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REVIEW ARTICLE

Chondromalacia Patellae: A Review

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ABSTRACT:

Chondromalacia patella (knee pain) is the softening and breakdown of the tissue (cartilage) on the underside of the kneecap (patella) and is often referred to as chondromalacia of the patella, patellofemoral syndrome, or runner's knee. Pain Results when the knee and the thigh bone (femur) rub together. Abnormal knee cap positioning, tightness or weakness of the muscles associated with the knee, too much activity involving the knee, and flat feet may increase the likelihood of chondromalacia patella. The undersurface of the patella is covered with hyaline cartilage that articulates with the hyaline cartilage covered femoral groove (trochlear groove). Post-traumatic injuries, microtrauma wear and tear, and iatrogenic injections of medication can lead to the development of chondromalacia. Chondromalacia occurs in any joint and is especially common in joints that have had trauma and deformities. Cartilage is the soft tissue padding which is present between all joint and bones and acts like a shock absorber. The cartilage experiences a lot of wear, tear and damage over time. The cartilage is essentially avascular (has no blood or nerve supply) and is therefore quite a difficult area to heal. Long term therapy is essential in ensuring healthy repair so that further complications are not experienced in the future.

KEYWORDS: Chondromalacia, chondromalacia patella, knee pain, cartilage.

INTRODUCTION:

The abnormal softening of the cartilage on the underside of the kneecap (patella) is known as chondromalacia patella. It causes pain in the front of the knee. It is one of the most common causes of chronic knee pain. Chondromalacia patella results from degeneration of cartilage due to poor alignment of the kneecap (patella) as it slides over the lower end of the thighbone (femur) and the process is sometimes referred to as patella femoral syndrome.

Chondromalacia (sick cartilage) is an affliction of the hyaline cartilage coating of the articular surfaces of the bone. It results in the softening and subsequent tearing, fissuring, and erosion of hyaline cartilage[1].

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The under surface of the patella is covered with hyaline cartilage that articulates with the hyaline cartilage covered with femoral groove (trochlear groove). Post-traumatic injuries, micro trauma wear and tear, and iatrogenic injections of medication can lead to the development of chondromalacia patella. Chondromalacia occurs in any joint and is especially intrauma and deformities.

Chondromalacia can be divided into 4 grades by MRI, typically using fat saturated proton density sequences. This grading system is the modified Outer bridge grading system, which was devised for arthroscopy initially for assessment of chondromalacia patella, but then modified and extended for all chondral surfaces.

Grade I:

It is found in focal areas of hyper intensity with normal contour arthroscopically: softening or swelling of cartilage.

Grade II:

It is blister-like swelling/fraying of articular cartilage extending to surface arthroscopically: fragmentation and

fissuring within soft areas of articular cartilage.

Grade III:
It causes partial thickness cartilage loss with focal ulceration arthroscopically: partial thickness cartilage loss with fibrillation (crab-meat appearance).

Grade IV:
It cause cartilage loss with underlying bone reactive changes arthroscopically: cartilage destruction with exposed subchondral bone.

According to the statistics there are many risk factors for developing chondromalaciai.e Age, sex, flat feet, previous injury, and activity level, arthritis. Patients with chondromalacia patellae usually present with anterior knee pain on walking up or down stairs. Additionally there may be knee pain when kneeling or squatting or after sitting for long periods of time. Knee stiffness, crepitus and effusions may also be present. In some cases, a history of patellar dislocation may be present.

Novel Biological Approach to Treat Chondromalacia Patellae:
Several novel biological approach have been used to treat chondromalacia patella one of this is mesenchymal stem cells from several sources (bone marrow, synovial tissue, cord blood, and adipose tissue) can differentiate into variable parts (bones, cartilage, muscle, and adipose tissue), representing a promising new therapy in regenerative medicine. In animal models, mesenchymal stem cells have been used successfully to regenerate cartilage and bones. However, there is no follow-up studies on humans treated with adipose-tissue-derived stem cells (ADSCs) for the chondromalacia patellae[2]. To obtain ADSCs, lipoaspirates were obtained from lower abdominal subcutaneous adipose tissue. The stromal vascular fraction was separated from the lipoaspirates by centrifugation after treatment with collagenase. The stem-cell-containing stromal vascular fraction was mixed with calcium chloride-activated platelet rich plasma and hyaluronic acid, and this ADSCs mixture was then injected under ultrasonic guidance into the retro-patellar joints of all three patients. Patients were subjected to pre- and post-treatment magnetic resonance imaging (MRI) scan. Pre- and post-treatment subjective pain scores and physical therapy assessments measured the clinical changes of three patients. One month after the injection of autologous ADSCs, each patient's pain improved 50–70%. Three months after the treatment, the patients' pain improved 80–90%[3]. The pain improvement persisted over 1 year, confirmed by follow up by treatment. Also, all three patients did not report any serious side effects. The repeated magnetic resonance imaging scans at three months showed improvement of the damaged tissues (softened cartilages) on the patellae-femoral joints[4]. In patients with chondromalacia patellae who have continuous anterior knee pain, percutaneous injection of autologous ADSCs may play an important role in the restoration of the damaged tissues (softened cartilages). Thus, ADSCs treatment presents a glimpse of a new promising, effective, safe, and non-surgical method of treatment for chondromalacia patellae

Causes for chondromalacia patella:
The patella (kneecap) is normally pulled over the end of the femur in a straight line by the quadriceps (thigh) muscle is known as chondromalacia patella. Patients with this infection frequently have abnormal patellar "tracking" toward the lateral (outer) side of the femur[5]. The undersurface of the patella to grate along the femur, causes chronic inflammation and pain. Certain individuals are predisposed to develop chondromalacia patella: females, knock-kneed or flat-footed runners, or those with an unusually shaped patella undersurface.

Etiology:
Several ways lead to the development of chondromalacia. Intra-articular injections of bupivacaine at high doses or frequent intra-articular injections of corticosteroid lead to softening and dysfunction of articular cartilage. Iatrogenic injection of chondrotoxic medication into a joint is one that patients can avoid. Chondromalacia is associated with abnormal (microtrauma) wear and tear of the hyaline cartilage of the patellofemoral joint. Lateral positioning of the patella in the patella-femoral joint is a frequent cause of chondromalacia. The abnormal Q angle causes tight lateral retinaculum or a lateral synovial plica may be implicated as the cause of this positioning,

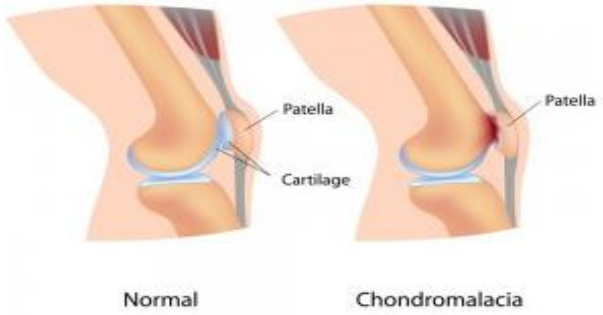
The Q angle is the measurement of the pull of the quadriceps muscle relative to the pull of the patella tendon on the patella[6]. A normal angle is 14 degrees in men and 17 degrees in women. This variance is created anatomically because normally for female have wider pelvis than males. The Q angle is measured by drawing a line from the centre of the anterior iliac spine to the centre of the patella (quadriceps pull) and a second line from the mid portion of the patella to the tibia tubercle (Patella tendon pull). An abnormally high Q angle indicates lateral pull of the patella in the trochlear groove of the femur and a mechanism of articular cartilage.

The alignment of the patella in the vertical plane can be also abnormal. Patella alta, high riding, and low riding in both the conditions it have been implicated as a cause of chondromalacia. Chondromalacia is also seen complication of injuries, immobilization and surgical procedures that lead to quadriceps atrophy[7]. This cause the micro-trauma created by the decreased pull of the quadriceps muscle on the patella.

Finally, foot and ankle anatomic variances (pesplanus)

that cause an increased valgus orientation of the knee cause increased lateral wear of the patellofemoral joint. For example, high-heel shoes, which create a increased stress on the patellofemoral joint also can be a cause of chondromalacia.

Symptoms:



The symptoms of chondromalacia patella are generally a vague discomfort of the inner front of the knee, aggravated by activity (running, jumping, climbing or descending stairs) or by prolonged sitting knees in a moderately bent position (pain arises from a desk or theatre seat). Some patients may also have a vague sense of "tightness" or "fullness" in the knee area. Occasionally, chronic symptoms causes loss of quadriceps (thigh) muscle strength may lead leg to "give out. Besides an obvious reduction in quadriceps muscle mass, mild swelling of the knee area may occur[8].

Epidemiology:

Due to increased Q angles women are affected more than men. Not a hormonal cause of variation. Active young adults who participate in running sports or workers who increase stress in their patellofemoral joint by repeated stair climbing or kneeling have a higher incidence of chondromalacia patella.

Pathophysiology:

The matrix consists of type 2 collagen, which are proteoglycans, and water. The chondrocyte which produce the collagen called proteoglycan[9] which are then secreted into the extracellular matrix. Hyaline cartilage is avascular. Hyaline cartilage is composed of chondrocytes that are dispersed throughout an extracellular matrix. Its nutrients diffuse into the matrix from synovial fluid. It does not repair well because of the lack of blood supply[9]. Hyaline cartilage also devoid of lymphatic and neural tissue.

Patella luxations may be congential or developmental, and there may be a genetic component. The cause of patella luxations is related to the complex function of the hip joint femur, patella, stifle joint and tibia. There is wearing of the trochlear ridge and flattening of the groove. Which leads to abnormal articular cartilage in the groove. The cartilage reacts to both in the environment as well as physical loads.

Destruction of hyaline cartilage may occur in response to chondrotoxic substances injected into a joint. It can also occur through exposure to cytokinins and proteolytic enzymes produced in response to the intra-articular bacterial infections[10]. Hyaline cartilage degeneration also occurs in response to microtrauma wear and tear. Repeated activities that create compressive stress on the patella femoral joint or increased loads causes chondromalacia patella.

Aging also has an affect on hyaline cartilage. Loss of elastic properties of the cartilage develops because of the cross linking of collagen fibrils that also occurs with aging. The superficial zone of hyaline cartilage is the first zone to degenerate in the aging. The number of chondrocytes in the cartilage decrease and this correlates with a reduction in the number of proteoglycans produced. This reduction leads to a decrease in the water content of the cartilage.

Histopathology:

Hyaline cartilage has four zones.

Superficial zone:

Gliding surface that is the articular surface of hyaline cartilage. The arrangement of its collagen fibers is parallel to the articular surface to resist shear forces.

Transitional zone:

This zone resists compressive forces, a deep zone which also resists shear forces.

Collagen fibers:

This zone is perpendicular to the articular surface. The fourth zone is the deep.

Calcified zone:

This zone contains hydroxyapatite and calcium salts. The deep calcified zone secures the hyaline cartilage to bone.

History:

Anterior knee pain is the most common complaint of all the patients with chondromalacia. This pain is usually made worse with activities that increase the stress on the patellofemoral joint, for example, stair climbing, squatting, and running. Differential diagnoses for anterior knee pain include Hoffa disease, *osteochondritis dessicans* of the patellofemoral joint, patellar tendonitis, patella alta, patella Baja, patella instability, plica, and bi-partite patella.

The varied etiological factors of chondromalacia mandate a thorough history and physical evaluation to correctly diagnose this condition and avoid mismanagement due to misdiagnosis. The history should include an evaluation of previous trauma, co-morbid conditions, unstable joints, foot and ankle pain or dysfunction, and activity.

The physical exam should appraise quadriceps appearance, the orientation of foot and ankle, as well a specific evaluation of the patellofemoral joint. The physical examination test which specifically evaluates the knee for chondromalacia is Clark's test. This test evaluates patellofemoral grinding and pain by compressing the patella into the femoral trochlea and having the patient contract their quadriceps muscle-pulling the patella through the groove.

Specific evaluation of the patellofemoral joint should include assessment of pain, effusion, quadriceps strength, patella mobility, and crepitance. X-ray examination of the knee allows for assessment of patella anatomy and positioning in the knee, and MRI allows for additional assessment of articular cartilage water content and wear[11].

Evaluation:

The Outerbridge classification of chondromalacia is the most commonly used way of describing the severity of the degenerative process. This classification refers to four different progressive levels of the degeneration. It is not uncommon to find several different levels of severity of the degenerative process in the same knee.

- Level **1** is a simple softening of the cartilage.
- Level **2** is a more advanced form of degeneration and is classified by fibrillation of the hyaline cartilage.
- Level **3** represents a fissuring of the articular cartilage to the level of subchondral bone.
- Level **4** is the most severe form and refers to eburnated bone which is devoid of an articular cartilage covering.

Commonly, these levels are assessed with an arthroscopic evaluation of the knee. MRI radiography can also classify the degree of articular cartilage wear, but it is not as accurate as the visual assessment done at arthroscopy[12].

Treatment/Management:

The patient management with the chondromalacia is difficult task and there is no specific form of treatment that is universally accepted as a standard of care. Medical management should be based on the physical exam findings and can also include patella stabilizing braces, physical therapy for quadriceps strengthening, orthotics which decreases pronation of the foot, and nonsteroidal anti-inflammatory medication. The use of platelet-rich plasma (PRP) is sometimes advocated, but it is not the standard of care. PRP has not been shown to improve patient consistently.

Surgical management indicate when there is a failure to respond to medical management. Arthroscopic evaluation and subsequent debridement of diseased cartilage (chondro abrasion), plica releases, or lateral retinacular releases are frequently the first-line of surgical management[13]. Sometimes, open re-alignment procedures are used to improve patellofemoral tracking. The option for patellofemoral replacement arthroplasty is available but rarely used.

The primary goal for the treatment and rehabilitation of chondromalacia patella is to create a straighter pathway for the patella to follow during quadriceps contraction. Initial pain management involves avoiding motions which irritate the kneecap. Icing and anti-inflammatory medications (for examples, ibuprofen or naproxen) can be helpful.

Selective strengthening of the inner portion of the quadriceps muscle helps normalize the tracking of the patella. Cardiovascular conditioning can be maintained by stationary bicycling (low resistance but high rpms), pool running, or swimming (flutter kick). Generally, full squat exercises with weights are avoided. Occasionally, bracing with patellar centring devices are required. Infrequently, surgical correction of knee alignment is considered.

Stretching and strengthening of quadriceps and hamstring muscle groups is critical for an effective and lasting rehabilitation of chondromalacia patella. "Quad sets" are the foundation of such a physical therapy program. Quad sets are done by contraction the thigh muscles while the legs are straight and holding the contraction for a count of 10. Sets of 10 contractions are done between 15-20 times per day.

Avoid strenuous use of the knee: - until the pain eases. Symptoms usually improve in time if the knee is not overused.

- **Painkillers** - paracetamol or anti-inflammatory painkillers such as ibuprobenmay be advised to ease the pain.
- **Physiotherapy** - improving the strength of the muscles around the knee will ease the stress on the knee. Also, specific exercises may help to correct problems with alignment and muscle balance around the knee.
- **Taping of the kneecap (patella)** - is a possible treatment which can reduce pain. Adhesive tape is applied over the patella, to alter the alignment or the way the patella moves. Some people find this helpful. Some physiotherapists can offer patellar taping treatment.

Surgery:

Surgery is not usually necessary, but may be advised if the above treatments have not helped. Arthroscopic surgery is the usual operation. A tiny flexible camera is inserted into the knee. The surgeon sees the inside of the knee joint and the cartilage, and may then operate through the camera tube, using very fine instruments. Possible surgical treatments are as follows:

- Tight ligaments on the side of the patella may be cut to allow the patella to align better and move more smoothly.
- Smoothing or shaving the cartilage behind the patella.
- Rarely, if all other options do not help, the patella can be removed (the knee can still function without it).

Joint Pain Treatment in Ayurveda:

Ayurveda has well-documented protocols for treating joint problems. Damage to the cartilage doesn't happen in a single day. It gradually progresses over the years. Hence, it is not uncommon to find people from different age groups suffering from some adverse form of cartilage damage[14]. It is possible to prevent and arrest the further degeneration of the cartilage and joints with proper treatment in Ayurveda.

Ayurvedic treatment primarily consists of three stages:

First phase:

The first phase involves managing inflammation and pain. Ayurvedic medicines commonly prescribed in this phase are Guggulutiktam Kashayam and Ghee, Guggulu tablets such as Kaisora Guggulu tablets and Yogaraja Guggulu tablets. Shadharanam Churnam is also useful based on the situation. Application of Sahacharadi and Kottam chukkadithailam, externally to the affected areas and joints can be done.

Second phase:

The second phase focuses on the strengthening of muscles around the joints and reestablishing the proper functioning of the joints. Application of thailam and performing kizhi therapy over the affected area are most beneficial. Kizhi therapy or poultice is a procedure in which massage is done using warm poultices of medicinal herbs held in a muslin sack. It provides the much-needed relief from pain and stiffness. Ksheeradhara – a herbal decoction in milk, is a more specialised treatment that some experts resort to in stubborn cases of pain and inflammation.

Third Phase:

It involves the treatment to arrest the underlying cause. Treatments such as Pizhichil, work to restore the flexibility of joints and promote blood flow to the muscles. Njavarakizhi (akizhi therapy done with medicated rice and milk decoction) also helps build muscle strength. These treatments are recommended as a path to complete cure. Oil Retaining Vasti (KatiVasti) is yet another Ayurvedic remedy used to relieve joint pain and to strengthen the cartilage. Vasti involves the retention of warm medicated oil over the affected area for about half hour to one hour.

Ayurvedic Medicine:

1. Mahanarayan Oil:

Massage the knee with Mahanarayan herbal oil and have Panchakarma or Marma Chikitsa (Ayurvedic Acupressure) for the knee. Panchakarma is the Ayurvedic detoxification and rejuvenation therapeutic treatment. Panchakarma should be done 3-4 times a year in between change of seasons. It opens clogged channels in the body and helps to clean the system of toxins and rejuvenates bodily tissues. When done for recovery after injuries, it can improve the strength of the system and help the body heal faster. Doing regular massage of the knee and surrounding structures will help promote circulation and lymphatic flow. Will create a flushing effect to remove waste products and help the joint heal faster.

Ingredients used in Mahanarayan oil:

Table 1: Mahanarayan oil

S. No	Name of the herb	Biological name	Family
1.	Shatavari	*Asparagus recemosus*	Asparagaceae
2.	Ashwagandha	*Withania somnifera*	Solanaceae
3	Bala	*Sida cordifolia*	Malvaceae
4.	Arjuna	*Terminalia arjuna*	Combretaceae
5.	Punarnava	*Boerhaavia diffusa*	Nyctaginaceae
6.	Fennel	*Foeniculum vulgare*	Apiaceae
7.	Musta	*Cyperus rotundus*	Cyperaceae
8.	Neem	*Azadirachta indica*	Meliaceae

2. Kaishore guggulu tablet:

It reduces pain and inflammation and contains the following ingredients

Table 2: Kaishore guggulu tablet

S. No	Name of the herb	Biological name	Family
1.	Guduchi	*Tinospora cordifolia*	Menispermaceae
2	Triphala	*Emblica officinalis,* *Terminalia bellirica* *Terminalia chebula*	Phyllanthaceae Combretaceae Combretaceae
3	Guggulu	*Commiphora wightii*	Burseraceae

3. Roasted Tamarind seeds:

This increases the lubrication in the joints, decreases joint pains, shoulder pains, knee pain, sometimes back pain and also reduces the other general pains in the body related to nerves and bones.

Preparation:

- Soak them for 2 days in clean water. Change the water twice a day.
- Remove the brown skin.
- Cut the whitish seed into small pieces and dry them in the sun.
- Dry roast them again.
- Powder the pieces.
- Mix equal quantity of candy sugar to it.

Dosage:
Half a spoon of this powder with water should be taken twice or thrice a day. This can be done for a month.

4. Natural Anti-inflammatories:
The natural anti-inflammatories such as Omega-3 oils, Turmeric, Boswellia and White willow bark decrease the inflammation.

5. Shilajit:
Shilajit detoxifies and strengthens joints. It is a Sticky tar like substance with a colour ranging from white to dark brown found in Himalayan Mountain.

6. Ashwagandha:
Ashwagandha root (*Withania somnifera*), one of the most important herbs in Ayurveda is used to improve muscle strength

7. Yogaraj Guggulu:
It is used for joints recovery and healthy joints. It contains the following ingredients.

Table 3: Yogaraj Guggulu

Name of the herb	Biological name	Family
Chitraka	*Plumbago zeylancia*	Plumbaginaceae
Pippalimoola	*Piper longum*	Piperaceae
Vavani	*Trachyspermum ammi*	Apiaceae
Karavi	*Piper chaba*	piperaceae
Ajamoda	*Trachyspermum roxburghianum*	Apiaceae
Jeeraka	*Cuminum cyminum*	Umbelliferaceae
Devadaru	*Cedrus deodara*	Pinaceae

Diet for joint health:

- Ensure adequate hydration as low water consumption can cause the cartilage to become dry and may contribute to further degrading of the cartilage material.
- Reduce acidic foods as these can contribute to inflammation and acidity which wears down the cartilage and joints. Foods which are acidic are red meats, dairy, wheat, sugar, tea, coffee, alcohol, preserved and processed foods
- Increase alkalising foods to reduce inflammation and acidity. Foods which have an alkalising effect are water, lemon juice, sprouts, nuts, seeds, fish, grains and alive foods (Green Barley powder, Spirulina).
- Increase essential fatty acids in your diet from foods such as fish, avocadoes, flax seed oil and raw oils.

Natural remedies for joint health:

- Glucosamine and Chondroitin are two components of the cartilage structure which is needed to help repair and strengthen the joint[15]. Breakdown of the soft, cushioning cartilage occurs when high amounts of inflammation are present and these nutrients help to further protect the joint and reduce damage. There are many studies to support the claim of using these joint nutrients long term to help stabilise the joint and rebuild cartilage.
- The Chinese medicine herb Tienchi Ginseng (*Panax notoginseng*) is traditionally used to invigorate the blood and to assist in the dispersal of stagnant blood and the resolution of inflammation, bleeding, trauma, swelling and pain. This herb may be of assistance to decrease inflammation, encourage better circulation and nutrients to the area and improve range of movement.
- Magnesium is needed to relieve muscle aches, pains and spasms. Many people are deficient in this important mineral for the nerve and muscles as it declines rapidly due to stress. Foods rich in magnesium are whole wheat, quinoa, cashews, almond's, black beans, sesame seeds, peanuts. Herb's rich in magnesium are spinach, Tulsi, Mint leaves
- Fish oil contains potent anti-inflammatory ingredients to reduce pain, inflammation and swelling and may also increase circulation to the site of injury. Methyl sulfonyl methane (MSM) powder may be of assistance in reducing pain and inflammation and improve the formation of cartilage and reduce wear and tear on the joint.
- **Herbs:** which have a direct anti-inflammatory effect on the musculo-skeletal system and may be taken internally are:
- **Cherry Juice: (***Prunus avium;* Rosaceae**)**: An ancient remedy for gout, arthritis and inflammatory disorders.
- **Ginger: (***Zingiber officinale*; Zingiberaceae**)**: Stimulates circulation, reduces spasms, cramps, and specifically contains multiple constituents that inhibit COX-2 inflammation.
- **Acerola Cherry: (***Malpighia emarginata*; Malpighiaceaei**)**: Contains high amounts of naturally occurring Vitamin C needed to make collagen.
- **Feverfew: (***Tanacetum parthenium;* Asteraceae**):** Relieves arthritis pain and muscle tension and has been used for centuries in Greek medicine for inflammation.
- **Valerian: (**Valeriana *officinalis, Caprifoliaceae)*: Natural muscle relaxer that sedates the central nervous system.
- **Lemon Powder: (**Citrus limon; Rutaceae**)**: An excellent source of natural anti-oxidants, bioflavanoids and enzymes in a "ready-to-use" form.
- **Cayenne Pepper: (***Capsicum frutescens*; Solanaceae**):** Helps to relieve muscle pain
- **Eucommia (**Eucommia ulmoides; Eucommiaceae**):** Both leaves and bark are used to relieve pain.
- **Acantho panax: (***Acanthopanax* gracilistylus;

Araliaceae**):** Similar to ginseng in its properties and alleged effects. Widely used to treat therapeutic uses.

- **Devils claw: (**Harpagophytum procumbens; Pedaliiaceae**):** Used as Anti-inflammatory and analgesic.
- **Free radicals:** can be reduce by taking an anti-oxidant supplement containing Zinc, Vitamin C, B Vitamins, Vitamin A and E. CoEnzyme Q10 and Selenium reduces the amount of damage to the cartilage.

Stem cell Therapy:

Stem cell knee therapy is exceptionally safe and effective. Since the cells come from the patient's own body, there's no threat of patient rejection. Stem cells are non-steroidal, naturally occurring anti-inflammatory agents. They contain growth factors which encourage a myriad of different types of tissue growth. In the case of knee and other joint therapy, these tissues include cartilage. Stem cell therapy also lubricates the affected joint.

Platelet rich plasma (PRP) **therapy** and **stem cell therapy:**

stimulates the growth of articulate cartilage and strengthens the supporting ligaments and tendons, which keep the joints properly aligned and thus protect the cartilage from damage caused by friction. The patient after PRP treatment with patellar tendinopathy showed a statistically significant improvement.

CONCLUSION:

Management of the patient with chondromalacia is difficult, and there is no one specific form of treatment that is universally accepted as a standard of care. Medical management should be based on the physical exam findings and can include patella stabilizing braces, physical therapy for quadriceps strengthening, orthotics which decreases pronation of the foot, and non steroidal anti-inflammatory medication. Surgical management is indicated when there is a failure to respond to medical management. Arthroscopic evaluation and subsequent debridement of diseased cartilage (chondro abrasion), plica releases, or lateral retinacular releases are frequently the first-line of surgical management. It can also be successfully treated through natural rehabilitation protocols such as stretching, strengthening, resting and icing. Yoga can also help to strengthen the knees, improve flexibility and release pressure on the knees through various stretches. Natural healing of the musculoskeletal system can be done by consuming anti-inflammatory foods and diet that provides all the vitamins, antioxidants, minerals and electrolytes.

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