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Effect of Proprioceptive Neuromuscular Facilitation in Improving Function in Osteochondritis Dissecans of the Knee - A Case Report

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ABSTRACT

The objective of this case report is to demonstrate the effect of Proprioceptive Neuromuscular Facilitation (PNF) in improving function in Osteochondritis dissecans of the knee. A 16-year-old female came with complaints of left knee pain, gradual in onset without any history of trauma and fever, was diagnosed as Osteochondritis dissecans. The subject had severe pain on weight-bearing and was confined to bed for 4 weeks. The treatment focused on PNF approach integrating the lower extremity patterns and techniques. Improvements in hip and Knee Range of Motion, Numerical Pain Rating Scale (NPRS), Lower Extremity Function Scale (LEFS), and Timed Up and Go (TUG) test were noted. The improvement gained was maintained after one month, 6 months, and 1-year follow-up. PNF improved pain, knee mobility, strength, and neuromuscular control which promoted weight-bearing and function in Osteochondritis dissecans of the knee.

KEYWORDS: PNF, Osteochondritis Dissecans, Knee.

INTRODUCTION

Osteochondritis can affect different areas of the body and often encountered in the knee. Osteochondritis Dissecans (OCD) of the knee is a relatively common reason of pain and limitation in function in children and young adults. It is an acquired condition in which the subchondral bone turns avascular, thus destabilizing the chondral coverage. If this is not reversed (consolidation), the bone-cartilage complex may separate completely from its bone bed on being subjected to impact and shearing forces, leading to joint irregularity and even formation of free bodies. (1)

This condition shows certain variations in accordance with the severity and stability of the condition. The common presentation is pain and edema in the knee, which may be aggravated by physical activity. Free bodies in the joint can cause crepitations, clicks, and also joint blockage (2)

Proprioceptive neuromuscular facilitation (PNF) treatment is a very effective therapeutic exercise for the improvement of muscle thickness, dynamic balance, and gait. (3)

CASE REPORT

An informed consent was given by the subject to participate in the case report. A 16-year-old female, a student, presented with pain in the left knee which was gradual in onset, since August 2016 without any history of trauma or fever. In September 2016 she experienced difficulty in extending her left knee and exacerbation of pain (Numerical Pain Rating Scale (NPRS)-

9/10) without any triggering event. She consulted a local physician who treated her conservatively using painkillers for pain relief, but she had no improvement in pain. She visited another local hospital where she was diagnosed with Osteochondritis Dissecans after an MRI and advised for surgery. She had severe pain on weight-bearing and was confined to bed for 4 weeks. The subject came to NIMS on October 3rd, 2016, and consulted the Orthopaedic surgeon who suggested a trial of conservative management and referred her to Physiotherapy OPD.

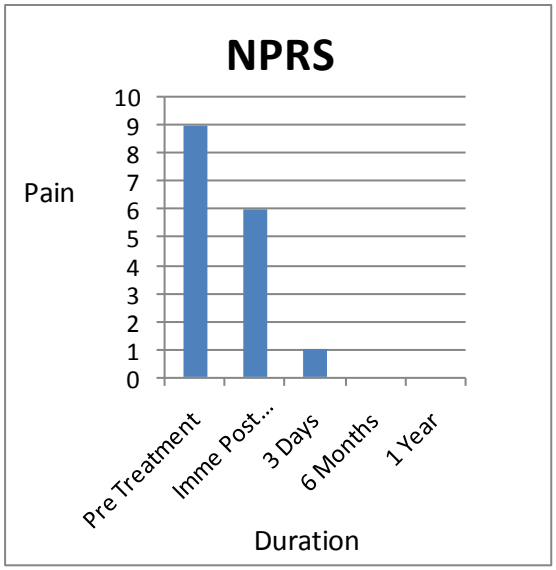
On observation in the supine position, the left hip and knee were in flexion. Swelling at the inferior-medial aspect of the left knee was observed and with grade 3 tenderness in the same area. On examination Active Range of Motion (AROM) of her left knee was 15-30 degrees, hip flexion 10-120^0, abduction 0-45^0, internal rotation 0-35^0, external rotation 0-50^0. Manual Muscle Testing (MMT) of hip flexion, abduction, and extension was 3$^+$/5. Hip medial and lateral rotations MMT was 4$^+$/5. Knee MMT could not be performed due to severe pain. AROM and MMT at the ankle and subtalar joint were normal. Right lower extremity AROM's and MMT were normal. MMT of trunk flexion was 3$^+$/5 and extension were 4/5. Tightness in left hip flexors (10^0) and hamstring muscles (15^0) was noted. Patient-reported pain at the left knee as 9/10 on NPRS. Lower Extremity Functional Scale score (LEFS) was 7/80. Gait evaluation could not be done due to severe pain. She was confined to bed and not walked for 4 weeks.

The treatment focused on the PNF approach with the application of lower extremity patterns incorporating the procedures and techniques to improve knee mobility, length of iliopsoas and hamstrings, gluteal activation, strength, and neuromuscular control. Cold packs were used to reduce pain. Immediate post-treatment assessment and reassessment at the end of 3 days, one month, 6 months, and 1 year were done. 3 sessions of PNF were given followed by a home exercise program.

After the first session of treatment, knee AROM improved at 0-130^0 which was 15-30^0 pre-treatment, hip flexion improved 0-120^0 which was at 10-120^0 and the subject was encouraged to walk. She was able to walk with an antalgic gait and the TUG test was completed in 22 seconds. Knee pain on NPRS improved to 6/10 immediately after the first session. After 3 sessions of treatment, improvement in knee ROM was maintained at 0-130 degrees, pain on NPRS was 1/10, Lower Extremity Functional Scale score was 52/80, completed Timed Up and Go test in 9 seconds and she was able to fully weight bear on her left knee and walk with negligible pain and limp.

Follow up was done after the end of one month and knee AROM was at 0-145^0, pain on NPRS is 0/10, Lower Extremity Functional Scale score was 80/80 and completed Timed Up and Go test in 9 seconds. Similar results were maintained at the end of 6 months (normal knee, hip ROM, NPRS -0/10, LEFS-80/80, TUG – 8.36 seconds) and 1 year (normal knee, hip ROM, NPRS -0/10, LEFS-80/80, TUG – 8.29 seconds).

Graph:1 NPRS at pre-treatment, immediate post-treatment, 3 days, 6 months and 1 year



Graph: 2: TUG Test at immediate post-treatment, 3 days,6 months and 1 year

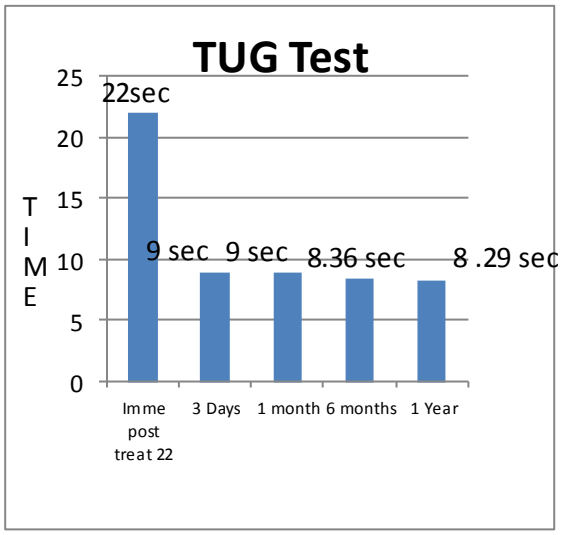


Table: TUG, NPRS, and LEFS at pre-treatment, immediate post-treatment, 3 days, 6 months, and 1 year.

Duration	TUG(sec)	NPRS	LEFS
Pre Treatment	NA*	9	07/80
Immediate Post Treatment	22	6	07/80
3 Days	9	1	52/80
1 month	9	0	73/80
6 months	8.36	0	80/80
1 Year	8.29	0	80/80

***Not able to perform due to pain.**

DISCUSSION

OCD which is seen frequently among children, adolescents, and young adults are associated with pain, effusion, weakness, and altered joint mechanics. As observed in this case report the pain and reduced physical activity due to OCD may have resulted in muscle weakness. This is in accordance with the study conducted by Dittmer et al. who suggested that the most obvious effect of prolonged immobilization is the loss of muscle strength and endurance. A muscle at complete rest loses 10% to 15% of its strength each week. Nearly half of normal strength is lost within 3 to 5 weeks of immobilization (4).

Physical therapy has a key role in the management of OCD lesions across the spectrum of nonoperative, preoperative, or postoperative phases of care. (5).

PNF may help in improving pain and dysfunction in OCD similar to its effect on other musculoskeletal conditions, as observed in a study conducted by Jung-Hoo Lee et al. who examined the effects of PNF on the pain and function of upper trapezius muscles concluded that exercise programs using PNF techniques can be said to be effective for the functional improvement of myofascial pain syndrome patients (6).

Improvements in LEFS due to PNF may be due to improved flexibility, balance, muscle strength, and neuromuscular control which may have contributed to improvements in gait. In a study conducted by Szafraniec et al. who investigated the effects of a single dose of contract-relax PNF stretching (CRS) of hip adductor and abductor muscles and concluded that single dose of CRS significantly improved mediolateral balance (7). However, Aslan et al. examined the acute effects of two hip flexor stretching techniques on knee joint position sense and balance and concluded that performing a single session of hold-relax proprioceptive neuromuscular facilitation and dynamic stretching protocols can significantly improve hip extension ROM (HR-PNF was more effective than a dynamic stretch) and dynamic balance performance but are unlikely to aid in the knee joint position sense (JPS) replication accuracy (8).

The improvements gained immediately after treatment sessions were maintained even after 1 year in OCD. Areeudomwong et al. investigated and found that the effects of a 4-week PNF training assessment were still present at the 12-week follow-up. The improvements in pain intensity, functional disability, patient satisfaction, and physical aspect of HRQOL were retained in patients with CLBP. (9)

Treatment of Osteochondritis dissecans may include nonoperative or operative intervention. In cases where the fragment is not amenable to preservation, the treatment may include complex reconstruction procedures, such as marrow stimulation, osteochondral autograft, fresh osteochondral allograft, and autologous chondrocyte implantation. (10)

PNF approach using functional diagonal patterns and techniques like Rhythmic initiation, Hold-relax, Contract-relax, Combination of isotonic, Dynamic

reversals, etc., can improve range of motion, pain, muscle strength, and neuromuscular control utilizing Autogenic inhibition, Reciprocal inhibition, Stress relaxation, and Gate control theory. It addresses all those impairments developed with OCD which causes significant disability and ensures an early return to functional activities.

CONCLUSION

PNF approach which uses functional-based diagonal patterns can help in early return to function by improving ROM, strength, and neuromuscular control in conditions such as Osteochondritis Dissecans.

Declaration by Authors

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