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Long Term Follow-up of a Reconstruction of Open Patellar Tendon Injury by Ecker's procedure Using Gracilus and Hamstring Tendons.

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ABSTRACT

Patellar tendon ruptures are rare and are often missed. Different methods of reconstructions with biological and synthetic materials and rehabilitation methods are described for this injury. An open knee injury with patellar tendon injury was initially debrided and later reconstructed with Gracilus and Semitendinosus tendons. At 10 year follow up our patient is able to play basket ball on hard court which he used to play pre- injury.
Keyword: Patellar tendon , Open ruptures, reconstruction, Gracilus , Semitendinosus

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INTRODUCTION

Patellar tendon ruptures are rare. They are often missed. The challenge is more if the injury is open and even with attempted reconstruction, good results cannot be expected. We present a case of an open patellar tendon injury by Ecker's procedure by using Gracilus and hamstring tendons.

Case report

A 36 year old gentleman had a vehicular accident in June 2004 when his right knee directly hit a median of the road. He presented to the casualty when he had a lacerated wound over the infra-patellar region and lateral aspect of the right knee. Through this wound the lacerated patellar tendon and the right upper tibia region were seen exposed. There was a saggital fracture line in the proximal tibia. The same day the knee wound was debrided and the saggital fracture in the proximal tibia was decided to be fixed with minimal implants in view of severe contamination i.e. with transverse lag screw across the fracture line. For the same reason, it was decided to reconstruct the open patellar tendon injury at later date. To retain the height of the patella, a stainless steel wire was passed medio-lateral in upper tibia and again medio-lateral direction in the patella as seen in figure 1. The wound was primarily closed by meshing the anterior skin flap. The limb was immobilized in a posterior plaster slab. Regular dressings were done for the wound. The patient was discharged and he was asked to come for the second stage of repair.

When the patient presented six weeks after the above initial procedure, there was no active extension. There was also stiffness of the right knee joint. The wound had settled. The antero-posterior and lateral radiographs of the patients knee showing the tension relieving wires.

Figure1: Wires are seen passing around the tunnels in tibia and patella to retain the height of the patella. A separate screw in the proximal tibia to fix a longitudinal split in the upper tibia is also seen.

In the second stage, eight weeks later, we planned a reconstruction of the patellar ligament using Gracilus and Semi-tendinosus tendons. Under spinal anesthesia, taking care to avoid the previous anterior scars, by an anteromedial incision, the patella, patellar ligament and tibial tuberosity were exposed. The cancellous screw and the height retaining Stainless Steel wire of the previous surgery were removed (figures 2 to 5).

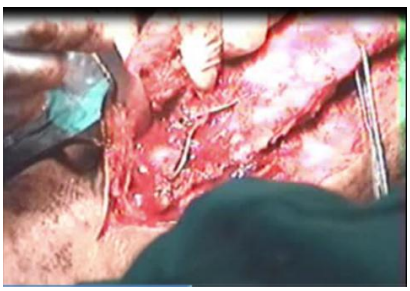

Figure 2: Wires that were passed during the frist debridement exposed

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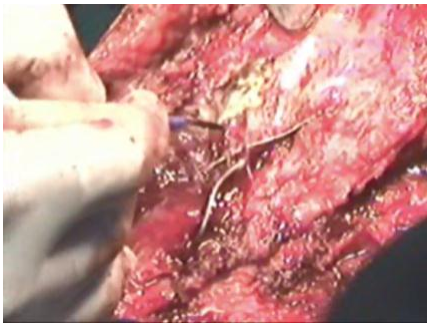

Figure 3: The defect in the patellar ligament filled with scar tissue being pointed with an arrow

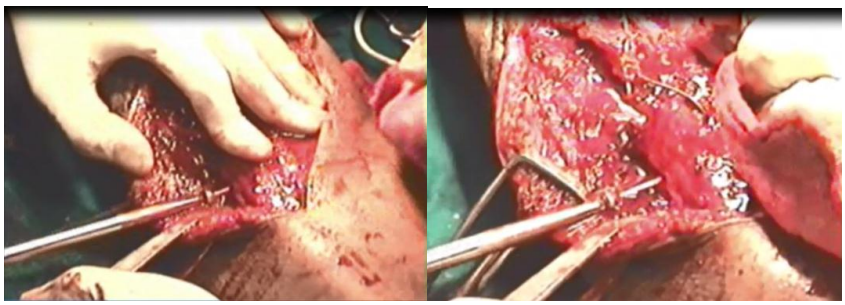

Figure 4a and 4b: The screw in the proximal tibia is removed.

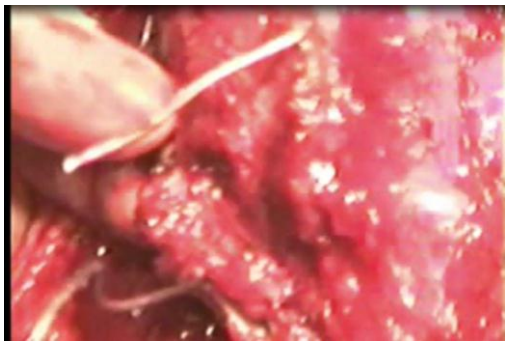

Figure 5: The wires are cut and removed

By another medial incision, the Gracilus (figures 6, 7, 8 and 9) was harvested and its distal attachment to the tibia is preserved. (Figures) and the free end was brought into the anterior wound. The Semitendinosus was harvested with care so that the graft is as long as possible. (Figure 10, 11) the distal attachment to the tibia is preserved and the free end was brought into the anterior wound. Thus the free end of both these tendons are brought into the anterior wound.(figures 12and 13).

Figure 6: Midline wound of exposure packed and by a separate medial wound Gracilus being dissected out.

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Figure 7: Further step of Gracilus being dissected to its insertion

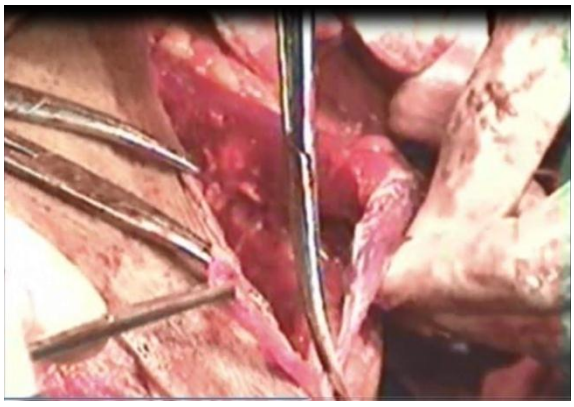

Figure 8: Holding the distal end of the Gracilus the proximal part is divided so as to have more tendinous portion distally.

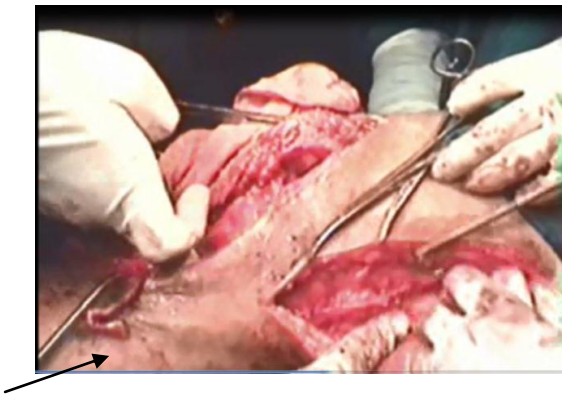

Figure 9: Free end of Gracilus brought into the antero medial wound.

Figure10: The dissection of Semitendinosus tendon

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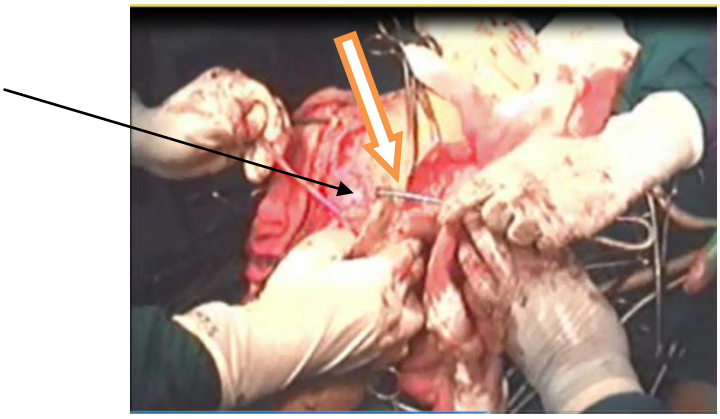

Figure11: Proximal musculotendinous portion of Semitendinosus divided and it is brought into the antero medial wound.

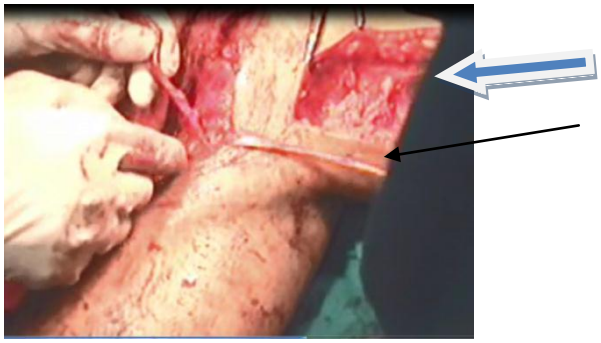

Figure12:Gracilus is seen on the left side and the shiny and long Semi-tendinosus is on the right marked with a black arrow .The blue arrow marks the hamstring donor site and the brown arrow shows the anterior wound.

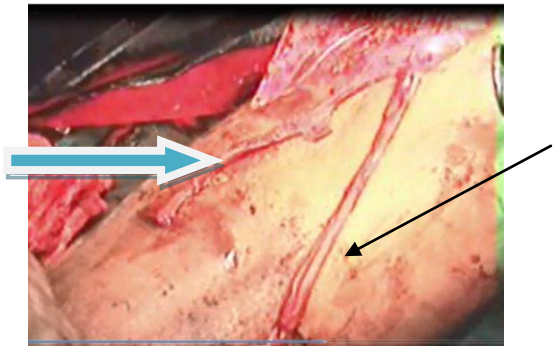

Figure13:Shiny semitendinosus on right side solid black arrow.
The gracilus is seen lying near this marked by a blue arrow.

Holes were drilled first in the medio-lateral direction to exit in the extra articular part of upper tibia first with a 3.2mm drill bit (figure 14) and later with serial intramedullary nail reamers to enlarge the holes in the same direction. (Figures 15 and 16) Similarly another hole was drilled in the latero medial direction in the patella substance in the same line where the previous SS wires were placed to avoid creating another stress riser in the patella. (figures 17, 18a and 18b)

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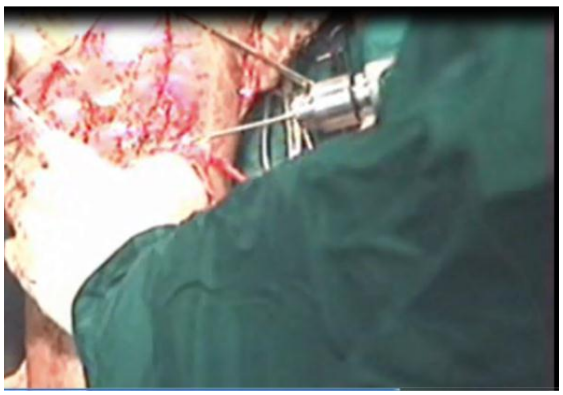

Figure14: A tibial tunnel is made first with the 3.2 drill bit

Figure15: This hole was enlarged later with 6, 7 8 mm reamers

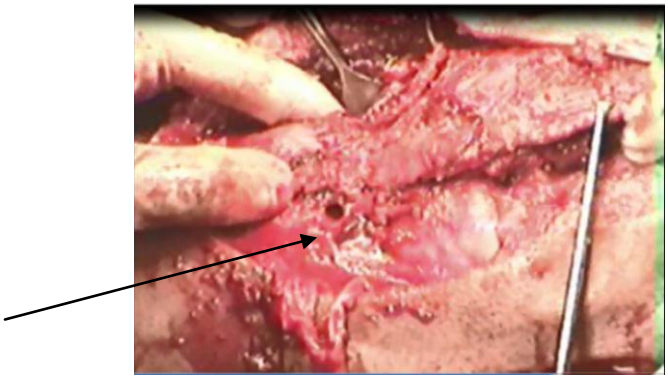

Figure16: The hole of the tibial tunnel is seen

Figure 17: Holes drilled in the patella

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Figure 18 a and 18 b: A separate hole drilled in the lower part of patella for placing the tension relieving wire

The harvested semi-tendinosus is tunneled first through the tibia tunnel in medio-lateral direction (figures 19, 20 and 21) and then tunneled in the patella in a latero- medial direction. (figures 22)

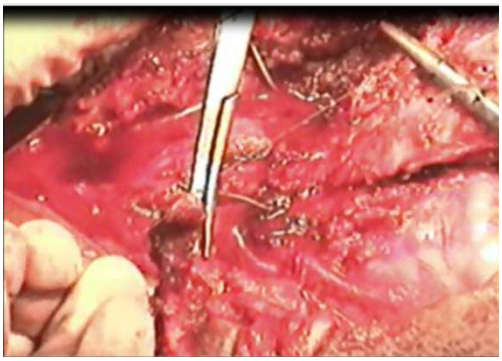

Figure19: Free end of Semi tendinosus is sutured using Vicryl to a Stainless Steel wire to enable easy passage into the holes drilled as above

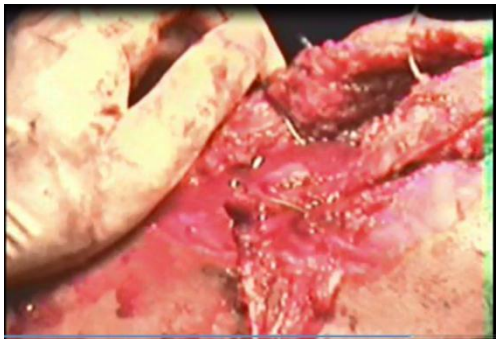

Figure 20: The free end of Semi tendinosus is seen entering the tibial tunnel

Figure 21: Free end of Semitendinosus is pulled laterally through the hole

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Figure 22: The free end of Semitendinosus is brought from lateral to medial in the patellar canal. The curve arrow pointing the direction of entry into the medial side of tibia and exit form medial side of patella.

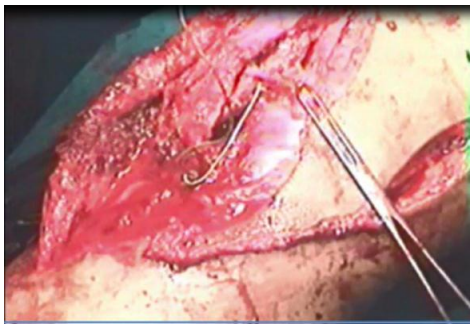

Figure 23: Tension relieving wires being tightened, with the free end of semitendinosus tendon being pulled with a Haley's forceps.

This reconstruction was protected using a stain less wire in a single loop method so as the removal will be easy later. (Figure 23). Gracilus tendon was brought along the medial border of the patella figure 24 and was sutured to the free end of the semi tendinosus graft as it emerges from the medial side hole of the patellar tunnel. (Figures 24, 25) Care was taken to avoid crossing of the wires to leave the mid part of the reconstructed ligament being compressed.

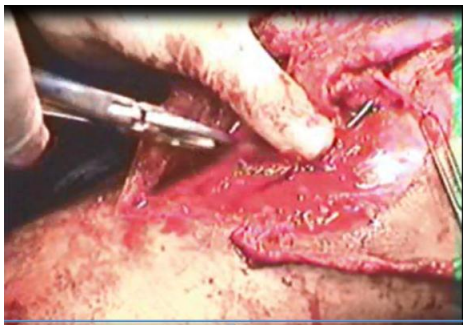

Figure 24: Free end of Gracilus is seen in foreground as the tension relieving wire is being tightened.

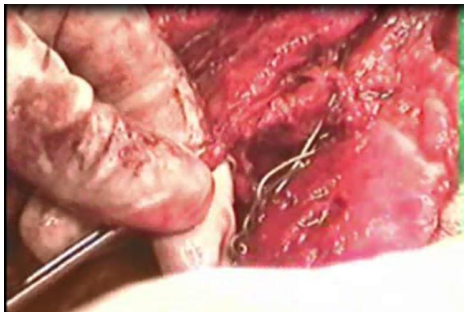

Figure 25: Free end of Semi-tendinosus is taken up for suturing.

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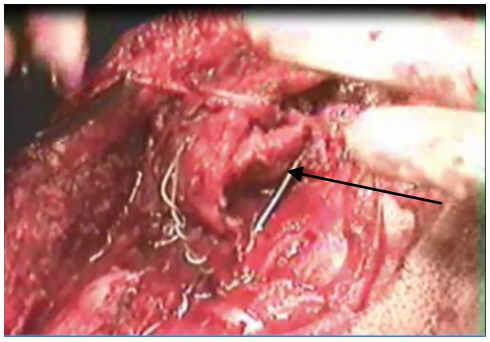

Figure 26: Defect previously filled with scar tissue is marked by arrows. Semi-tendinosus is seen pulled for suturing

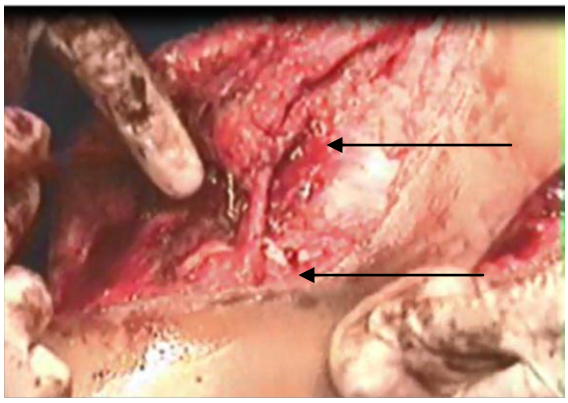

Figure 27: Gracilus (lower arrow) is sutured to free end of Semi tendinosus(upper arrow) to complete the reconstruction.

For twelve post operative days the patient was kept in the hospital for dressings. There was minimal ooze which settled with antibiotics. The knee was protected with an above knee plaster slab. From the 42nd day, the slab was discarded and gradual mobilization of the right knee joint was done with a physiotherapist. The patient was an athlete and he cooperated well for the physiotherapy regimen. He in a step by step fashion got good range of movement.

Figure 28: This is the two year post operative X-rays

At 2 years later patient was assessed and the wires were removed under an intravenous general anesthesia. The radiographs in figure 28,show the status of the patella and tibia at 10 year follow up (June 2014)and the sites of tension relieving wires can also be seen .He is now able to play basket ball on hard court which he used to play pre- injury.

His 10 year followup status is seen in the clinical photographs as post operative figures 29 to 36

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The figure 29.show the harvest scars of hamstring. The figure 30 a and 30 b show the old depressed scar of wound that was grafted . The figure 31 show the old scars of anterior and medial donor wound .The figure 32 show the old scar of meshing during the first debridement by arrows.

Figure 29: The hamstring donor site

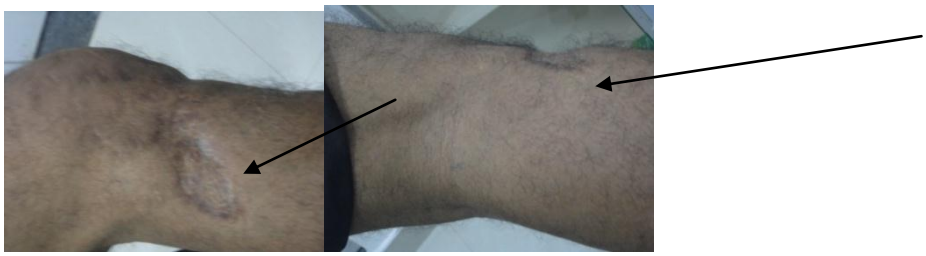

Figure 30 a and 30 b: The depressed part of the lateral aspect of upper leg showing the site of previously grafted wound.

Figure 31: The anteromedial incision scar (lower arrow) and medial wound (upper arrow)

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Figure 32: Arrow marking the meshing of the skin during the first surgery to enable skin closure.

After 10 years, the degree of extension (figures 33), flexion (figures 34 and 35) and cross legged sitting (figure 36) are of acceptable limits.

Figure 33: The status of the limb after 10 years

Figure 34: Maximum available flexion

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Figure 35: Squatting with available flexion

Figure 36: Patient sitting cross legged.

DISCUSSION

In a case of multiple fractures, Fixation of the fractures are done and the rupture of the patellar tendon can be missed and could then be neglected And by the time it was diagnosed at seven months, the patella had migrated proximally. Retraction , adhesion, atrophy of the quadriceps muscle and proximal patellar migration are the reasons for a neglected patellar tendon rupture to be difficult to treat than acute ruptures, sometimes Quadriceps-plasty preoperative or intra-operative traction external fixation. [1] Their case report has similar association of upper tibia fracture treated with cancellous screws like our case. In our case we did not have a delay as in that series. As our case is a open injury and the lesion was directly visualized. In our case there was no elevation of the patellar height due to the fact that we have put a height retaining wire. However, there was no active knee extension [1].

Bek et al did similar reconstruction of the patellar tendon with semitendinosus and gracilis tendons . even after a 7 months delay they were able to move the patella distally to the original anatomic location in the extended knee without any pre-operative traction or other intra-operative procedures using a twisted wire. After 2 weeks sutures were removed. Special ROM brace was given. Supervised flexion achieved with up to 30°reaching 50 ° in fourth week and 70° sixth weeks reaching 110 ° the tenth week postoperatively. The authors have used Cybex testing and found quadriceps muscle strength is only 15% less than uninjured extremity, as confirmed by after two years. [1]

Direct surgical repair of fresh patellar tendon ruptures at the inferior pole- return to pre-injury functional status in terms of ROM, the strength of the quadriceps muscle. Neglected rupture of the patellar tendon is a rare. Proper physical examination can miss in multi-trauma, obesity and knee hemarthrosis. Delayed more than six weeks there is every chance of quadriceps retraction and proximal patellar migration with fibrous adhesions developing between the patella and the underlying femur. The ends of the ruptured tendon shrink and become covered by scar tissue. [1]

Primary repair with augmentation using autogenous graft (fascia lata or hamstring tendons) allograft (Achilles tendon or patellar tendon has been most commonly used , has also been used. in severe contracture of the quadriceps tendon and elevated patella ,many techniques have been reported to relocate the patella to its anatomic position, Ilizarov method or Z lengthening for the quadriceps tendon and Z shortening for the patellar tendon with augmentation using the semi tendinosus and Gracilus tendons. Although proximal migration and gap in our case became obvious with knee flexion (Fig. 5), The positive outcome in this case suggests that this approach should be studied as a possible solution to obtain proper patellar position and functional ROM. Obvious elevation of the patella in knee flexion before the incision. [1]

Chronic patellar tendon ruptures are uncommon injuries presenting with weakness in extension of the leg, atrophy of the quadriceps muscle, and pain at the inferior pole of the patella. [2] They follow trauma, surgery like total knee arthroplasty or following steroid use, which are treated differently. [2, 3] Repairing the defect with V-Y advancement of the Quadriceps Tendon and Semitendinosus Graft was 66-year-old man for a Patellar Tendon neglected for 19 years with an extensor lag of 40 degree. [4] Several methods have been utilized to repair chronic patellar tendon ruptures, including: non-operative management, direct repair of the tendon, autogenous grafting, allografting, or xenografting or combined direct repair of the tendon and autogenous grafting using the semitendinosus tendon. [4] Late reconstruction of undiagnosed ruptures of the patellar tendon by transfer of the gracilis and semitendinosus tendons, supplemented by a heavy-gauge encircling wire to bridge the gap, was successful in four patients. These tendons are stronger than fascial strips which have previously been used for the purpose. The four patients treated by this technique returned to their pre-injury functional levels. [5] Two cases of late reconstruction of the patellar tendon using the semitendinosus and Gracilus tendons are reported. Adequate graft length enabled satisfactory fixation without augmentation. Good functional recovery was achieved in both cases. [6] Sometimes Carbon fiber is used to repair the extensor mechanism defects of knee involving patellar ligament or quadriceps tendon. [7] Late reconstruction of a rupture of the patellar tendon by transfer of the semitendinosus tendon supplemented by a strip of fascia lata and encircling twisted wires to bridge the gap was successful in one patient. [8, 9]

In our case, the lateral view X- ray of patient's knee figure 37.showing the height of the patella is almost equal to the reconstructed patellar ligament anatomic location of the patella. [10]

Figure 37: Post-operative lateral view X- ray of patient's knee, showing the height of the patella.

CONCLUSION

Long follow ups are the real tests for the outcome of any surgery. A decade long follow up of this rare case of reconstruction of an open patellar tendon injury with Gracilus and hamstring tendons by Ecker's procedure showed with near normal rehabilitation.

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