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Resolved Knee Pain and Instability after Prolotherapy in Anterior Cruciate Ligament Tear: A Case Report

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Abstract:- Anterior cruciate ligament (ACL) tear is one of the most common knee injuries affecting a-young-active individuals. Apart from being the most preferable therapy for ACL tear, the reconstructive surgery sometimes brings a reluctance to the patients. There is prolotherapy, a non-surgical intra-articular injection therapy, which uses hypertonic dextrose solution to promote the healing of ACL by mechanism of inflammation and proliferation. We bring up a case of 25-year-old male with partial tear of left ACL who had prior sports injury on the left knee. Anterior drawer and Lachman test showed a definite anterior tibial translation. He received 5 prolotherapy and structured quadriceps strengthening exercises. 15 weeks post therapy, full knee range of motions were achieved and the patient was able to climb and decent stairs without pain and instability. MRI post-treatment showed fibrous tissue around the ACL.

Keywords:- *ACL tear, dextrose prolotherapy.*

I. INTRODUCTION

The anterior cruciate ligament (ACL) is vulnerable in stabilizing the normal knee functions. This ligament acts as the primary restraint to anterior tibial translation (ATT), and stabilizing the knees during internal rotation movement. Anatomically, the ACL runs obliquely from the anterior border of the tibia and attaches to the lateral femoral condyle. Oftentimes, ACL injury is ensued from a non-contact trauma followed by internal rotation and valgus of the knee. ACL tear accounts for more than 50% of knee injuries, mainly in sports related injuries.[1]

A thorough history taking, specific physical examinations, and appropriate imaging are useful to accurately diagnose an ACL tear. An audible "pop" or snap sound will eventually be heard when the ACL tear happened.[2] The most common physical finding is knee effusion 2 hours after the knee injury, potentially indicates the knee joint hemarthrosis.[3]

In fact, ACL reconstruction surgery is the most common therapeutic choice towards all modalities, but many patients avoid to have it and looking for non-invasive treatment. Another treatment option includes the prolotherapy. This is an injection therapy that utilizes combination of mixed hypertonic solution and lidocaine to stimulate the proliferation and healing of damaged tissues.[4] Prolotherapy will initiate the tissue inflammation process, successively followed by collagen deposition and further tissue remodeling.[5]

Prolotherapy solution acts as proliferant, that is believed to cause local irritation, inflammation, and tissue healing then later will generate soft tissue enlargement and strengthening the damaged ligament, tendon, and intra-articular structures.[4-6] The aforementioned mechanism, perhaps, will initiate and improve knee stability and reduce the pain after an ACL tear.[7]

II. CASE REPORT

A 25-year-old male with a tall-athletic posture came to the Orthopaedic Clinic of Charitas Hospital Palembang due to diffuse left knee pain with definite swelling and limping. Instability of knee during walking and soreness while doing long-walking activities were felt for 3 days. It was later found out that the patient had a history of jumping and landing on the left foot with a twisted left knee when playing competitive soccer two weeks before he was visiting the doctor. The audible "pop" sound was heard and suddenly he was unable to walk on his own. He was immediately side-lined and effusion of the left knee started to develop. After the injury, the RICE (rest, ice, compression, and elevation) protocols were performed but further medical care had not been assessed. The following day, he felt the tightness, pain, and found it difficult to extend the left knee. Later on, the same day, bearing weight on the left foot while walking was impossible.

On physical examination, the left knee was found to have minimal swelling without erythema. The left knee was palpated using a milking method from the suprapatellar pouch in a downward motion, and the patella was seen to be lifted, indicating that moderate effusion was found on the affected knee. Anterior Drawer test was performed on both knees starting from the unaffected limb. On clinical findings, we found positive anterior drawer test on the left knee with more than 5mm of anterior tibial translation. Afterward, we commit to perform the Lachman test to ensure that ACL tear was the most possible diagnosis. The same result came out with definite anterior tibial translation. Because the laxity of the left knee was noted on the two aforementioned tests, we directly examined the posterior cruciate ligament, lateral collateral ligament, medial collateral ligament, and meniscus to subside the possibility of multi- ligaments injury and meniscal tear. The posterior drawer test, assessing the PCL integrity, was negative, so did the posterior sag sign. No laxity on the varus and valgus stress test were confirmed. Moreover, none of the pain was provoked on Apley's compression test, suggesting that both parts (medial and lateral) of the meniscus were intact. The pain intensity, measured by visual analog scale (VAS), was scaled 8 out of 10.

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Magnetic resonance imaging of the left knee was performed with the standard protocol of T1-T2 weighted axial, coronal, and sagittal scans, using a Siemens Avanto 1.5T magnetic resonance scanner. There was an almost complete tear of the left ACL near the insertion of the tibia with edema relative to the ACL. Cartilage defects on the left tibial plateau were found, representing the typical description of Osgood-Schlatter disease (Fig. 1).

After physical examinations and knee, MRI was performed, we offered several treatment modalities that could be used to minimize the pain and regain knee stability. The patient declined for further ACL reconstruction surgery using arthroscopic device, therefore, we introduced and discussed sets of prolotherapy and physical therapy treatment to the patient. To achieve the best result, we assessed 5 times prolotherapy, once every 3 weeks, followed by ACL rehabilitation programs at the medical rehabilitation department of Charitas Hospital Palembang after the third prolotherapy injection. Ultrasound, infrared, Transcutaneous Electrical Nerve Stimulation (TENS), and quadriceps strengthening (isometric) exercises were performed twice a week. Patient also asked to do 10 - 15 minutes of stationary bike exercise every day.

Fig. 1: T1 and T2 weighted MRI scanning in sagital position showing a parital ACL tear of the left knee

The procedure of the knee prolotherapy is not much different from other intra-articular knee injections. To start the procedure, skin preparation on the injection site is mandatory to prevent the risk of joint infections. Aseptic and antiseptic of the knee are performed using 70% ethyl alcohol on sterilized gauze. The injection portal is taken at the superolateral section of the patella on the extended knee without any radiological guiding. The borders of the patella and femoral condyle are the bony landmarks noting the exact area of the injection. Hereafter, 0.5 mL of Lidocaine 2% is injected over the target site via a 26-gauge 0.5-inch needle. Afterward, guiding arthrocentesis of the knee using a 5cc Luer-lock syringe with a 22-gauge 1.5-inch needle is used to reduce the joint effusion. Gentle compression of the knee is committed to milk the excess synovial fluid. Finally, the 5cc syringe is removed and the needle is fixed using a Sawtell, afterward the prolotherapy solution; consisting of 4 mL of 40% Dextrose, 3 mL of 0.9% sodium chloride, and 2 mL of 2% Lidocaine Hydrochloride, is injected to the knee joint space via 10cc syringe. After the injection is performed, the knee is passively flexed and extended to make sure that all the solutions cover up all the articular surfaces.

After 5 sets of prolotherapy injection (15 weeks) and continuous physical exercise to strengthen the thigh muscles, the patient was asked to be examined for assessing clinical progress. Pain on the left knee was progressively diminished from day-by-day with VAS score 0 out of 10. Maximal left knee flexion and extension were achieved and it was easy to so squad, sit, and stand up. Patient have not started running yet, but he was able to climb and descend stairs independently without pain. Moreover, he also started to working out on stationary bike 25-35 minutes in a day. Anterior drawer test and Lachman test was found to have minimal and almost no anterior tibial translation. Thereafter, follow-up MRI of the left knee was performed. The left knee MRI without intravenous contrast showed an irregular and thickened ACL, indicating a well healed ACL with the formation of fibrous tissue, no effusion and bone bruise were found (Fig 2).

Fig. 2: T1 and T2 weighted MRI scanning in sagital position after 16 weeks first MRI show an ireegularity and thickening of the left ACL

III. DISCUSSSION

This is a case report describing a 25-year-old male with tall-athletic posture conservatively treated for ACL injury. ACL injury is a common injury in a young-active individuals, especially related to sports injury.[8] The mechanism of ACL injury commonly is caused by noncontact pivoting injury with a knee in a valgus load.

Often a feeling of "pop" and audible snap sound is heard, followed by sudden hemarthrosis 2 hours after the injury.[9]

Anterior drawer and Lachman tests are used repetitively to assess and help working up the diagnosis of ACL injury. The Lachman test is 81.8% sensitive and 96.8% specific, while the anterior drawer test is 40.9% sensitive and 95.22% specific. Apley's grinding test is used to subside the possibility of associated meniscal injuries. In this case, multiple knee clinical examinations will help the physician to rule out any other ligamentous or even meniscal injury toward the affected knee.[10-12]

The current "gold standard" of diagnosing ACL injury is arthroscopy, however, this procedure is invasive and many patients are reluctant to have this procedure just for seeking a diagnosis. Therefore, MRI will be the most acceptable modalities toward diagnosing and re-evaluating ACL tear. The MRI of an acute partial ACL tear will show partially swollen and obvious diffuse thickening of ACL with high signal at the T2W1 position. Moreover, the accuracy rate of MRI in the diagnosis of partial ACL tear is around 94%.[13]

Many active patients and also athletes will mostly require ACL reconstruction surgery, but inactive-sedentary patients are considered as special population; therefore, non-surgical approach is recommended.[14]

Not many publications have revealed the basic mechanism of prolotherapy, but it is probably multifactorial and apparently work via fibroblast stimulation, vascular proliferation, collagen deposition and growth of cartilage. It is also believed that prolotherapy induces the inflammation process that may initiate tissue growth factor.[4,15] Dextrose solutions may potentially give a sensorineural analgesic effect as suggested recently by the effect of epidural injection of dextrose in treating chronic non-surgical low back pain.[16] Prolotherapy techniques and injected solution may vary based on physician concern. Hypertonic 15% hypertonic dextrose, with composition of 3 mL dextrose 50%, 5 mL saline 0.9%, and 2 mL lidocaine 2%, is typically used for prolotherapy with 2 to 6 weeks injection interval.[4] In this case, we used 17% of hypertonic dextrose to perform the intra-articular prolotherapy.

Non-operative management of ACL often leads to recurrent instability, so preservation of quadriceps strength and knee range of motion programs are the two most important exercise in ACL rehabilitation. The target of ACL rehabilitation program is restoring range of motion, improving the lower limb strength and stability, and reducing the risk of re-injury.[17] Therefore, in this case, to reduce the morbidity and preventing the patient for further ligamentous and knee joint damage, we really assured him to undergo a structured physical rehabilitation program. After several programs of rehabilitation and prolotherapy, clinical assessment of re-evaluating the laxity of ACL was performed using the same clinical diagnosis examinations which resulted in minimal ATT. It was probably as the cause of ACL scarring, based on the ACL scarring pattern by Crain, to the femoral intercondylar notch or PCL.[18]

IV. CONCLUSION

This report explains a non-surgical treatment of a partial ACL rupture in a young-athletic individuals using sets of prolotherapy and structured physical therapy. ACL tear commonly affects a young-active person and related to sports injury. The patient declined to have ACL reconstruction surgery and committed to non-surgical approach to treat the ACL tear. We performed 5 sets of prolotherapy using 9 mL of 17% hypertonic dextrose once in every 3 weeks and asked the patient to do individual stationary bike exercise followed by structured physical therapy. Following all the medication and treatment, patient was re-assessed clinically and radiologically. After 15 weeks, patient felt no pain on the left knee, with minimal laxity of anterior drawer and Lachman test. The MRI post-treatment revealed a thickened ACL with homogenous irregularity, representing a well-healed ACL. Prolotherapy may be used to treat partial ACL rupture or even any other ligaments or tendons injuries in certain selected population, yet, this mode of therapeutic still need further improvement and meticulous clinical trials.

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