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RECONSTRUCTION OF THE PATELLAR TENDON USING SEMITENDINOSUS–GRACILIS (STG) TENDON GRAFTS WITH PRESERVED DISTAL INSERTIONS IN ADDITION TO FIXATION WITH TENSION-REDUCING WIRE

Orthopaedics

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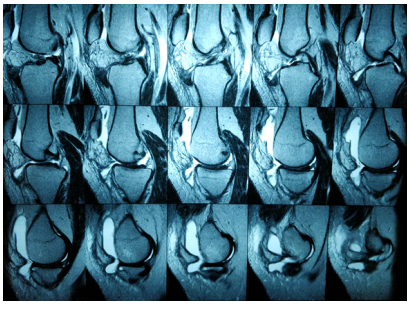
ABSTRACT

Chronic neglected patellar tendon ruptures are rare as most of the acute patellar tendon ruptures are disabling and often primarily treated (). Usually patients present late to the hospital due to missed diagnosis, native treatment or neglect requiring acute repair to reestablish knee extensor continuity and to allow early motion. Neglected ruptures of the patellar tendon is defined as ruptures presenting after six weeks of injury which are often difficult to repair [,], and various surgical techniques have been described for reconstruction using auto-grafts, allografts and synthetic materials. , we followed an improved surgical technique for reconstruction of the patellar tendon using semitendinosus–gracilis (stg) tendon grafts with preserved distal insertions in addition to fixation with tension-reducing wire

KEYWORDS

Case 1

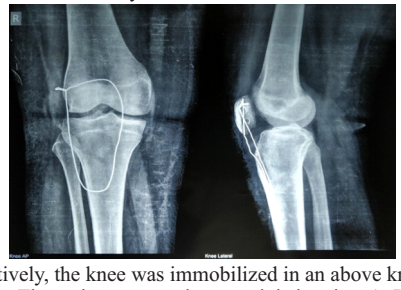
a 21 year old male,smoker, presented with complaints of difficulty in walking for 2 months. He had a history of road traffic accident 2 months back when he sustained injury to his right knee. Following which he developed weakness in right knee, difficulty climbing upstairs/downstairs. On examination , range of movements and extensor lag in the knee was measured using a goniometer with the patient sitting on the edge of a couch and legs hanging freely ,active extension was not possible,passive knee rom was normal .anterior drawer test was positive. Palpable interval was noted between the patella and tibia.muscle wasting of 2cm was present on the right thigh when compared to the left. Xrays and MRI was done which showed



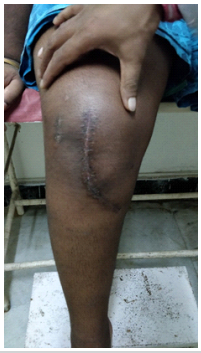
Surgical technique

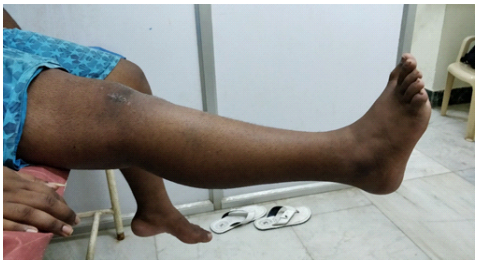
Pre-operatively , to estimate the insall– salvati ratio Antero Posterior and lateral radiographs of both knees were performed and the measurement from the uninjured side was used as a guide during the reconstruction.1 the insall–salvati ratio measured 1.0. The procedure was explained to the patient and written consent was obtained for a patellar tendon reconstruction using hamstring graft and if necessary z lengthening of the quadriceps tendon.

Under Spinal anaesthesia the patient was placed in supine position on the operating table and IV antibiotics were administered. 'Tourniquet ischemia was not applied as this may have caused tethering of the quadriceps, preventing adequate assessment of patellar height'. On examining under anaesthetic no restrictions of movements of patella was seen. It was possible to bring the patella to its appropriate position distally. Knee was placed in 90 degree flexion and an Anterior longitudinal midline skin incision was made and subcutaneous tissue was dissected and retracted. The ruptured patella tendon was visualized 'the tendon had ruptured off the distal pole of the patella'. The scar tissue and tendon was removed in total. An assessment of the ability to recreate the insall– salvati ratio was confirmed at this stage and the patella was mobilized distally without significant tension from the quadriceps.Partial tear in the ACL was seen.The semitendinosus and gracilis tendons were identified and harvested with an open tendon stripper and 'leaving the tendons attached distally at their tibial insertion'. The proximal tendon edges were stripped of remaining muscle and soft tissue and prepared with 'whip-stitch sutures'. Two transosseous tunnels were subsequently drilled following the general principles as described by ecker et al.2; first, a 5.5 mm transverse tunnel through the patella, just distal to the mid-patellar level and then a 4.5 mm tunnel behind the tibial tuberosity .With the knee in 30 degree flexion to bring the patella distally. 'The suture' was used to set the height of the patella, using the previously calculated insall–salvati ratio of the uninjured knee. This was confirmed using c-arm image intensifier with the knee at 30 of flexion .The free end of the semitendinosus tendon was passed medio-later-ally through the oblique tunnel behind the tibial tubercle using the whipstitch and a suture passer. It was then passed latero-medially through the transverse patellar tunnel, again using a suture passer in the figure of 8 pattern. The gracilis tendon was then passed in the same manner to augment the Semitendinosus.a cerclage SS wire was passed over the patella and tibial tunnel. The knee was flexed freely to 90 degree passively without any interval at the rupture site and patellar position was assessed at 60 degree of knee flexion and found to be symmetrical to the other leg. The wound was closed in layers.



“Postoperatively, the knee was immobilized in an above knee Slab at 15 of flexion. The patient was made not weight bearing. At POD 15 the cast and sutures were removed and the knee was placed in a hinged brace allowing flexion from 0 to 20 . Quadriceps isometric exercises were started. At 6 weeks the cerclage wire was removed .Further physiotherapy ultimately achieving 120 of flexion in 12 weeks. At the three-month follow-up, initiation of weight be aring was permitted along with closed chain knee exercises under the supervision of a physiotherapist.





Case 2

A 32 year old male, well built, mechanic by profession came to our hospital with complaints of pain and weakness in left knee for 3 months.history of skid and fall from bike 3months back when he was diagnosed with patellar tendon rupture,patient did not undergo any treatment at that time. On examination there was a palpable interval noted in the patellar tendon region and active extension was not possible. MRI was done which showed complete tear of patellar tendon.the same procedure and protocol was followed and patient had knee ROM upto 120degree in 12 weeks and active SLR till 70 degree.

DISCUSSION

"A chronic neglected patellar tendon rupture is a rare condition either as a result of neglect, native treatment or missed injury and Several techniques of treatment have been described to manage. Simple reapproximation of the torn ends and direct repair augmented by cerclage wire was successfully employed in four cases by casey and tietjens.[3] other authors[4] have used autogenous semitendinosus-gracilis tendon grafts adopting the principles of the ecker et al.[2] technique, but without the use of a steinman pin for patellar traction. Instead, they used circular wire through the patellar and tibial tunnels, in order to obtain satisfactory patellar height. Milankov et al.[5] used a contralateral bone-patellar tendon-bone graft followed by double-wire loop reinforcement. Furthermore, bone-patellar tendon-bone allograft,[6] achilles tendon allograft[7] and synthetic materials[8] have also been used yielding satisfactory results. And subsequently adapted by other authors[4]. Chen et al.[4] have recently described the value of the use of a semitendinosus-gracilis tendon graft and the preservation of its distal insertion. They also described the principle behind the use of a tension-reducing wire as an aid to natural recovery and proper patellar tracking" .the use of cerclage wires provide two advantages,initially it establishes patellar height for the semi-tendinosus and gracilis tendon graft reconstruction, and also it serves as an augmentation for the reconstruction.

During the treatment of neglected patellar tendon ruptures, the difficulty in achieving the correct patellar height is usually due to adhesions and quadriceps contracture or atrophy that causes patella alta. Several methods have been previously described in order to adequately mobilize the patella and relocate it to its anatomical position. Mandelbaum et al.[9] recommended z lengthening of the quadriceps tendon and z shortening of the patellar tendon with augmentation using the semitendinosus and gracilis tendons. In cases with severe contracture of the quadriceps tendon, external fixation with pins and wires[10] and the ilizarov method have been employed.

Both of our patients had an injury due to a road traffic accident (especially fall from two wheelers), making this the most common cause of injury in our part of the world compared to sports injuries which was described earlier. The delay in treatment was not due to missed diagnosis but by neglect of the patients. " Various techniques of reconstruction have been reported by authors largely as case reports and there have been few case series studies for this uncommon problem. Ecker et al. [7] in 1979 reported four cases of late patellar tendon reconstruction using both the gracilis and semitendinosus tendons. Each tendon was passed through separate horizontal tunnels in the patella and sutured to each other. A cerclage wire was also used to supplement the stability. This may require implant removal later and also has a risk of iatrogenic patella fractures due to double tunnels in the patella. Dejour et al. [8] in 1992 reported patellar tendon ruptures treated with a contra-lateral autograft composed of a block of tibial bone, middle third of patellar ligament, block of patella, and quadriceps tendon. This has the limitation of producing morbidity in contralateral normal knee. In 2001, casey et al. [9] reported four cases wherein the retracted patella was mobilised and the ruptured stumps were repaired and protected by mul-tiple cerclage wires. Postoperatively these patients had flexion of 112°. This end-to-end repair in chronic cases may produce shortening of the patellar tendon and may be the cause of restricted flexion. In 2007, van der zwaal [10] reported two cases using semitendinosus and gracilis for reconstruction with augmentation of fixation by bioscrews and staples. In 2012, chen et al. [11] reported two cases using semitendinosus and gracilis for reconstruction retaining the distal insertions of the tendons proposing preservation of vascularity of the tendons. Similar cases have been reported as single case reports using various techniques with different graft choices that included autograft (contralateral patellar tendon [12], semitendinosus tendon [3, 5, 13]), allograft (massive extensor mechanism graft [14], achilles tendon [15–17]) or synthetic materials.

Using both semitendinosus and gracilis tendon graft with figure of 8 pattern of the tendon and reinforcement with cerclage wires increases the stability and allows early mobilisation of the knee preventing stiffness. The disadvantage of our procedure is that it require implants for augmentation, and needs second surgery for implant removal.Our patients did not require pre-operative pin traction through the patella or intra-operative quadricepsplasty or quadriceps lengthening because excessive retraction of patella was found to be prevented by the intact para-patellar retinaculum. The improvement in strength of the quadriceps was clinically assessed by mrc grading of power of knee extension

Pre-operative mri evaluation of the knee in addition to confirming the diagnosis also reveals associated ligament injuries so that they can be managed simultaneously. Intra-operatively it is important to maintain the normal position of patella since both patella alta and patella baja have negative impact on knee function.Maintaining the proper patellar tendon length avoids any extension lag or flexion restriction. It is important to prevent excessive pressure of patella over the trochlea of the femur by adequate retinacular release to maintain smooth tracking of patella over the trochlea thereby preventing anterior knee pain.passive knee movement performed intra-operatively up to 90° confirms the strength of the reconstruction and the permissible range of movement possible. It also affirms normal patella tracking and smooth gliding over the trochlea without undue pressure. In addition to structural reconstruction of the patellar tendon, postoperative rehabilitation also important in achieving a good functional result.

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