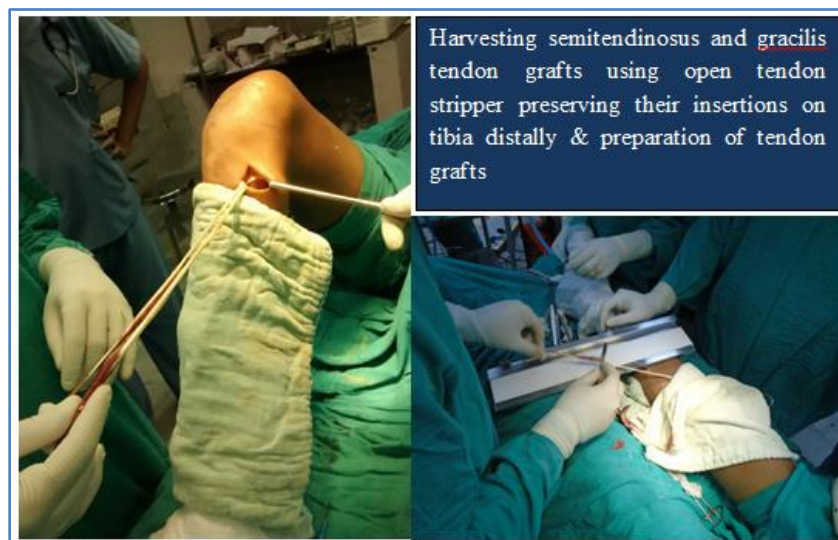
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STEP 2:



STEP 3:

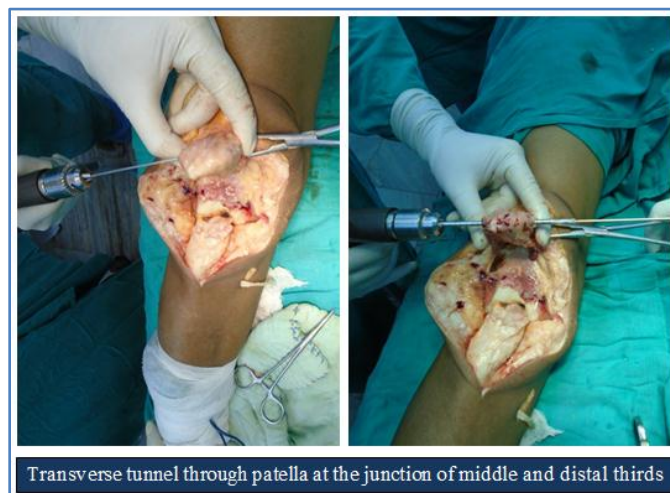


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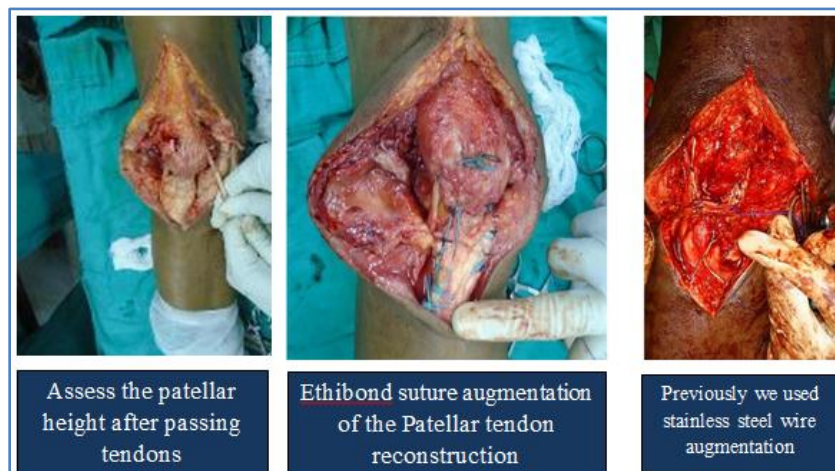
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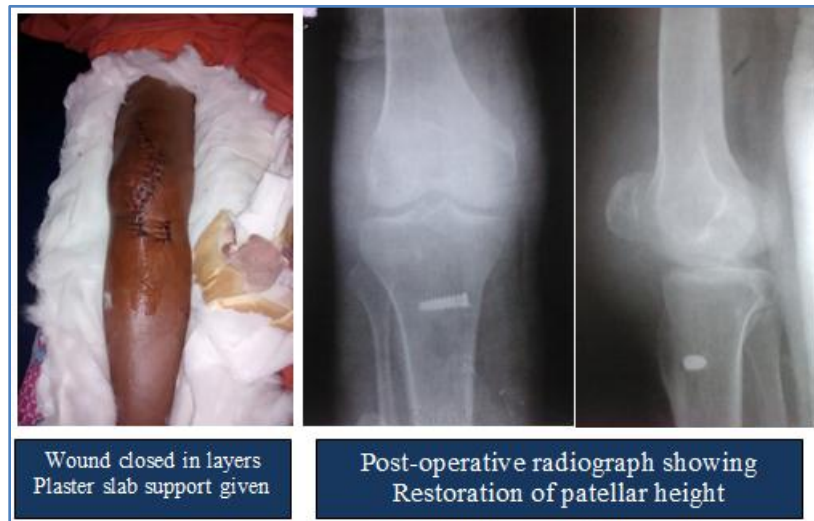


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STEP 7:



STEP 8:



STEP 9:



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