

# Sinding Larsen Johansson Syndrome

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## Search Strategy

Pubmed: (Sinding Larsen Johansson Syndrome) AND (therapy)

Pubmed & Web Of Science: Sinding Larsen Johansson Syndrome

Pubmed: Quadriceps tendon

Pubmed: tendon calcification

Pubmed: (Sinding Larsen Johansson Syndrome) AND (exercises)

Pubmed: (Sinding-Larsen-Johansson disease) AND (etiology)

Pubmed: (Sinding Larsen Johansson Syndrome) AND (treatment)

Pubmed: (Sinding Larsen Johansson Syndrome) AND (other diagnosis)

Web of Science: (Sinding Larsen Johansson Syndrome) AND (Diagnosis)

Web of Science: (Sinding-Larsen) OR (Larsen-Johansson) OR (Sinding Larsen-Johannsson)  
OR (Sinding Larsen-Johannsson Syndrom) AND (maintain)

Web of Science: (Sinding-Larsen) AND (prevent)

Web of Science: (Larsen-Johansson syndrome) AND (MRI)

Web of Science: (Sinding-Larsen) OR (Larsen-Johansson) OR (Sinding Larsen-Johannsson)  
OR (Sinding Larsen-Johannsson Syndrom)

## Definition/Description



The Sinding Larsen Johansson Syndrome (SLJ) is an osteochondroses and traction epiphysitis affecting the extensor mechanism of the knee. SLJ occurs at the inferior pole of the patella, at the superior attachment of the patella tendon. The tenderness of the inferior pole of the patella is usually accompanied by roentgenographic evidence of splintering of that pole. Most patients with SLJ also show a calcification at the inferior pole of the patella.<sup>(1)</sup> The syndrome usually appears in adolescence, during the growth spurt. It's associated with localized pain which is worsened by exercise. Usually we observe a localized tenderness and soft tissue swelling. There's also a tightness of the surrounding muscles, the quadriceps, hamstrings and gastrocnemius in particular. This tightness usually results in inflexibilities of the kneejoint, altering the stress through the patellofemoral joint.<sup>(2)</sup>

## Clinically Relevant Anatomy

The Sinding-Larsen Johansson Syndrome is a rupture or avulsion of the patellar ligament at the distal point of the patella caused by traction.<sup>(3)</sup> The patellar ligament or tendon is the distal part of the tendon of the M. Rectus Femoris, part of the quadriceps femoris, which is a continuation of it. It goes over the patella and is attached to the tibial tuberosity. It's other attachment is the spina iliaca anterior inferior. The most superficial fibers originate from the rectus femoris, the deepest layer from the vastus intermedius and the intermediate layer from the vastus lateralis and vastus medialis.<sup>(4)</sup>

(5)



The distal pole of the patella is shown on the picture.

The syndrome may lead to tendinitis, which is an inflammation of the tendon, and calcification in the ligament. This means that calcium deposits in the substance of the tendon. The presence of such can cause an increase in rupture rate, slower recovery times and a higher frequency of complications after surgery.<sup>(6)</sup>

## Epidemiology/ Etiology

In 1991 and 1992 Sinding-Larsen and Johansson respectively and independently described a syndrome, in the adolescent consisting of tenderness at the inferior pole of the patella accompanied by radiographic evidence of fragmentation of the pole. This is the Sinding-Larsen-Johansson disease (SLJD), and has been used as an umbrella term for the syndrome that causes pain of the inferior pole of the patella accompanied by fragmentation of the pole or a calcification at the pole.<sup>(7)</sup> SLJ is mostly caused by repeated microtrauma.

The syndrome typically affects children and adolescents between the ages of ten and fifteen years old and athletes. However, it can also affect active adults who run for moderate to long distances or are involved in sports that require much jumping or squatting. In adolescents, repeated traction on the distal pole of the patella from quadriceps muscle contractions creates this synchondrosis at the tip of the patella. This can be followed by calcification and ossification if the condition becomes chronic. The pain is caused by the abnormal motion of the synchondrosis area that appears mainly after an acute injury event or repeated microtrauma.<sup>(8)</sup> The diagnosis of SLJ can be difficult to make, it is used as a general term for all pain conditions at the pole of the patella but its etiology is not clear.

## Characteristics/Clinical Presentation

US or MRI imaging may show osseous fragmentation of the distal patellar pole, or it may be irregular, with chondral changes and thickening at the insertion of the patellar tendon. Any activity, from normal walking to climbing stairs, may increase the person's pain depending upon the severity of the condition. In less severe cases, a person may not begin to feel pain until after extended activity, such as running for several miles. The pain occurs when straightening the knee against force: deep knee bends, kneeling, jumping, climbing stairs, squatting, running, weightlifting.<sup>(9)</sup> Tenderness to touch, limping and a tender bump in the infrapatellar area are all common signs. Lower extremity neurovascular signs or crepitus in the knee are rare and may be indicative of another pathology.

## Differential Diagnosis

Other diseases with similar symptoms to the Sinding Larsen Johansson Syndrome are injury to the infrapatellar fat pad, Hoffa disease, patellofemoral joint dysfunction, mucoid degeneration of the infrapatellar tendon.<sup>(10)</sup>

The clinical presentation of the Sinding Larsen Johansson Syndrome (SLJD) can be difficult to differ from other injuries or diseases like a sleeve fracture, osteochondritis, stress fracture of the patella, tendinitis of the patella tendon<sup>(7)</sup> and Osgood-Schlatter disease<sup>(11)</sup>.

The difference between a sleeve fracture, osteochondritis and a stress fracture is difficult based on the radiographic findings. The SLJD results from overuse while the sleeve fracture is due to a trauma (acute) with an explosive acceleration that causes rapid contraction of the quadriceps while the knee is flexed. This mechanism causes an avulsion of the

periosteum, retinaculum, and cartilage of the patella.<sup>(24)</sup> So with the anamnesis the distinction can easily be made. Likewise osteochondritis is related to overuse just like the SLJD. On the other hand, a stress fracture is a partial or complete fracture of the bone due to lower force repeated stress. The etiology between these three injuries (SLJD, osteochondritis and a stress fracture) does not differ sufficiently. Following this further investigation need to be performed. Tendinitis (jumper's knee) and SLJD can appear at the same time. Further studies have to clarify the differences between SLJD and osteochondritis, stress fracture and tendinitis. For this purpose magnetic resonance images and pathological examinations can be performed.<sup>(7)</sup>

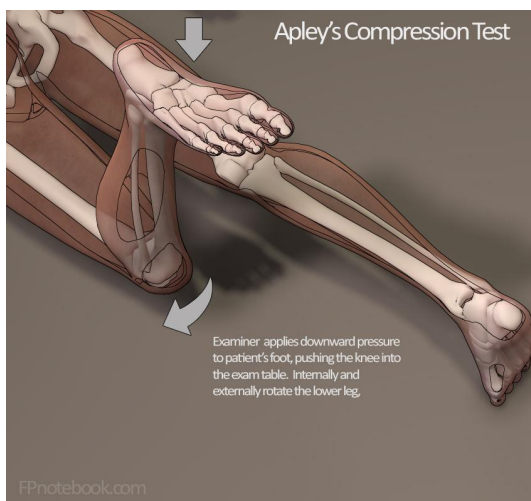
Research shows that the Osgood-Schlatter disease and SLJD incidence is 4 times greater in sport-specialized athletes than in multisport athletes. Osgood-Schlatter disease and Sinding Larsen Johansson syndrome may in some cases appear in the same patient at the same time.<sup>(7),(11)</sup>

## Diagnostic Procedures

The physiotherapist performs a physical examination of the knee and reviews the patient's symptoms. In case of anterior knee pain there are three important tests to perform. In all tests the patient is in supine position.

**Patellar Grind Test<sup>(12)</sup>**; Tester places thumb web-space just above the patella, then asks to contract their quad forcefully. The test is positive if there is pain or grinding.

**Compression Test<sup>(13,14)</sup>**; Hard downward pressure is applied with rotation, pain indicates meniscal injury.



**Extension Resistance Test<sup>(15)</sup>**

SLJ can be a difficult diagnosis to make. To confirm SLJ, arthroscopic excision of the distal pole of the patella is an effective procedure to check the tendon and return to sports within a few months. An ultrasound has proven to be a reliable method for the diagnosis of knee joint osteochondrosis.

Medlar identified four radiographic stages of the disease process: stage 1, normal findings; stage 2, irregular calcifications at the inferior pole of the patella; stage 3, coalescence of the calcification; stage 4A, incorporation of the calcification into the patella to yield a normal radiographic configuration of the area; and stage 4B, a coalesced calcification mass

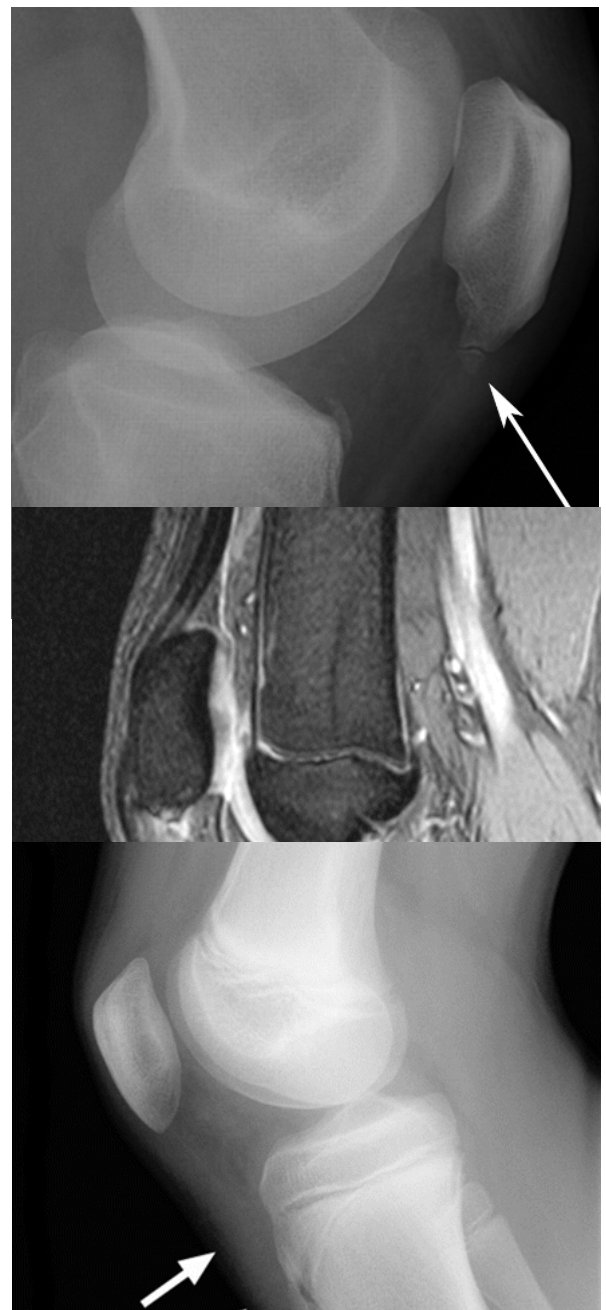
separated from the patella. Clinically, however, radiographic abnormalities at the inferior patella seem to vary; there are several pathogenesis reported; apophysitis, periostitis, tendinitis, calcification accompanied by avascular necrosis, or osteochondritis.<sup>(7)</sup>

## Examination

Sinding-Larsen-Johansson syndrome has a similar radiographic appearance with injuries as sleeve fracture, osteochondritis of the patella, stress fracture of the patella and tendinitis of the patellar tendon. In particular, sleeve fracture, osteochondritis and stress fracture are scarcely distinguished based on the radiographic pictures. So further evaluation with MR imaging is necessary to differentiate these injuries. This further evaluation is also needed because the exact degree of damage is often underestimated; the lateral radiographs may reveal an unusually elevated position of the patella (with regard to the femur and one or multiple small bony fragments nearby to the inferior pole of the patella).<sup>(16,7)</sup>

Lateral radiograph of the left knee shows a tiny avulsed fracture fragment (arrow) arising from the inferior aspect of the patella.<sup>(16)</sup>

As mentioned before, this syndrome is caused by traction on the patellar tendon and this causes inflammation. SLJS can be distinguished from patellar tendinopathy by the presence of bone marrow oedema in the patella. MR image illustrates thickening and increased signal of the proximal patellar tendon (arrow) and irregular ossification of the inferior pole of the patella with underlying bone marrow oedema.<sup>(17)</sup>



Sinding-Larsen-Johansson syndrome is often confused with the Osgood–Schlatter disease as also has been mentioned before. This image is from an 11-year-old female with anterior knee pain. This lateral radiograph of the knee demonstrates soft tissue swelling anterior to the tibial tuberosity (arrows) which shows the difference of location from these injuries.<sup>(17)</sup>

Case: “A 29-year-old, male professional handball player presented with chronic, anterior knee pain. The pain became acute several months prior, after landing from a jump. A diagnosis of patellar tendinitis was made at that point. Rest and standard rehabilitation were prescribed by his team's medical staff. After 4 months, he was still unable to run because of persistent pain.”<sup>(8)</sup>

The knee was normally aligned, it was not swollen and had normal range of motion. Significant pain in the proximal part of the patellar tendon with pain projecting to the medial compartment was established by clinical examination. There was also no pathological laxity found and the quadriceps and hamstring muscles testing were normal by this patient.

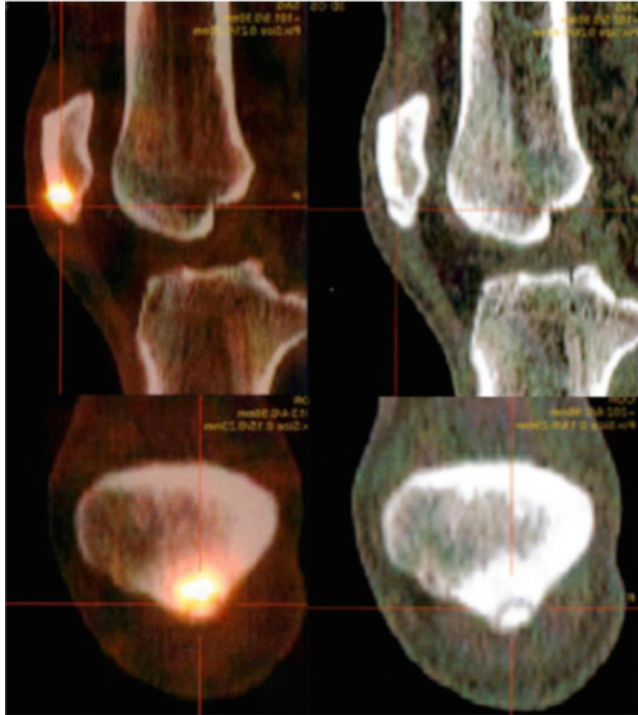
The diagnosis of SLJ syndrome was made based on the chronicity of the pain and all of the supplementary examination.



Lateral X-rays of the knee showed fragmentation of the distal pole of the patella; A: preoperative and; B: postoperative.<sup>(8)</sup>



Sagittal MRI slices of the right knee showing hyperintensity in the area of the synchondrosis.<sup>(8)</sup>



Sagittal and coronal SPECT-CT (Single Photon Emission Tomography - Computed Tomography) slices of the right knee showing the presence of SLJ syndrome. SPECT-CT also showed increased uptake in this area.<sup>(8)</sup>

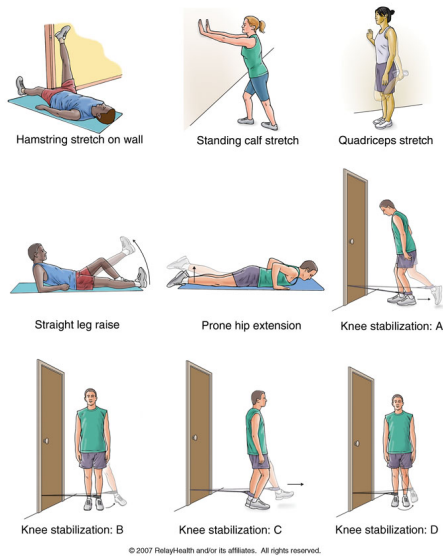
## Physical Therapy Treatment

Referral to an MD for anti-inflammatories should be initiated. First and foremost, physical therapists must educate the patient on activity modification. Kneeling, jumping, squatting, stair climbing, and running on the affected knee should be avoided at least for the short term. Lower extremity strength needs to be tested, especially at the ankle and the hip to find any muscle weaknesses that may be contributing to the overuse syndrome. Core strengthening should be initiated as well as exercise addressing flexibility or strength issues. The goal in patients with SLJ is to avoid muscle atrophy. This can also be achieved by electrotherapy.<sup>(9)</sup>

The conservative therapy should consist of eccentric exercises, isokinetic strengthening and viscosupplementation. This was used for only one patient in a case report, so the level of evidence is not very high.<sup>(8)</sup>

This picture, with several exercises you can do for the SLJ Syndrome, comes from the site of a physiotherapy practice in Belgium, it's an expert's opinion and so it is not fully researched.<sup>(18)</sup>

## Osgood-Schlatter Disease Rehabilitation Exercises



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If the patient doesn't respond (the pain doesn't decrease), it can be possible to give platelet-rich plasma injections. These are given in the synchondrosis area under ultrasound guidance.<sup>(8)</sup>

Stretching and proprioceptive muscle strengthening exercises in patients with anterior knee pain, have been proven beneficial.<sup>(19)</sup> An improvement of strength and functionality can be accomplished by both open and closed kinetic chain exercises.<sup>(20)</sup>

Patients who followed a 30 to 60 minute therapy, once a week during six weeks showed a decrease in patellofemoral pain. Table one shows the content of the therapy.<sup>(21)</sup>

TABLE 1  
Elements of Physical Therapy Intervention

All treatments	
Stretches	
Mediolateral (glide & tilt) mobilization of the patella combined with deep friction massage to the lateral soft tissues <sup>a</sup>	3 repetitions of 60 seconds each
Hamstring muscle stretches in sitting <sup>a</sup>	3 repetitions of 30 seconds each
Anterior hip structures stretch. Subject in prone position, one hip externally rotated with both the hip and knee flexed <sup>a</sup>	
Patellar taping	
Corrective taping of the patella to correct the four components of patellar orientation: glide, lateral tilt, anterior tilt, and rotation	
Weeks 1 and 2	
Exercises	
Isometric vastus medialis oblique muscle contractions while sitting with knee at 90° of flexion <sup>a</sup>	
Squats to 40° of knee flexion combined with isometric gluteal muscle contractions <sup>a</sup>	4 sets of 10 repetitions
Isometric hip abduction against the wall while standing <sup>a</sup>	4 sets of 15-second hold
Weeks 3 through 6, as for weeks 1 and 2 and include:	
Step-downs <sup>b</sup> —slow lowering of unaffected leg with a 10-cm step <sup>a</sup>	3 sets of 5 repetitions or 3 sets of 10 repetitions
Isometric hip abduction while standing	4 sets of 30-second hold
Home exercise program	
Exercises from the supervised exercises in a standard program	Twice daily

<sup>a</sup> Exercise included in the home exercise program.

<sup>b</sup> Subjects were assessed at each return visit on the "step-down test." If five repetitions could be completed on the 10-cm step without pain but not on the 20-cm step, the patient progressed to the step-down exercise, three sets of five repetitions. If five repetitions could be completed on the 20-cm step without pain, the patient progressed to the step-down exercise, three sets of 10 repetitions.



An adjunct treatment that has been proven beneficial for tendonitis or tenosynovitis problems is the ASTYM system. <sup>(22)</sup>

A safe progression back to sports or high-level activities may happen when each of the following happens in this specific order:

- The lower kneecap is no longer tender and there is no swelling.
- The injured knee can be fully straightened and bent without pain.
- The knee and leg have regained normal strength compared to the uninjured knee and leg
- Ability to jog straight ahead without limping.
- Ability to sprint straight ahead without limping.
- Ability to do 45-degree cuts.
- Ability to do 90-degree cuts.
- Ability to do 20-yard figure-of-eight runs.
- Ability to do 10-yard figure-of-eight runs.
- Ability to jump on both legs without pain and hop on the injured leg without pain. <sup>(19)</sup>

If there has been no progress, then an operation may be necessary. After the operation full weight bearing is allowed with two canes without immobilization splint for the first week. Then therapy can start after one week, with knee exercises to regain joint range of motion. The first six weeks will consist of eccentric quadriceps exercises and jumping and other more functional movements are allowed after three months. This strategy was, again, used for only one specific patient and is not fully researched. <sup>(8)</sup>

## Medical Treatment

Before medical treatment can be considered, conservative treatment has to be performed starting with limiting sports activities and anti-inflammatory medications, physical therapy and local corticosteroid injections. <sup>(23)</sup> These injections are used because they reduce the pain very efficiently and rapidly. However they are not recommended if alternatives relieve the symptoms sufficiently. This is because they cause significant damage to the tendon when repeated or with an insufficient injection interval. <sup>(10)</sup> If the conservative treatment is not effective, more specifically when there is a continued decrease in activity levels for more than 3 months, then surgery is the preferred treatment strategy. <sup>(23)</sup>

Surgical treatment allows patients to return to their prior activity level with a complete pain relief. There are many surgical options and each one of them show great results. <sup>(23)</sup>

Arthroscopic excision is one of the options. Arthroscopic excision of the the distal pole of the patella ensures the tendon to be checked. The rehabilitation starts about 1 week after the surgery. Patients can return to sports activities within a few months. <sup>(8,10)</sup>

On the other hand there are some studies that claim that long term complications appear. These complications could be osteoarthritis and patellofemoral arthritis. Further research with long term follow-up is needed to determine whether those complications do appear and if other complications arise. <sup>(23)</sup>



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