Journal of Medical and Scientific Research

JMSR
www.jmsronline.com

Anand AR et al. J Med Sci Res. 2024; 12(3):257-261
http://dx.doi.org/10.17727/JMSR.2024/12-48

CASE REPORT OPEN ACCESS

Efficacy of conservative treatments for anterior knee pain with chondromalacia patella

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Abstract

Chondromalacia of patella (CMP) is a condition in which cartilages under patella and underlying surface soften and tear resulting in anterior knee pain that worsens especially while flexing and climbing stairs. Conservative treatments can delay or prevent the need of surgical interventions. The prime objective of this paper is to demonstrate the efficacy of certain conservative treatments for symptomatic relief from anterior knee pain due to CMP on a single case. A 45-year-old male diagnosed to have symptomatic CMP of grade-IV with anterior knee pain in both the legs sequentially and difficulty in flexion and climbing stairs has been treated conservatively with nutraceutical supplement, physical rehabilitation, and combined platelet rich plasma (PRP) and hyaluronic acid (HA) intra-articular (IA) injections. Knee flexion angle (KFA) and kneeling ability score (KAS) are considered as clinical evaluation parameters for demonstrating the efficacy of the conservative treatments. The conservative treatments with collagen peptide nutraceutical supplement and rehabilitation exercises for the right knee and the same along with combined PRP and HA IA injections for the left knee sequentially are found to be effective in symptomatic relief from the knee pain to a great extent with significant improvement in the knee joint flexibility as demonstrated on a single case. Thus, the treatments are remarkable for significant alleviation of the knee pain and improvement in the knee joint flexibility.

Keywords: Chondromalacia patella; anterior knee pain; conservative treatments; kneeling ability; knee flexion.

Introduction

Chondromalacia of patella (CMP) or patellofemoral syndrome is a condition wherein cartilages under patella and underlying surface soften and tear [1]. This causes acute anterior knee pain especially while flexing and climbing stairs. In addition, the pain also increases after sitting for a long time or during kneeling and squatting. CMP is very common and can be due to plenty of reasons such as intense sports, patella misalignment, weak muscles in thighs or calves, trauma, progressing age, poor dietary, malnutrition and obesity or sometimes idiopathic [2]. In a healthy cartilage, proteoglycan entrapped in collagen fibrils in extracellular matrix (ECM) make the tissue serve as cushion. In CMP, patellar cartilage turns soft and fibrillated, finally degenerating and wearing away, resulting in patellofemoral osteoarthritis (OA). The cartilage is necessarily avascular and aneural (deprived of blood and nerve supply, respectively) and is hence difficult to heal. As a result, preservation and health of an articular cartilage are of paramount importance for joint wellness. Articular cartilage is mostly nourished by diffusion of nutrition from the synovial fluid. Depending upon the level of cartilage damage, CMP is graded into four [3]. Grade-I is the condition in which there is soft indentation with only fissures and cracks over the cartilage superficially. Grade-II represents cartilage lesions going down to around 50% of its depth. In grade-III, defects in the cartilage are more than 50% of its depth. In grade-IV, the cartilage defects spread down to subchondral bone. CMP grade–I/II is considered to be the

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Received 30 March 2024; *Revised* 9 May 2024; *Accepted* 18 May 2024; *Published* 30 May 2024

Citation: Anand AR, Naveen K, Kumar MA, Rauniyar S, Hemant K. Kalyan. Efficacy of conservative treatments for anterior knee pain with chondromalacia patella. J Med Sci Res. 2024; 12(3):257-261 DOI: http://dx.doi.org/10.17727/JMSR.2024/12-48

initial stage, whereas grade–III/IV is the severe stage. In general, the patellar cartilage has the capability to heal itself in the initial stage but the cartilage lesions in the grade-III/IV has a tendency to become patellofemoral OA wherein the cartilage has very low or no self-healing power [4]. Clinical examination of patients with anterior knee pain generally includes physical examinations such as palpation to evaluate tenderness on the patellar periphery and range of motion assessment, assessment of Kellgren-Lawrence (K&L) scale from plain radiographic images and evaluation of magnetic resonance imaging (MRI) pictures [5-7]. However, MRI remains a significant method to assess cartilaginous lesions / irregularities. It is worth noting that in rare cases, the lesions found on MRI are asymptomatic and are only incidental findings [6]. Symptomatic CMP impacts daily activities. Some patients respond well to conservative treatments while some do not. Surgical interventions for CMP such as arthroscopic surgery or patellofemoral arthroplasty are required only on patients who are refractory to conservative treatments. Conservative treatments can substantially delay or sometimes prevent the need of surgery in patients with early PF arthritis [8].

Conservative management for knee pain includes nonsteroidal anti-inflammatory drugs (NSAIDs), nutraceuticals, physical rehabilitation exercises, aquatic therapy, intra-articular (IA) injections with corticosteroids, viscosupplementation or platelet rich plasma (PRP), etc. Although NSAIDs (especially, nonselective type) for arthritic pain provide short term relief from pain by blocking cyclooxygenase enzymes thereby preventing the release of prostaglandins, these are not advised for long term benefits due to their impact on gastro-intestinal track (ulcerogenicity) and other side effects on renal and cardio-vascular systems [9]. Nutraceuticals such as bioactive collagen peptides have therapeutic effect in OA patients due to their excellent bioavailability and stimulatory action on ECM synthesis in human cartilages wherein type-II collagen is abundant [10]. Physical rehabilitation exercises for quadriceps and hamstring strengthening are helpful in providing symptomatic relief from pain and improving stability. Intra-articular corticosteroid injections also provide symptomatic relief due to its localized anti-inflammatory effect [11]. Corticosteroids such as triamcinolone acetonide are found to be effective for a period up to 6 months [12]. Viscosupplementation with hyaluronic acid as intra-articular (IA) injection improves the biomechanical function of knee joints by increasing the viscosity of the synovial fluid and creates potential anti-inflammatory and anti-catabolic effects [11]. The autologous PRP is trusted to have potential therapeutic effects. When the PRP is injected into a synovial joint, it releases plenty of growth factors and is expected to possess regenerating capacity resulting in symptomatic relief from pain. Despite the individuals benefits of viscosupplementation and PRP IA injections, there are a few studies which demonstrate that the efficacy of combined therapy of viscosupplementation and PRP is better than either viscosupplementation or PRP alone for symptomatic relief from pain for up to 12 months [13]. Thus, the prime objective of this paper is to demonstrate the efficacy of conservative management for symptomatic CMP on a single case using various modalities for regeneration of cartilaginous lesions and alleviating pain with full range of motion.

Case report

A 45-year-old male was complaining of severe pain on right knee over 6 months. The body-mass index (BMI) of the patient was 22 kg/m^2. The patient had no history of trauma or other comorbidities such as hypothyroidism, rheumatism, hypertension, dyslipidemia, diabetic mellitus and hyperuricemia or deficiencies such as hypocalcemia, hypovitaminosis-D or -K and anemia. Plain radiographic images (both anterio-posterior [AP] and lateral views) taken under supine position for checking any deformity were normal. Skyline radiographic images also showed normal alignment of patellae with trochlear grooves. After thorough physical examinations to rule out other possible defects, the patient was prescribed oral nonsteroidal anti-inflammatory drug (NSAID) [Naproxen 250 mg, dosage: *bd*] only for 5 days and advised for ultrasound therapy and cryotherapy for 10 sittings. In addition, the patient was advised to do quadriceps strengthening exercises (such as quad set and straight leg raise) and hamstring strengthening exercises (such as basic bridge and prone hamstring curl) two times a day for 3 months and report afterwards. However, after 6 months, the patient reported with acute pain on the right knee and very mild pain on the left knee. Consequently, MRI was performed on bilateral knees which revealed grade-IV chondromalacic changes in the patellar and the underlying cartilages over the right knee. Subsequently, the patient was in conservative treatment for 9 months. After 9 months, the therapeutic results on the right knee were quite significant but pain on the left knee worsened. Subsequent MRI revealed significant regeneration of the cartilages of the patella and underlying surface in the right knee but grade-IV chondromalacic changes over the left knee. The patient was given single dose of IA viscosupplementation with PRP injection and advised to follow all the conservative therapies as followed for

the right knee. The diagnosis, conservative treatments and therapeutic results are all discussed in detail in the subsequent section.

Results and discussion

The diagnosis of the CMP on the right knee was from MRI which revealed focal subchondral edema over the medial patellar facet close to the apex along with irregularity of the overlying articular cartilage, suggestive of grade-IV chondromalacia (Figure 1). Rest of the articular surfaces were found to be smooth and the articular cartilages were well preserved in all the three compartments.

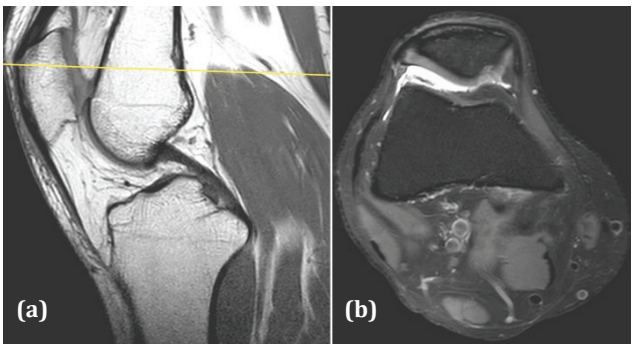

Figure 1: MRI on right knee (a) T2 sagittal image and (b) axial proton density fat-saturated image revealing grade-IV chondromalacic changes in the medial patellar facet (Flip angle: 90°).

There was no evidence of patellar alta, baja or lateral drifting and the extensor mechanism was well preserved. Both the anterior and posterior cruciate ligaments were also intact. MRI on the left knee revealed no significant abnormality. The patient was again advised for ultrasound therapy and cryotherapy for 10 sittings and prescribed oral NSAID (Naproxen 250 mg, dosage: *bd*) for 5 days and collagen nutraceutical supplement [Collaflex®] for 6 months. Collaflex® is a symptomatic slow-acting drug containing bioactive collagen peptides (10 g) which can aid cartilage regeneration and can be taken orally by dissolving it in water. In addition, the patient was advised to continue quadriceps strengthening exercises and hamstring strengthening exercises for improved therapeutic results. The patient was also advised to rate the pain while kneeling and measure the knee flexion angle (KFA) on the right knee every month to assess the therapeutic effects of all the conservative treatments. To rate the pain while kneeling, kneeling ability score suggested in Ref. [14] was considered. This kneeling ability score (KAS) is given by

$$\mathrm{KAS} = 1 - \left(\frac{Q_1+Q_2+Q_3}{30}\right) \quad (1)$$

where Q_1, Q_2 and Q_3 are the pain scales (in 0-10) upon kneeling on very hard surface (tile/concrete), medium surface (rug) and very soft surface (pillow/sponge), respectively. The scale '0' represents without pain and '1' is for very intense pain. The value of KAS can lie between 0 and 1, where '0' represents complete disability to kneel and '1' represents ability to kneel without pain. Despite the improvement in kneeling ability, slight discomfort started on the left knee after 3 months. Hence, the left knee was guarded with a cushion underneath and KAS was evaluated for the right knee. After a period of 9 months, the patient reported with significantly alleviated pain on the right knee but increased pain on the left knee. The pain scores (Q_1, Q_2 and Q_3) started decreasing and the parameters – KAS and KFA on the right knee started gradually improving, resulting in significant increase in the range of motion (ROM). At the end of nine months, the kneeling ability was regained up to 0.97 as shown in Figure 2.

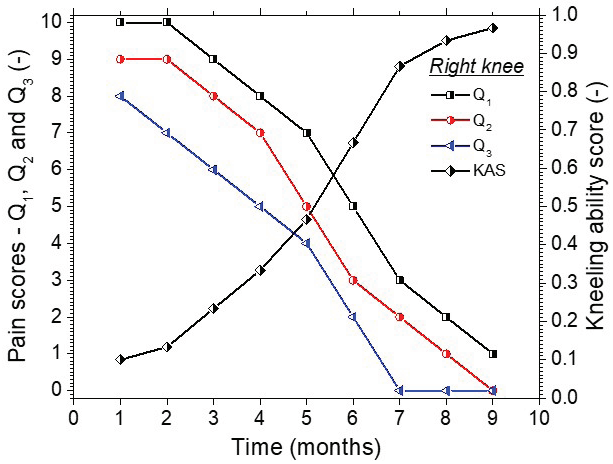

Figure 2: Pain scores and KAS on the right knee.

The flexion ability also improved quite significantly. KFA was estimated from the photo taken at the knee flexion condition [Figure 3 (a)] using trigonometry as

$$\mathrm{KFA} = 180^\circ - tan^{-1}\left(\frac{y}{x}\right) \quad (2)$$

where y is the distance of the vertical line connecting the centre line of tibia and the centre line of femur and x is the distance between the intersection of these two centre lines and the intersection of the vertical line with the centre line of tibia.

As seen from the plot of KFA in Figure 3 (b), ROM is also fully recovered at the end of sixth month itself. MRI was repeated to monitor the degenerative/regenerative changes on the bilateral knees. On the right knee, the focal subchondral edema found over the medial patellar facet near the apex and the irregularity of the underlying articular cartilage considerably disappeared revealing a significant regeneration of the damaged cartilages as shown in Figure 4.

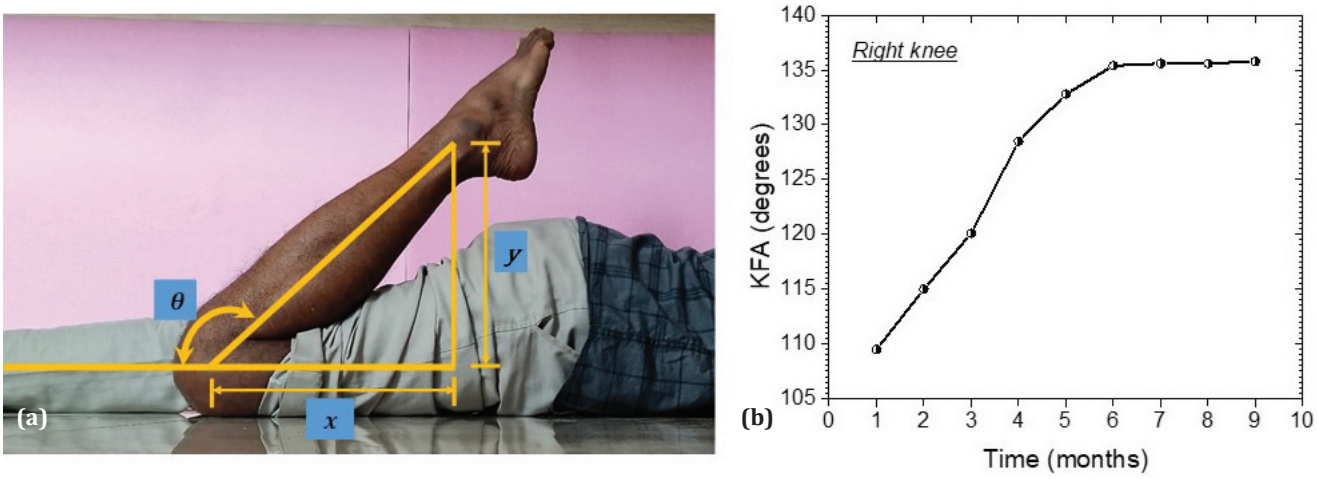

Figure 3: (a) KFA measurement (b) measured KFA on the right knee.

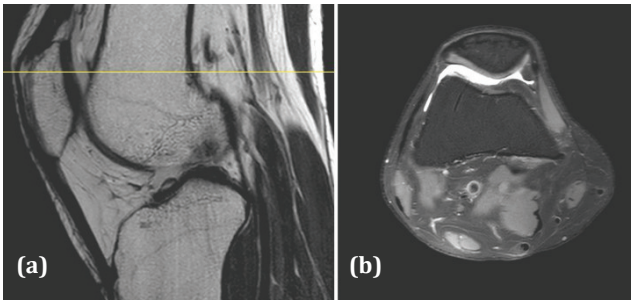

Figure 4: MRI on the right knee after 9 months of conservative treatment (a) T2 sagittal image and (b) axial proton density fat-saturated image wherein the focal subchondral edema found over the medial patellar facet has disappeared (Flip angle: 90°).

However, despite the well-preserved condition of the articular cartilages, the MRI on the left knee showed subtle subchondral erosion with full thickness fissuring of the medial patellar cartilage and the underlying cartilage suggestive of grade-IV chondromalacia (Figure 5) which could possibly be due to load imbalance on the knees. Considering the severity and discomfort expressed by the patient, it was decided to give him a combination therapy of viscosupplementation with Synvisc One® and PRP IA injections on the left knee. Synvisc One® is an avian based hyaluronan with high molecular weight (~6×10^6 Da) and is composed of cross-linked derivatives - solid hylan gel particles and soluble hylan molecules.

Firstly, 30 ml of high concentration PRP was prepared from 100 ml of intravenous blood through centrifuge using standard procedure. The patient was asked to lie on the bed in supine position and the patellar surface was cleaned with 10% w/v povidone iodine antiseptic solution. A local anesthesia of 5 ml 2% lignocaine hydrochloride was injected intra-articularly over supero-lateral location of the left knee as shown in Figure 6, followed by the viscosupplementation and PRP injections.

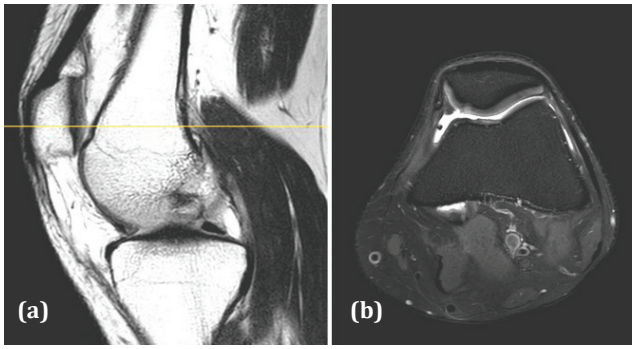

Figure 5: Left knee (a) T2 sagittal image and (b) axial proton density fat-saturated image revealing near full thickness fissuring of the medial patellar articular cartilage with subtle subchondral erosion (Flip angle: 90°).

Figure 6: Intra-articular injections on left knee on supero-lateral location in supine position.

A plaster bandage was fixed over the injection spot and an elastic grip crepe was wrapped over the knee joint to minimize the mobility. As a precautionary measure to prevent infection and pain, antibiotics [Cefuroxime 500 mg (dosage: *qd*)] and NSAID [Naproxen 250 mg (dosage: *bd*)], were prescribed for 5 days. The patient was also advised to keep ice pack over the knee joint every 4 hours for 3 days to prevent inflammation. The patient was advised to start the quadriceps and hamstring strengthening exercises after a week and also to rate the

kneeling ability and ROM at regular intervals. The pain scores, KAS and KFA were evaluated for 5 months. At the end of third month, substantial decrease in the pain scores and significant increase in KAS were observed [Figure 7 (a)]. The plot of KFA [Figure 7 (b)] reveals that ROM is also regained at the end of third month itself.

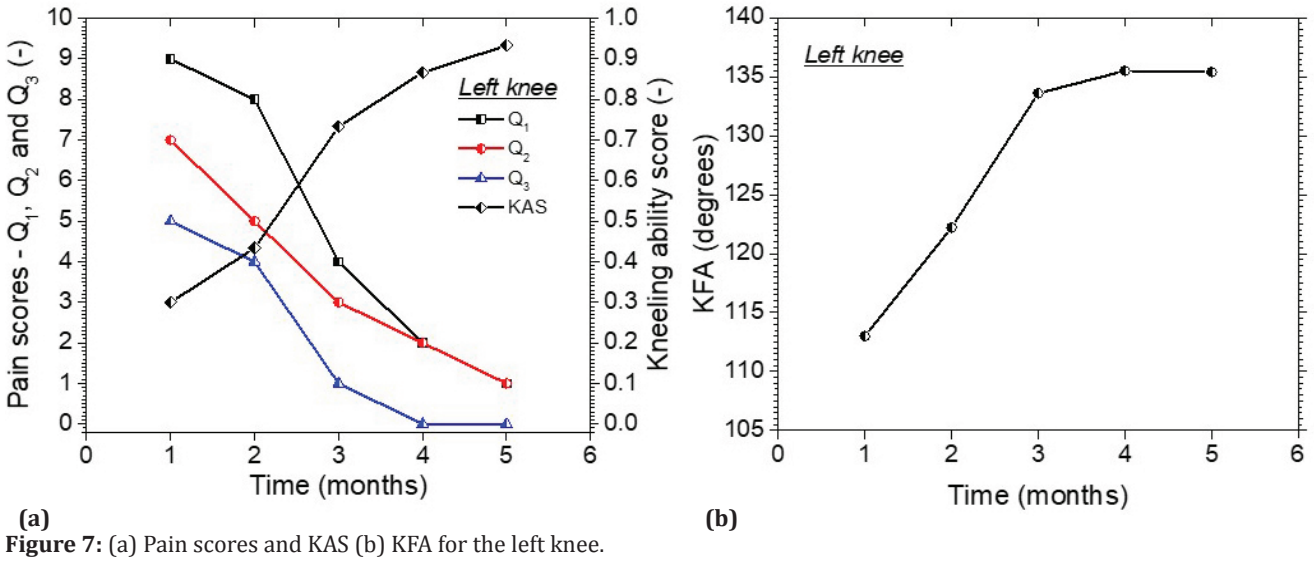

Figure 7: (a) Pain scores and KAS (b) KFA for the left knee.

However, MRI was not repeated on the left knee due to cost effectiveness. Even after 2 years from the time of IA injections, the patient did not complain of any aggravating pain, however, follows sustainability measures for knee health. Under any circumstance, despite the significant therapeutic results, it is also very essential to sustain the same by various means. For instance, minimizing stairs, avoiding high impact exercises, avoiding squatting and cross-legged sitting, regular practice of physical rehabilitation exercises or yogic therapies, etc. will help towards sustainability.

Conclusions

Chondromalacia of patella (CMP) is a painful condition and conservative treatments can substantially delay or prevent the need of surgical interventions. The present study on a single case demonstrated that CMP lesions respond well to the conservative treatments with collagen peptide nutraceutical supplement, rehabilitation exercises and combined PRP and HA intra-articular injections. However, after the improved therapeutic conditions, sustainability approaches are to be followed on a regular basis in order to preserve knee function and knee joint flexibility.

Source of funding

The authors greatly acknowledge URSC/ISRO for funding the charges for MRI and treatment.

Conflicts of interest

Authors declare no conflicts of interest.

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