Case Report

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Orthopaedics Section

Delayed Primary Repair of Patella Tendon Tear with Autologous Soft-tissue Graft Augmentation: A Report of Two Cases

ISHAN RAJENDRA SHEVATE[1], SELVI ASHISHKUMAR KHAJANCHI[2], RAHUL SALUNKHE[3], VIKRAM REDDY CHEEMALA[4]

ABSTRACT

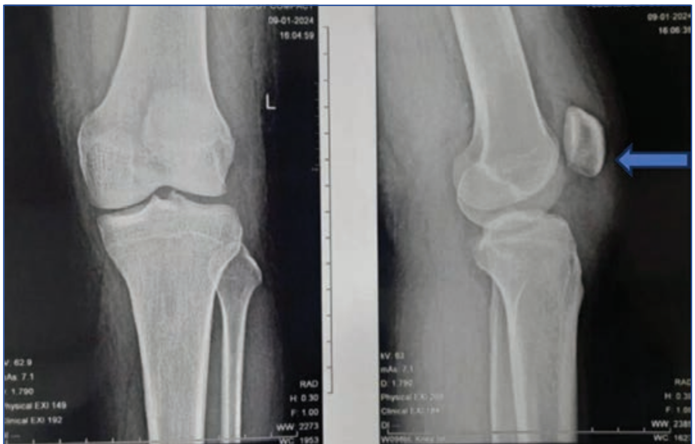
A patellar tendon rupture is an infrequent injury that results in the loss of active knee extension, leading to significant disability. Chronic patellar tendon ruptures are challenging to manage due to the proximal retraction of the patella, contracture, atrophy of the quadriceps muscle and scarring of the surrounding tissues. Delayed primary repair of patellar tendon tears with autologous soft-tissue graft augmentation is an effective surgical technique for restoring knee extensor function and structural integrity in cases where immediate repair is not feasible. This case report discusses two cases in which the patellar tendon tear was neglected, resulting in the loss of both extension and flexion of the knee, thus causing difficulties in daily living. The patients presented late to the orthopaedic Outpatient Department (OPD) with patellar tendon injuries, which were treated by delayed primary repair with soft-tissue autograft augmentation utilising semitendinosus grafts. This study highlights the fact that this approach provides strong tendon reinforcement, minimises the risk of re-rupture and promotes robust tendon healing by leveraging the biological benefits of autologous tissue. The outcomes of this study suggest good functional recovery, improved stability and satisfactory Range of Motion (ROM) in the knee.

Keywords: Hamstring autograft, Knee joint stability, Orthopaedic surgery, Tendon reconstruction

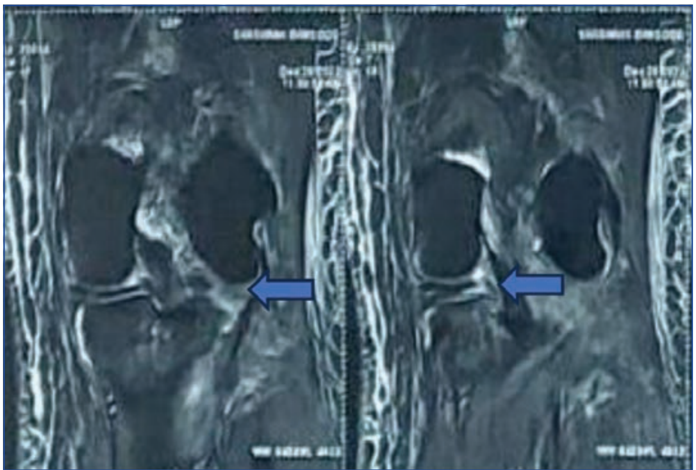
CASE REPORT

Case 1

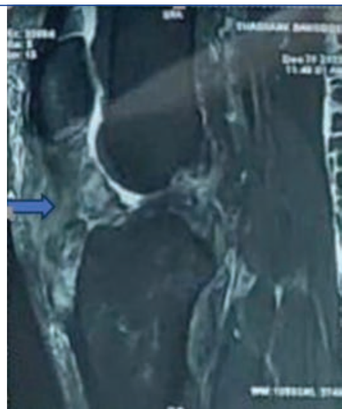
A 36-year-old male patient presented with symptoms of pain in the left knee, as well as an inability to extend the knee, following a Road Traffic Accident (RTA) three weeks back. On physical examination, the patella was found to be migrated proximally, with no active extension of the knee. Active flexion was possible up to 60°, while passive flexion reached 80°. The Lachman and Anterior Drawer tests were positive, with a grade 2 firm end point for the Anterior Cruciate Ligament (ACL). For the medial and lateral meniscus, McMurray's test was positive, and X-rays showed a superiorly migrated patella [Table/Fig-1]. Magnetic Resonance Imaging (MRI) revealed a partial ACL tear, a complex tear of the posterior horn of the medial meniscus, along with a radial tear of Lateral Meniscus (LM). Midsubstance tear was also identified for the patellar tendon, accompanied by a tear of the lateral retinaculum [Table/Fig-2,3].



[Table/Fig-1]: Preoperative X-ray depicting left knee anteroposterior and lateral views, blue arrow shows a superiorly migrated patella (Case 1).



[Table/Fig-2]: MRI of left knee in coronal view. The blue arrow shows a partial ACL tear, complex medial meniscus tear of the posterior horn, and radial tear of the Lateral Meniscus (LM) (Case 1).

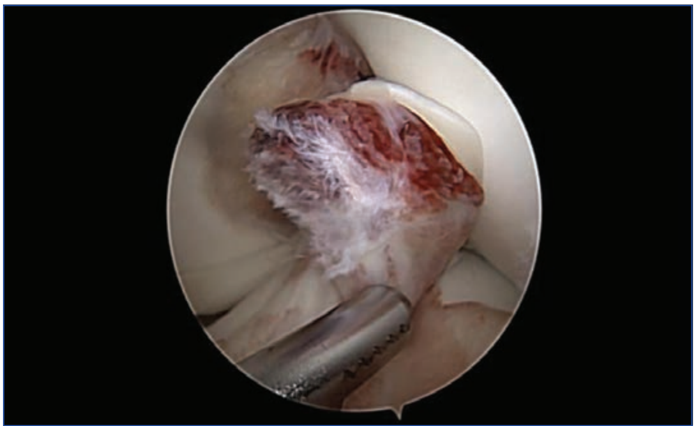


[Table/Fig-3]: MRI of left knee in sagittal view. The blue arrow shows midsubstance tear for the patellar tendon along with lateral retinaculum tear (Case 1).

The patient commenced ROM treatments, as well as isometric strengthening exercises. A ROM of 0 to 100° was achieved by the end of four weeks postinjury. Following this, the patient was planned for medial meniscus tear resection/repair, LM radial tear resection/

repair, and primary patellar tendon repair with augmentation using an autologous semitendinosus graft. The decision regarding ACL reconstruction was planned to be made after examination under anaesthesia and subsequent diagnostic arthroscopy.

The patient was taken under spinal anaesthesia in a supine position. Diagnostic arthroscopy was performed, revealing a partial ACL tear [Table/Fig-4], a complex medial meniscus tear of the posterior horn [Table/Fig-5], and LM radial tear [Table/Fig-6] was noted. Partial ACL tear was found to be stable and was conserved. Medial meniscus tear resection and balancing was done and LM radial tear repair was executed using the all-inside technique.



[Table/Fig-4]: Arthroscopy image showing partial ACL tear (Case 1).

[Table/Fig-5]: Arthroscopy image showing complex tear of posterior horn of medial meniscus (Case 1).

[Table/Fig-6]: Arthroscopy image showing a Lateral Meniscus (LM) tear (Case 1).

For the patellar tendon repair, a midline incision was made from the lower pole of the patella to the tibial tubercle. Soft-tissue dissection was carried out laterally and medially to expose the retinacula. Torn ends of the patellar tendon with paratenon were identified and dissected free from the surrounding scar tissue and fibrosis. End-to-end approximation of the torn patellar tendon was found to be feasible. The end-to-end repair of the patellar tendon was achieved using No. 2 fibre wire in Kraków's fashion, after which the ipsilateral semitendinosus graft was harvested and prepared. The harvested semitendinosus graft was cleared of muscle and soft-tissue, and the ends were sutured using No. 2 Ethibond in a whipstitch fashion. A transverse mid-patella tunnel was drilled using a 5 mm reamer. Distally, just below the tip of the tibial tubercle, another tunnel was drilled using a 7 mm reamer. The graft was passed through the patellar tunnel, and the graft ends were crisscrossed in a figure-of-eight fashion. These ends were then traversed through the tibial tunnel and fixed with a 7 mm titanium screw [Table/Fig-7]. The lateral retinaculum was repaired using No. 2 fibre wire. The wounds were meticulously irrigated, sutured in layers and wrapped in a sterile fashion. A postoperative X-ray of the patient showed the 7 mm titanium screw used for fixing the semitendinosus graft in the tibia [Table/Fig-8].

[Table/Fig-7]: Intraoperative photo showing patellar tendon repair with overlying semitendinosus graft augmentation fixed with titanium screw (Case 1).

[Table/Fig-8]: Postoperative X-ray of left knee with black arrows showing a 7 mm titanium screw used for fixing semitendinosus graft in the tibia (Case 1).

Rehabilitation Protocol

The patient was immobilised for three weeks in a long knee brace. For postoperative rehabilitation, knee ROM was started with passive and active-assisted flexion ROM starting from 0 to 30° until postoperative day 10, progressing to 0 to 60° by postoperative day 20, and reaching 0 to 90° by postoperative day 30. Bedside active-assisted extension exercises, along with isometric exercises for the quadriceps and hamstrings, commenced on postoperative day 1. The patient was allowed to walk non weight bearing with walker support for four weeks, after which he developed a knee ROM of 0 to 120° over 12 weeks [Table/Fig-9]. Weight-bearing mobilisation was introduced at the end of the fourth week.

[Table/Fig-9]: Clinical photo showing knee flexion till 120° (Case 1).

At three months, the patient exhibited a 20° extension lag due to quadriceps weakness [Table/Fig-10]. To eliminate the extension lag, the patient was placed on an electric muscle stimulation-assisted active extension exercise programme. By the end of five months, the patient achieved full active extension and flexion ROM. At one year postinjury, the patient returned to his preinjury status and was able to perform all activities of daily living.

[Table/Fig-10]: Clinical photo showing extension lag (Case 1).

Case 2

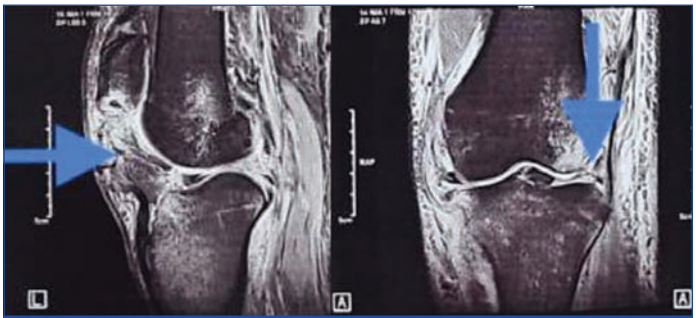
A 21-year-old male patient presented to the OPD with a history of a one-month-old RTA. The patient had an unstable posterior dislocation of the left knee with a contused lacerated wound, which was stabilised using an external fixator and underwent debridement with suturing at an outside hospital [Table/Fig-11]. Upon admission to our hospital, there was a healed scar measuring 10 centimeters inferior to the inferior pole of the patella. The external fixator was in situ, with healthy pin tracks. The external fixator was removed under sedation and the patient was allowed time for pin track healing.

[Table/Fig-11]: Preoperative X-ray of left knee showing external fixator applied for left knee dislocation (Case 2).

On examination, it was noted that the patella had reduced mobility with superior migration. There was no active knee extension, and the patient presented with a flexion deformity of 20°, with an additional 10° of further flexion. The Lachman test, as well as the anterior and posterior drawer tests, could not be performed due to stiffness. A grade III opening was observed during the varus stress test between 0-30° of flexion, while a grade II opening became apparent during further varus stress testing.

MRI imaging revealed a complete tear of the ACL and Posterior Cruciate Ligament (PCL), LM grade III tear at posterior horn, a grade III tear of the Lateral Collateral Ligament (LCL), and a grade II tear of the Medial Collateral Ligament (MCL). An avulsion of the patellar tendon from the inferior pole of the patella, along with distal retraction, was also noted [Table/Fig-12].

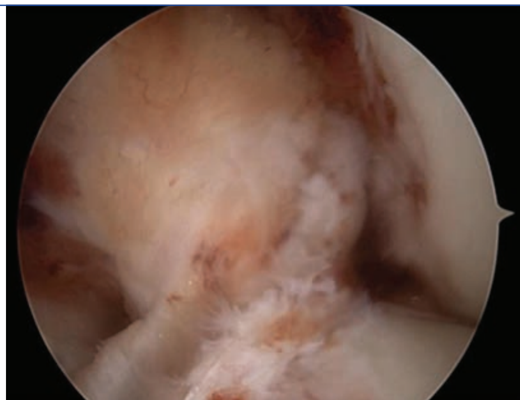
The patient began rehabilitation, utilising a continuous passive motion machine for assisted ROM exercises, alongside isometric



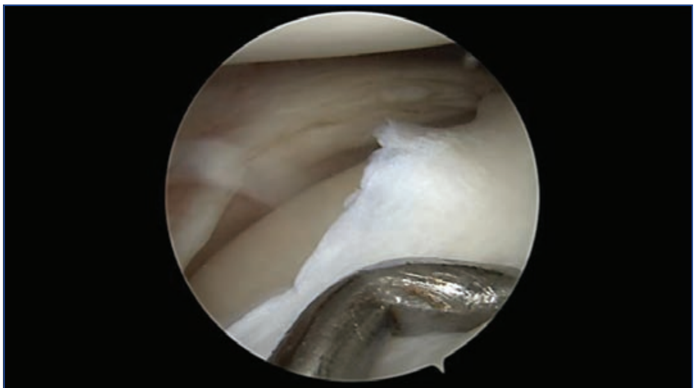
[Table/Fig-12]: Sagittal and coronal view of left knee, blue arrows showing patella tendon rupture and Lateral Meniscus (LM) Tear (Case 2).

strengthening. After 15 days of physical treatment, the patient was able to achieve an aided flexion ROM from 0 to 100°. Subsequently, the patient underwent surgery under spinal and epidural anaesthesia six weeks post-trauma. The left lower limb was positioned in a dangling manner [Table/Fig-13]. During diagnostic arthroscopy, tears of the ACL [Table/Fig-14], PCL, and LM [Table/Fig-15] were confirmed.

[Table/Fig-13]: Patient taken in dangling position with bony landmarks marked (Case 2).

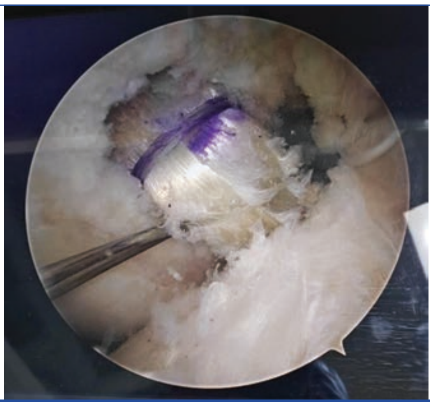


[Table/Fig-14]: Arthroscopic image showing ACL tear (Case 2).

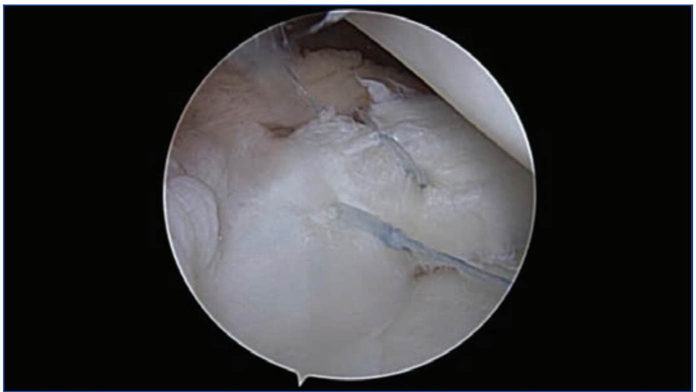


[Table/Fig-15]: Arthroscopic image showing Lateral Meniscus (LM) tear (Case 2).

The first surgical procedure involved arthroscopic PCL reconstruction using an ipsilateral peroneus longus tendon graft [Table/Fig-16]. LCL reconstruction was performed using a contralateral semitendinosus graft, applying Larson's technique. The LM was repaired using an all-inside repair device [Table/Fig-17].

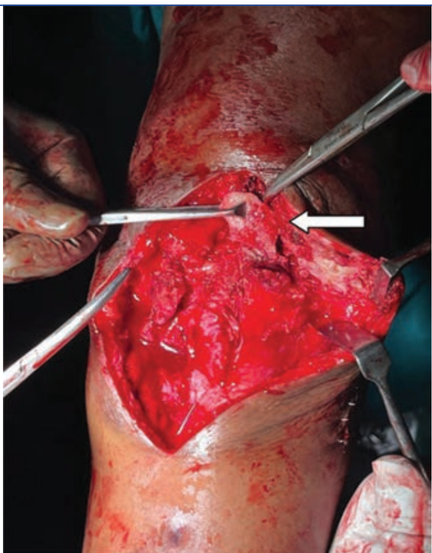


[Table/Fig-16]: Arthroscopic image showing PCL reconstruction using ipsilateral Peroneus longus graft (Case 2).



[Table/Fig-17]: Arthroscopy image showing Lateral Meniscus (LM) repair using all inside technique (Case 2).

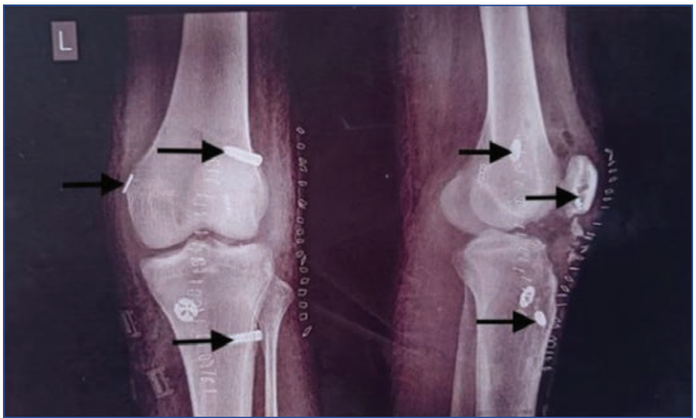
For the patellar tendon repair, an incision was made over the healed scar. The end of the avulsed patellar tendon was identified and freed from the adhesions of the scar tissue [Table/Fig-18]. A double-loaded 5 mm titanium suture anchor with a needle was inserted in the lower pole after freshening the crater. Two parallel rows of Krakow sutures were placed in the patellar tendon stump and the repair was conducted over the suture anchor at the lower pole of the patella [Table/Fig-19]. Repair stability was confirmed with 0 to 30° of flexion. The patellar tendon repair was reinforced with a semitendinosus graft using a similar technique as mentioned in case 1. Wound closure was performed, and a sterile dressing was applied.



[Table/Fig-18]: Surgical photo showing torn end of patellar tendon (Case 2).

[Table/Fig-19]: Intraoperative photo showing patellar tendon repair with semitendinosus graft augmentation (Case 2).

Postoperative X-rays show an endobutton in the femur, a suture disc in the tibia, a titanium anchor in the lower pole of the patella, and two titanium screws in the femur (for the LCL) and tibia (for the patellar tendon) [Table/Fig-20].



[Table/Fig-20]: Postoperative X-ray of left knee, black arrows showing endobutton in femur, suture disc in tibia, titanium anchor in lower pole of patella and 2 titanium screws in femur (for LCL) and tibia (for patella tendon) (Case 2).

Rehabilitation Protocol

A protocol similar to that of the first patient was followed. The patient was then scheduled for the second stage of ACL reconstruction. After six months of rehabilitation, the patient underwent arthroscopic ACL reconstruction. A graft from the contralateral peroneus longus was harvested and routine ACL reconstruction was performed.

Using a 9 mm triple-stranded peroneus longus graft, fixation was achieved with a femoral adjustable button and a 10×25 mm titanium-coated tibial screw. Standard postoperative rehabilitation following ACL reconstruction was implemented. Follow-up was scheduled for three months later, at which point the patient had returned to his preinjury level. By the end of six months, the patient was able to resume all routine daily activities, including gym exercises, cycling and swimming.

DISCUSSION

Acute ruptures of the patellar tendon, often located at the inferior pole of the patella, necessitate prompt surgical repair of the extensor mechanism to achieve maximum recovery of preijury functionality. Immediate repairs of newly ruptured patellar tendons have yielded superior outcomes regarding ROM, quadriceps muscle strength and overall functional recovery. Despite thorough physical assessments, patellar tendon ruptures may be overlooked in patients with multiple traumas, obesity and knee haemarthrosis [1].

Reapproximation of the severed tendon ends is frequently challenging when surgery is postponed beyond six weeks. A prolonged interval between injury and repair increases the probability of quadriceps retraction and proximal patellar migration. The most commonly employed technique is primary repair augmented by autogenous grafts, utilising fascia lata or hamstring tendons [1]. The direct end-to-end repair technique, when used alone, often necessitates extended immobilisation, which may result in complications such as inadequate tendon support, quadriceps weakening, or knee stiffness [2]. Therefore, augmentation plays a crucial role in facilitating early mobilisation, safeguarding the patellar tendon repair and preventing patella alta.

In more severe and chronic cases, augmented repairs are reinforced using loop and free tendon grafts, which can be either allografts or autografts. Various techniques have been employed, such as those by Milankov MZ et al., who utilised a contralateral Bone-Tendon-Bone (BTB) autograft, while Levis PB et al., used the Achilles tendon [3,4]. These methods have shown favourable short-term outcomes, reducing the need for postoperative immobilisation and enabling good ROM within six months postsurgery.

Another method for the reconstruction of the patellar tendon is the Porto technique, in which the graft is secured in a U-shape, allowing tension to be distributed through the retinaculum and graft to the anterior tibial tubercle during knee flexion. This method prevents excessive stress from being focused on the patella and the repaired patellar tendon [5].

Following a patellar tendon rupture after ACL reconstruction with a BTB autograft, the primary goals of surgical intervention are to restore the function of the extensor mechanism with minimal or no extensor lag, enable early ROM to prevent stiffness and minimise wound complications. Metal implant techniques, such as Dall-Miles cables, have been employed to reinforce the repair, facilitating earlier mobility [6]. However, these methods necessitate a follow-up procedure to remove the cables before the central defect has fully healed.

Hamstring autografts have also been used for patellar tendon reconstruction due to their low harvest morbidity and the preference for autograft over allograft tissue. This approach is typically reserved for cases of failed patellar tendon repairs, chronic ruptures, or salvage procedures where the quality of the remaining tendon tissue is inadequate [7-9]. Research by Van der Bracht H et al., has highlighted the strength of hamstring autografts and their suitability for early rehabilitation. This study applied the concept of using a hamstring autograft for tissue augmentation, addressing the surgical void in the patellar tendon caused by the BTB harvest [8].

CONCLUSION(S)

Delayed primary repair of patellar tendon tears with autologous soft-tissue graft augmentation is an effective surgical technique for restoring knee extensor function and structural integrity in cases where immediate repair is not feasible. This approach provides strong tendon reinforcement, minimises the risk of re-rupture, and promotes robust tendon healing by leveraging the biological benefits of autologous tissue. Although careful surgical skill and suitable graft selection are essential for successful treatment, results indicate good functional recovery, increased stability and satisfactory ROM in the knee. To evaluate potential side-effects and verify the durability of the outcomes, long-term follow-up research is required.

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PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of Orthopaedics, Dr. D. Y. Patil Medical College and Hospital, Pune, Maharashtra, India.
2. Postgraduate Student, Department of Orthopaedics, Dr. D. Y. Patil Medical College and Hospital, Pune, Maharashtra, India.
3. Professor, Department of Orthopaedics, Dr. D. Y. Patil Medical College and Hospital, Pune, Maharashtra, India.
4. Senior Resident, Department of Orthopaedics, Dr. D. Y. Patil Medical College and Hospital, Pune, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Selvi Ashishkumar Khajanchi,
D3-1503, Mahindra Antheia, Pimpri, Pune, Maharashtra, India.
E-mail: selvikhajanchi.96@gmail.com

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