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Single-Stage Treatment of a Patellar Osteochondral Defect in an Adolescent Using Autologous Minced Cartilage – Platelet-Rich Plasma Scaffold Technique: A Case Report and Technical Considerations

Anand Raj Rajendrababu[1], Akhil Prasad[1], Riyas Tharayil Nazar[1], Renjit John Mathew[2], John Thayyil John[2], Prasad Menon[1]

Learning Point of the Article:

Single-stage autologous minced cartilage combined with PRP scaffold offers a promising biologic and cost-effective treatment for adolescent patellar osteochondral defects, enabling functional recovery and a less morbid alternative to traditional two-stage procedures.

Abstract

Introduction: Osteochondral defects of the patella in pediatric patients are rare but clinically significant due to pain, mechanical symptoms, and potential long-term sequelae. Traditional two-stage approaches, such as autologous chondrocyte implantation, are often avoided in younger patients due to surgical burden and cost. This case report presents a single-stage biologic cartilage repair using autologous minced cartilage and a biologic scaffold (AutoCart, Arthrex) in a 14-year-old male with a symptomatic osteochondral defect in the patella.

Case Report: The technique involves arthroscopic harvest of autologous minced cartilage, intra-operative preparation of platelet-rich plasma (PRP), and application of a cartilage-PRP-BioCartilage matrix. Cancellous bone graft was also added in this case due to the large size of the defect.

Conclusion: At 6 months post-operative, the patient was asymptomatic, had returned to full activity, and magnetic resonance imaging confirmed excellent defect filling with no complications.

Keywords: Osteochondral defect, patella, autologous minced cartilage, adolescent.

Introduction

Osteochondral defects (OCD) of the patella in skeletally immature patients are diagnostic and therapeutic challenges. These defects, often traumatic or idiopathic, can lead to progressive pain and early degeneration if untreated [1]. Traditional management includes microfracture, osteochondral autografts, and autologous chondrocyte implantation (ACI). While ACI has shown promising outcomes in patella-femoral lesions [2, 3, 4], its use in young patients is limited due to the two-staged nature, higher cost, and delayed recovery. Emerging single-stage, biologically augmented techniques utilizing minced autologous cartilage, platelet-rich plasma (PRP), and cartilage scaffolds offer an attractive alternative [5,6,7]. This case illustrates the application of such a technique (AutoCart, Arthrex) in an adolescent with an osteochondral patellar lesion.

Case Report

A 14-year-old healthy, right-hand dominant male football player presented with a 9-month history of anterior knee pain on the right side. Pain was insidious in onset, worsened by stairs,

Author's Photo Gallery


Dr. Anand Raj Rajendrababu


Dr. Akhil Prasad


Dr. Riyas Tharayil Nazar


Dr. Renjit John Mathew


Dr. John Thayyil John


Dr. Prasad Menon

[1]Department of Orthopaedics, Kasaragod Institute of Medical Sciences, Kasaragod, Kerala, India,
[2]Department of Orthopaedics, Lourdes Hospital, Kochi, Kerala, India.

Address of Correspondence:
Dr. Anand Raj Rajendrababu,
Department of Orthopaedics, Kasaragod Institute of Medical Sciences, Kasaragod, Kerala, India.
E-mail: mail.anandrajr@gmail.com

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Figure 1: Pre-operative radiograph of the knee (anteroposterior and lateral views) showing osteochondral lesion on the lateral facet of the patella.

squatting, and prolonged activity. No prior trauma or instability was reported. Mild effusion, positive patellar grind test, and crepitus were observed on physical examination, along with tenderness on the lateral facet of the patella.

X-ray and computed tomography scan of the knee showed a smooth osteochondral defect in the lateral facet of the patella (Figs. 1 and 2). Magnetic resonance imaging (MRI) revealed a focal 14 × 12 mm osteochondral defect along the superior pole of the right patella on the lateral facet with >15 mm depth (Fig. 3). There were no signs of instability or ligamentous injury. Initial treatment consisted of physical therapy, activity modification, and NSAIDs for 3 months. Persistent symptoms prompted surgical management.

Surgical technique

Preparation

After a round of diagnostic arthroscopy (Fig. 4a) confirming the diagnosis and loose body removal, autologous minced cartilage, approximately 200 mg, was harvested arthroscopically from a non-weight-bearing area of the lateral femoral condyle and trochlea using an arthroscopic shaver. Simultaneously, nearly 60 mL of the patient's blood was drawn and processed intraoperatively to isolate PRP.

Graft preparation

The cartilage was minced using a sterile shaver (GraftNet system) and mixed with micronized cartilage scaffold (BioCartilage) and autologous PRP to form a cohesive paste.

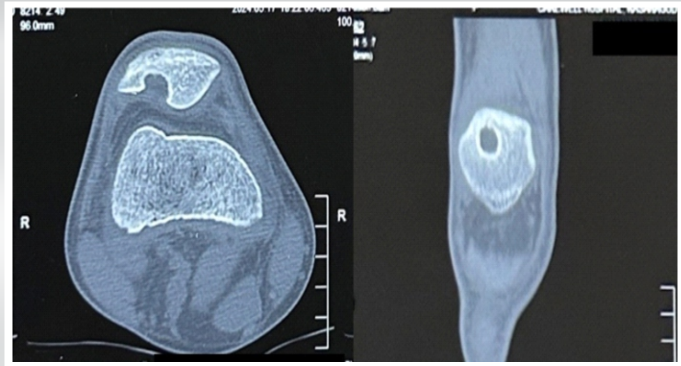

Figure 2: Computed tomography image showing the osteochondral defect on the lateral facet of the patella.

Application

The undersurface of the patella cannot be treated arthroscopically by this technique. Hence, an open procedure was carried out. A lateral parapatellar incision was made approximately 10 cm long and dissected by the lateral parapatellar approach. The patella was everted medially, and the large osteochondral defect was visualized (Fig. 4b).

- Cancellous bone graft obtained from the non-weight-bearing area of the lateral femoral condyle
- Defect site was debrided to stable cartilage margins, and bone was prepared using a curette to create a stable bed (Fig. 4c)
- Cancellous bone graft applied (Fig. 4d), followed by the biologic paste (Fig. 4e) to fill the defect and contour flush with the surrounding cartilage surface (Fig. 4f)
- Fibrin glue was applied to secure the construct (Fig. 5)
- The knee was held in extension post-application to ensure adhesion during the initial polymerization

Figure 3: T1- and T2-sagittal, coronal, and axial magnetic resonance imaging sections showing the osteochondral defect in the patella.

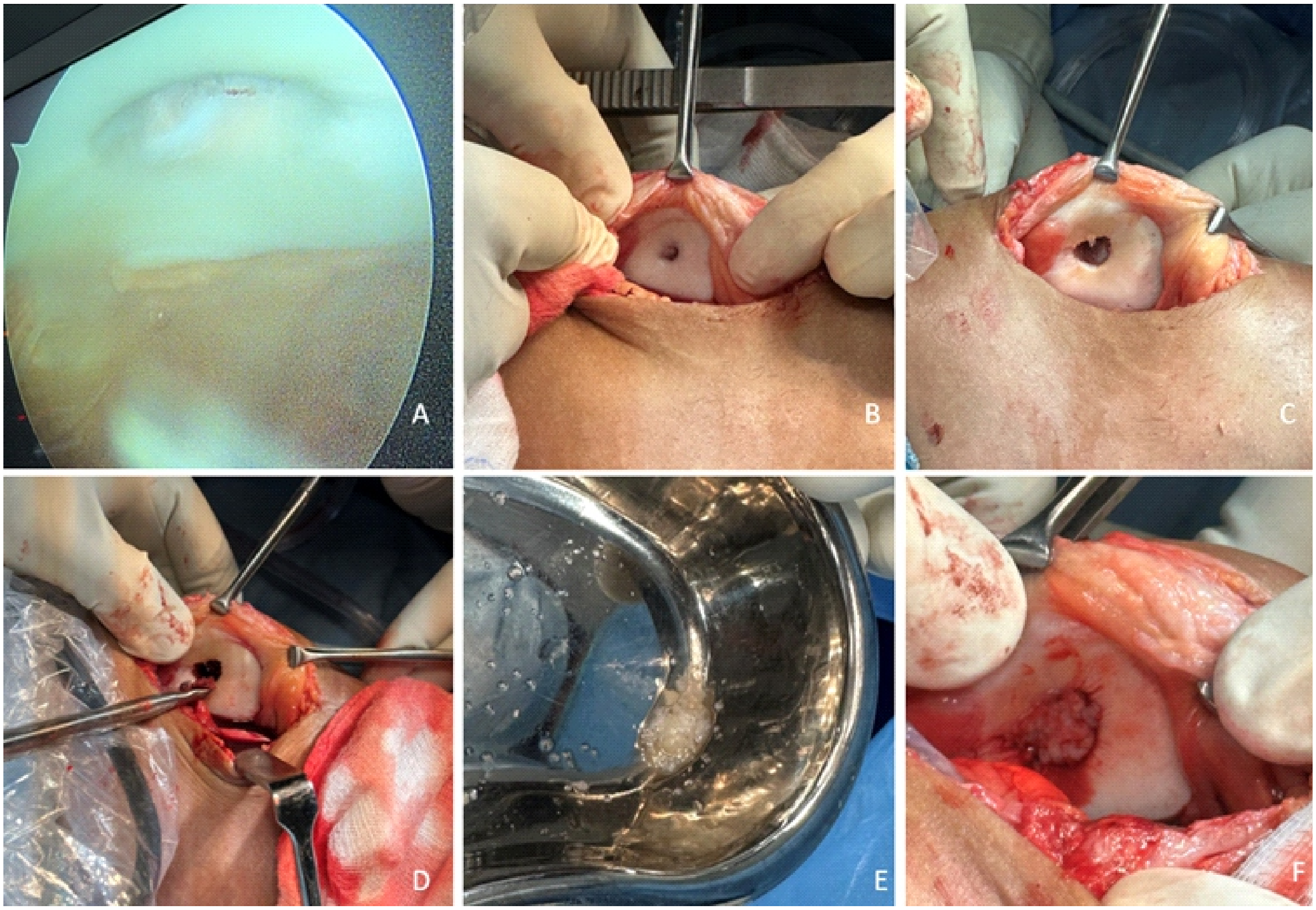

Figure 4: Arthroscopic view of the osteochondral defect on under-surface of the patella (a). Intraoperative image showing osteochondral defect on the lateral facet of the patella seen after everting the patella medially (b). Osteochondral defect after debridement for graft application (c). Cancellous bone graft is being applied to the defect (d). Autologous minced cartilage mixed with micronized cartilage scaffold (BioCartilage) and autologous platelet-rich plasma (PRP) to form a cohesive paste (e). Autologous minced cartilage mixed with micronized cartilage scaffold (BioCartilage) and autologous PRP to form a cohesive paste used to fill the defect, and contoured flush with the surrounding cartilage surface (f).

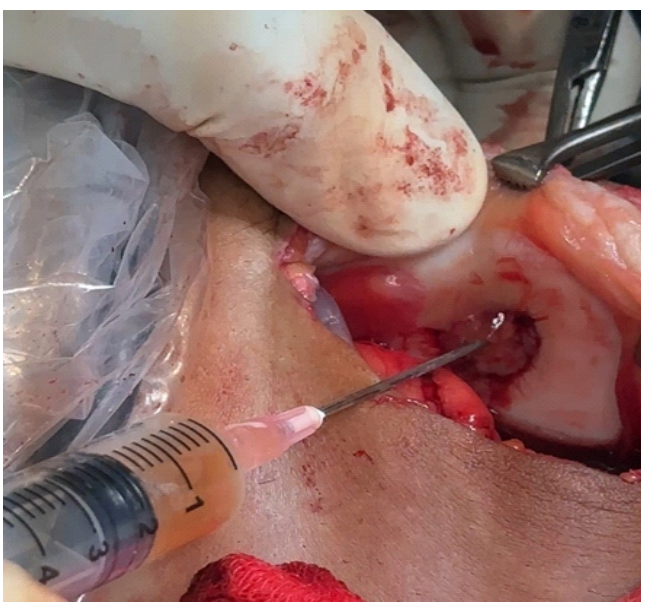

Figure 5: Fibrin glue application with the help of a needle and syringe.

• The knee was taken through a full range of movement to make the graft contoured with the surface of the patella.

The immediate post-operative period involved a hinged knee brace allowing flexion up to 30° flexion in the first 2 weeks, followed by progressive increase in range of motion (ROM) up to 90° in the 1st month; progressive weight bearing was allowed

Figure 6: A 6-month post-operative follow-up showing knee range of motion and healed surgical scar.

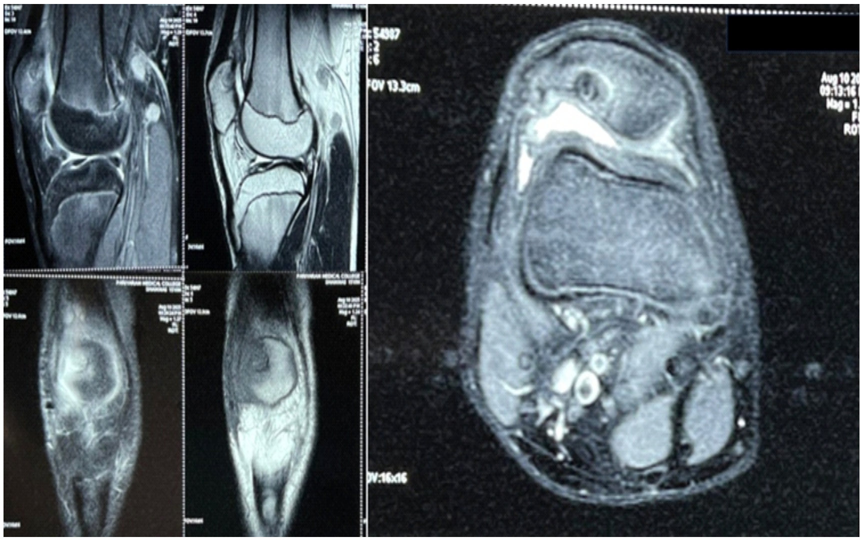

Figure 7: T1- and T2-sagittal, coronal, and axial magnetic resonance imaging sections showing 6-month post-operative status of the healed osteochondral defect in the patella.

as tolerated. Return to sports training at 4 months, full return to sports at 6 months.

Results

The patient achieved pain-free walking at 2 months; almost full ROM and returned to football at 6 months (Fig. 6). IKDC pediatric increased from 52 (pre-operative) to 91 (12 months post-operative); KOOS-Child Sports subscore improved from 60 to 95. MRI findings (Fig. 7) at 6 months postoperatively showed a near-complete defect filling with well-defined cartilage of uniform signal intensity, nearly 3 mm thick, and likely to be hyaline. Minimal subchondral edema and cortical irregularity were noted, but without any unstable osteochondral fragments. No hypertrophy or delamination. No complications such as infection, arthrofibrosis, or donor site morbidity.

Discussion

This case supports the viability of biologic, single-stage cartilage repair techniques in adolescents, particularly for patellar OCD. Compared to traditional matrix-induced autologous chondrocyte implantation or osteochondral autograft transfer system procedures [2,3], this approach avoids the need for multiple surgeries, preserves tissue, and leverages the high healing potential in young individuals [6].

A similar technique was described by Farr and Yao using BioCartilage and PRP for femoral condyle lesions [5], but data in adolescents and for patellar defects remain limited. Recent reports on AutoCart demonstrate promising mid-term results with simplified logistics and similar efficacy to staged ACI [7, 8, 9].

Limitations

Single-patient case study, lack of second-look arthroscopy or histology, and no long-term data beyond 18 months (Tables 1

Table 1: Comparison of cartilage repair techniques for patellar osteochondral defects [8, 9]

Technique	Key features	Advantages	Disadvantages
Microfracture	Subchondral drilling to induce fibrocartilage	Single-stage, inexpensive, technically simple	Fibrocartilage formation, poor long-term durability
Osteochondral autograft transfer system	Plug(s) from non-weight-bearing areas	Hyaline cartilage repair, single-stage	Donor-site morbidity, limited graft size
ACI/MACI	Two-stage; cultured chondrocytes implanted with a membrane	Produces hyaline-like cartilage; long-term results	Two surgeries, high cost, longer recovery
Allograft transplantation	Osteochondral plug from a cadaver donor	Suitable for large defects, restores bone+cartilage	Limited availability, risk of immune reaction, higher cost
Minced cartilage+PRP scaffold (AutoCart-type)	Single-stage; autologous minced cartilage with PRP and scaffold	Biologic, autologous, avoids cell culture; low morbidity	Limited long-term outcome data; technique sensitive

ACI: Autologous chondrocyte implantation, MACI: Matrix-induced autologous chondrocyte implantation, PRP: Platelet-rich plasma

Table 2: Advantages of minced cartilage+PRP in the pediatric patella compared to MACI [8, 9, 10]

Feature	Minced cartilage PRP scaffold	MACI/ACI
Surgical staging	Single-stage	Two-stage (biopsy+implantation)
Cell source	Intraoperatively minced autologous cartilage	Cultured autologous chondrocytes (4–6 weeks)
Scaffold type	BioCartilage+PRP	Collagen membrane
Bone integration option	Can be combined with bone graft as needed	May require a separate procedure
Cost	Lower	High (cell culture, facility)
Recovery time	Shorter; sport at 6 months	Longer; sport at 9–12 months
Indicated age group	Ideal for adolescents and young adults	Adults use more established
Literature base	Growing, but limited long-term data	Extensive long-term studies

ACI: Autologous chondrocyte implantation, MACI: Matrix-induced autologous chondrocyte implantation, PRP: Platelet-rich plasma

and 2).

Considerations

The regenerative environment in adolescents may enhance outcomes with biologic scaffolds. While long-term outcomes remain under investigation, early results support the feasibility of autologous minced cartilage repair for medium-sized patellar OCDs.

Conclusion

Single-stage autologous cartilage repair using minced cartilage, PRP, and scaffold represents a promising strategy for managing OCD in the adolescent patella. It provides functional improvement, radiographic healing, and high patient satisfaction with low morbidity.

Clinical Message

Single-stage autologous minced cartilage repair combined with platelet-rich plasma scaffold is a promising and effective treatment for adolescent patellar osteochondral defects, offering functional improvement, radiographic healing, and high satisfaction with low morbidity, whereas avoiding the complexity and cost of traditional two-stage procedures.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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