



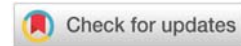
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## Review Article

# Patellar chondromalacia among adolescent athletes–A systematic review

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## Abstract

Knee injuries, acute or chronic are one of the most often injuries in sport, both in adults and adolescents. They mostly occur in contact sports due to torsional and deceleration forces, causing around 80% painful knee conditions that disable sports performance. If chronic, they occur in the form of repetitive microtrauma that generates articular cartilage damage, producing cartilage softening and thinning and causing anterior knee pain. Etiological factors that are also associated with anterior knee pain in the form of patellar chondromalacia are idiopathic or post-traumatic patellar luxation and different types of femoral trochlear dysplasia. Repetitive trauma might cause cartilage fissures, fragmentation and necrosis so the patients can feel retropatellar pain, usually after physical activities. Treatment of patellar chondromalacia is usually conservative but an early diagnosis (magnetic resonance imaging and arthroscopy) is essential in the prognosis of these patients.

## Introduction

### Review

**Knee joint anatomy and biomechanics:** Knee joint is consisted of tibiofemoral and patellofemoral joint, covered with articular cartilage and reinforced with articular capsule and ligaments. Both medial and lateral (bigger, more mobile, less vascularized) meniscus, fibrocartilagenous structures absorb the intraarticular pressure. According to some authors, in patients with a total meniscectomy, the force of pressure of the femur on the condyles of the tibia increases by as much as 350%. Knee flexion and extension movements, in the range of 150° are enabled by quadriceps femoris muscle and hamstrings. The maximum degree of internal and external rotation,

depending on cruciate ligaments tightening and relaxation is 5–20°, while lateral sliding movement are slight, due to collateral ligaments' tightening [1–9].

**Knee sports injuries:** Along with the ankle injuries, knee injuries are one of the most common sports injuries. They mostly occur in contact sports (soccer, football, basketball, running) due to torsional and deceleration forces and cause around 80% painful knee conditions that disable sports performance. The pathogenesis of these injuries involves: sudden changes in the direction of movement, sudden stopping or irregular landing, that cause excessive internal rotation and hyperextension in the knee joint. Untimely diagnosed and treated, they can be an introduction to the occurrence of chronic degenerative changes in the knee joint, such as patellar chondromalacia [4,9,10].



**Definition and epidemiology:** Patellar chondromalacia is defined as a painful retropatellar condition, caused by damage of the patellar cartilage, due to repeated stress to the articular surface. Being a common reason for patellofemoral pain syndrome – anterior knee pain, this condition might limit daily life activities. Patients are usually young female athletes in the second decade of life [4,11].

**Etiopathogenesis:** Patellar chondromalacia can be idiopathic, post-traumatic and also a consequence of biomechanical disorders of the extensor apparatus of the knee, such as: reduced strength of the quadriceps femoris muscle, reduced Q-angle, *patella alta* or *patella infera*, patellofemoral malalignment. Patellar malalignment may be related to patellar (sub)luxation, dysplasia of the femoral trochlea as well as deformities of proximal tibia anatomical parameters such as: tibial slope, trochlear depth, lateral trochlear inclination, and lateral patellar tilt. According to some authors, articular cartilage damage (ICRS grade 1-4: cartilage softening, cartilage surface fissures, cartilage fragmentation, cartilage necrosis) in the region of patellofemoral joint is arthroscopically detected in 71% patients with different types of knee trauma, such as: menisci rupture (46%), anterior cruciate ligament rupture (34%) and recurrent patellar luxation (15%) Cartilage damage stimulates transition of proinflammatory cytokines to cartilage as well as the local metabolic changes; chondrocytes increase the secretion of proteoglycans and collagen, enzymatic tissue degradation accelerates so the subchondral bone might terminally be affected with sclerosis, while cartilage becomes softer [6,7,13,14].

### Clinical presentation

Patients suffering from patellar chondromalacia usually feel anterior knee pain. Pain may increase during activities, especially due to prolonged walking, climbing or descending stairs, walking on uneven surfaces, squats, lifting heavy loads. Occasionally, patients may also experience pain during prolonged sitting when the knee is bent. In severe cases, patients cannot walk properly.

### Diagnosis

Considering the fact that pathological changes occur in cartilage, radiography is usually not a significant diagnostic method in the examination of patellar chondromalacia. Knee arthroscopy as well as Magnetic Resonance Imaging (MRI) can indicate the extent and degree of tissue damage and decide on further treatment. MRI with a high tissue contrast can detect chondromalacia in the lower stages: signal irregularities, fissures and chondral thinning thus leading to earlier diagnosis and treatment [11,13].

### Treatment

Treatment can be preventive (elimination of causes such as static disorders), conservative (physical therapy, quadriceps exercises, non-steroid antiinflammatory drugs) and surgical (chondrectomy, ventralization and medialization of the patella, sagittal osteotomy of the patella) [11,15]. The existence of excessive distance between tibial tuberosity and tibial

groove, *patella alta* or *patella infera*, patellofemoral instability as a functional problems must be treated with tibial tubercle osteotomy, often combined with a soft tissue procedures, in order to obtain a satisfactory result, with a good prognosis and positive functional capacity outcome [16-18]. The most usually used soft tissue procedure is medial patellofemoral ligament reconstruction, as one of the primary methods in the treatment of patellar instability, using hamstring or peroneus longus muscle tendon as a graft [19,20].

### Conclusion

Repetitive microtrauma in physically active adolescents might also generate patellar cartilage damage, causing anterior knee pain that can significantly reduce daily activities, especially in females. As the most frequent entity of the anterior knee pain, patellar chondromalacia is characterized by the presence of cartilage softening, fissures, fragmentation and necrosis, producing pain that is usually localized retropatellary and stimulated during and after activities, more often in patients with different types of patellofemoral malalignment and anatomical deformities of the femoral trochlea. Early diagnosis and treatment are essential in achieving a good prognosis in patients with patellar chondromalacia.

### References

- Milanović F (2020) Procena uspešnosti primene plazme obogaćene trombocitima na regenerativnu sposobnost hrskavice kod sportskih povreda zgloba kolena. Fotokopirnica Kopija: Medicinski fakultet Univerziteta u Beogradu.
- Mrvljević D (2010) Articulatio genus. In: Vojislav Busarčević, editor. Anatomija donjeg ekstremiteta, petnaesto izdanje. Beograd: Savremena Administracija 10-17.
- Milislavljević M (2002) Klinička anatomija – Donji ekstremitet (zglob kolena). Beograd: NAUKA 184-186.
- Stevanović V (2010) Sportske povrede i bolna stanja kolena. In: Milinković ZB i saradnici, editors. Sportska medicina u pitanjima i odgovorima. Niš: Narodna Knjiga Alfa 364-374.
- Jonhston BD, Liebert PL (2011) Exercise and Sports Injury. In: Porter RS, Kaplan JL, editors. The Merck Manual Of Diagnosis and Therapy, 19th edition. New Jersey. Merck Sharp & Dohme Corporation. A subsidiary of Merck & Company, INC - Whitehouse Station 3292-3306.
- Jakovljević A, Čulum J, Čazić A (2018) Uvod. In: Jakovljević A, editor. Plazma obogaćena trombocitima – PRP (Platelets-Rich Plasma). Banja Luka: Zdravstvena Ustanova – Bolnica iz hirurških i internističkih oblasti S-tetik, Sportska ambulanta 12-33.
- Kleemann RU, Krockner D, Cedraró A, Tuischer J, Duda GN (2005) Altered cartilage mechanics and histology in knee osteoarthritis: relation to clinical assessment (ICRS Grade). Osteoarthritis Cartilage 13: 958-963. [Link: https://bit.ly/3wWCqYu](https://bit.ly/3wWCqYu)
- Stevens AL, Gharaibeh B, Weiss KR, Fu FH, Huard J (2006) Gene Therapy in the Treatment of Knee Disorders. In: Scott WN, editor. Surgery of the Knee, the fifth edition. Philadelphia: Elsevier – Churchill Livingstone 4-32.
- Đurašković R, Radovanović D, Pantelić S, Popović-Ilić T (2009) Sportske povrede. In: Živković D, editor. Sportska medicina, treće, dopunjeno izdanje. Niš: Centar za izdavačku delatnost Fakulteta sporta i fizičkog vaspitanja Univerziteta u Nišu 399-477.
- Matteo D, Vetere D (2015) Meniscal Lesions. In: Piero Volpi, editor. Football Traumatology – Current Concepts: from Prevention to Treatment 197-203.

11. Blagojević Z (2015) Oboljenja kolena. In: Maksimović Ž, editor. Hirurgija – udžbenik za studente pete godine medicine. Beograd: CIBID 839-843.
12. Yu Z, Yao J, Wang X, Xin X, Zhang K, et al. (2019) Research Methods and Progress of Patellofemoral Joint Kinematics: A Review. J Healthc Eng 2019: 9159267. [Link: https://bit.ly/3rpmoFe](https://bit.ly/3rpmoFe)
13. Tabary M, Esfahani A, Nouraie M, Babaei MR, Khoshdel AR, et al. (2020) Relation of the chondromalacia patellae to proximal tibial anatomical parameters, assessed with MRI. Radiol Oncol 54: 159-167. [Link: https://bit.ly/3kHehm6](https://bit.ly/3kHehm6)
14. Gudas R, Šiupšinskas L, Gudaitė A, Vansevicius V, Stankevicius E, et al. (2018) The Patello-Femoral Joint Degeneration and the Shape of the Patella in the Population Needing an Arthroscopic Procedure. Medicina (Kaunas) 54: 21. [Link: https://bit.ly/2TxCw4](https://bit.ly/2TxCw4)
15. Ostojic SM (2006) Leksikon sportske medicine i fiziologije vežbanja. Beograd: Udruženje Nauka i društvo Srbije. [Link: https://bit.ly/3BvpGf1](https://bit.ly/3BvpGf1)
16. Caton JH, Dejour D (2010) Tibial tubercle osteotomy in patello-femoral instability and in patellar height abnormality. Int Orthop 34: 305-309. [Link: https://bit.ly/2V5uhnq](https://bit.ly/2V5uhnq)
17. Middleton KK, Gruber S, Shubin Stein BE (2019) Why and Where to Move the Tibial Tubercle: Indications and Techniques for Tibial Tubercle Osteotomy. Sports Med Arthrosc Rev 27: 154-160. [Link: https://bit.ly/3y0H60E](https://bit.ly/3y0H60E)
18. Iliadis AD, Jaiswal PK, Khan W, Johnstone D (2012) The operative management of patella malalignment. Open Orthop J 6: 327-339. [Link: https://bit.ly/3zBRYCT](https://bit.ly/3zBRYCT)
19. Xu C, Zhao J, Xie G (2016) Medial patella-femoral ligament reconstruction using the anterior half of the peroneus longus tendon as a combined procedure for recurrent patellar instability. Asia Pac J Sports Med Arthrosc Rehabil Technol 4: 21-26. [Link: https://bit.ly/3wXjJDV](https://bit.ly/3wXjJDV)
20. Surendran S (2014) Patellar instability - Changing beliefs and current trends. J Orthop 11: 153-156. [Link: https://bit.ly/36V1rbQ](https://bit.ly/36V1rbQ)

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