PHYSIOTHERAPY MANAGEMENT OF KNEE OSTHEOARTHRITIS IN ELDERLY: A Case Study

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Abstract

Introduction:
Osteoarthritis (OA) knee is a degenerative and chronic disease of the knee joint due to damage to hyaline cartilage and the most common type of arthritis among individuals over 65 years of age. OA knee is directly related to disability related to physiotherapy problems such as pain, quadriceps dysfunction, and proprioceptive disorders. Therefore, proper management of knee OA is needed to prevent disease progression, reduce pain, and improve knee function in daily functional activities.

Case presentation
A female patient named MH aged 66 years. The patient had a chief complaint of pain in the right knee. Complaints worsens especially when going up and down stairs and when standing for long periods and walking long distances. The patient also feels stiffness in the knee joint in the morning with a duration of less than 30 minutes.

Management and outcomes
Giving several optional interventions such as ultrasound, exercise program including static quadriceps exercise, and land base exercise itseffectives for reduce pain, increase muscle strength, increase joint range of motion and improve stability and balance in OA knee.

Discussion
After being given physiotherapy intervention and exercise programs including static quadruceps exercise and land base exercise, the results were a decrease in motion pain and pressure, and there was an increase in flexor and extensor muscle strength from T1 with a muscle strength value of 4/5 , to 5/5 at T4, There is an increase in the range of motion of the joint at T1the result is 100^0 becomes 130^0 at T4. and a decrease in risk factors for falls and an increase in balance and stability in the knee joint.

Conclusion
After physiotherapy intervention in the form of ultrasound and exercise program that includes static quadriceps exercise, land base exercise for 4 therapy sessions can reduce pain levels, increase leg muscle strength, improve balance and reduce the risk of falls and functional activities in the elderly with OA knees.

Keywords: osteoarthritis knee, elderly, static quadriceps exercise, land base exercise, ultrasound

Introduction

Osteoarthritis (OA) of the knee is a degenerative and chronic disease of the knee joint due to damage to hyaline cartilage and the most common type of arthritis among individuals over 65 years of age. KOA appears to be the primary diagnosis of the 430,000 hospital discharges each year in the United States. The estimated prevalence of knee OA is 12% in adults 60 years of age or older. The number of people affected by knee OA is likely to increase, no doubt due to the increasing elderly population and the growing rates of overweight and obesity.Knee OA affects the 3 compartments of the knee joint (medial, lateral, and patellofemoral joints) and usually develops slowly over 10 to 15 years, interfering with activities of daily liviNG. Knee OA is also affected by a combination of factors, including family history, age, obesity, diabetes, synovitis, systemic inflammation, lower limb alignment (genu valgum and genu varum), joint shape and dysplasia, trauma, and inflammation by the metabolic syndrome. Knee OA is directly related to disability related to physiotherapy problems such as pain, quadriceps dysfunction, and proprioceptive disorders. In addition, individuals with knee OA experience a chronic form of pain and show decreased ability to use the joint, resulting in muscle weakness. The muscle weakness in knee OA usually causes joint stiffness and decreased range of motion (ROM). The role of physiotherapy is very necessary in the management of knee OA which aims to prevent the progression of knee OA disease progression, reduce pain, and improve knee function in daily functional activities.

Case Presentation

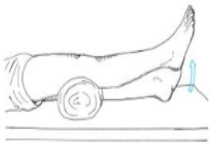
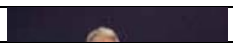
A female patient named MH aged 66 years. The patient had a chief complaint of pain in the right knee. The patient came to a hospital in Semarang on March 13, 2021 with complaints of right knee pain since 2 months which was getting worse especially when going up and down stairs and when standing for long and walking long distances. The patient also feels stiffness in the knee joint in the morning with a duration of less than 30 minutes. The pain subsides slightly when resting. On physical examination, the patient's general condition was good, with vital signs within normal limits. Then a palpation examination of the right knee was performed and it was found that there was tenderness in the medial part of the right knee and the alignment of the right knee appeared varus and on dynamic inspection it was seen that there was walking disturbance and weight bearing that was too reliant on the healthy side of the leg. Radiological investigations were carried out to support the patient's diagnosis, namely showed osteophytes on the lateral and medial condyles of the femur and tibia dextra, with the impression of grade 4 osteoarthritis of the genu dextra. On examination of the ligament with varus test, there was instability in the lateral

collateral ligament. Several other examinations were also carried out, including pain assessment with the Numeric rating Scale (NRS), examination of the range of motion of the joints with a goniometer, examination of muscle strength with manual muscle testing, examination of the risk of falling with a goniometer.*Four Stage Step Test*, and 30 Second Chair Test, and dynamic balance test with Time Up and Go Test.

Management and Outcome

Problems that arise in patients caused by knee osteoarthritis are tenderness in the medial part, decreased static and dynamic balance, walking disorders and weight bearing that is too reliant on the healthy side of the foot, and experiencing limitations in performing some daily activities. Based on these problems, several optional interventions can be given such as ultrasound, exercise programs including static quadriceps exercise, and land base exercise. Ultrasound is given to reduce pain and spasm in the muscles around the knee. Static quadriceps exercise is intended to reduce pain and increase the patient's confidence to contract his muscles. Land base exercise that focuses on muscle strengthening and functional knee osteoarthritis patients. disease progression, reduce pain, and improve knee function.

Table 1. Physiotherapy Intervention Dosage

Intervention	Dose	Picture	Information
US	F : 1 Mhz I : 1.5 w/cm T: 5 minutes T :-		US is given on the medial side
Static quadriceps exercise	F: 2x a week I : 3 sets of 10 repetitions with a 6 second hold T: 5-10 minutes T: quadriceps strengthening		Static contraction on the quadriceps muscle
Strengthening exercise (Bridging Exercises)	F: 2 x a week I : 3 sets of 10 repetitions with a 3 second hold T: 5-10 minutes T: strengthening quadriceps and hamstring muscles		Bridging exercise is discontinued if the patient reports an increase in pain of more than 2 NRS points, but this should be avoided by ensuring appropriate initial intensity/resistance.
Weight Bearing	F: 2x a week		The patient is directed to carry

Functional Exercise	I: 3 sets of 30 seconds T: 5-10 minutes T: build body awareness and increase proprioception		out a body weight-bearing movement on the right leg (the sore leg), this exercise can be done with hands holding on to a chair
Weight Bearing Functional Exercise (forward)	F: 2x a week I : 3 sets 30 seconds T: 5-10 minutes T: build body awareness and increase proprioception		The patient is directed to stand with one foot stepping forward by supporting the weight of the body towards the front
Weight Bearing Functional Exercise (tandem stance)	F: 2x a week I : 3 sets 30 seconds T: 5-10 minutes T: build body awareness and increase proprioception		The patient is directed to stand by aligning the leg in front of the thumb of the other leg, to practice body position, balance, and coordination

After physiotherapy intervention for 4 times therapy, there was an increase in pain evaluation, increased muscle strength, increased static and dynamic balance which are described in the following tables.

Table 2. Results of Pain Evaluation with NRS (Numeric Rating Scale)

Painful	**T1**	**T4**
Silent pain	0/10	0/10
Tenderness	4/10	3/10
Motion pain	6/10	4/10

The results of pain measurement with NRS (Numeric Rating Scale) were assessed on pain when sitting still, tenderness and pain in motion. With the results of the examination there is tenderness in the medial knee area and pain in motion is felt when walking. After the physiotherapy intervention, it was found that

there were changes in tenderness and motion pain. NRS (Numeric Rating Scale) has a validity and reliability value of 0.93.

Table 3. Results of evaluation of joint range of motion with a goniometer

Region	T1	T4
Knee (D)	S: 0-0-100^{o}	S : 0-0-130^{o}
Knee (S)	S: 0-0-135^{o}	S: 0-0-135^{o}

Examination of the range of motion of the knee joint was measured using a goniometer on knee extension and flexion movements. Based on the measurements, it was found that the patient could perform flexion movements on the left knee, but not maximally. While the right knee flexion obtained maximum flexion movement. After the physiotherapy intervention, the results of the measurement evaluation with the goniometer showed an increase in right knee flexion from 100^{o} to 130^{o}.

Table 4. The results of the evaluation of muscle strength with MMT (Manual Muscle Testing)

muscle groups	T1	T4
Knee flexors (D)	4/5	5/5
Knee extensors (D)	4/5	5/5
Knee flexors (S)	5/5	5/5
Knee extensors (S)	5/5	5/5

The results of the evaluation of muscle strength measured using MMT showed an increase in muscle strength from T1 to T4. At T4 the strength of the knee flexor and extensor muscles is 5/5 which means the patient is able to move and resist maximally.

Table 5. Test your balance and fall risk with Time Up and Go Test

Standard	T1	T4
12 seconds	20.58 seconds	20.10 seconds

The results of the Time Up and Go Test on the patient can be concluded that the patient has a risk of falling, with a total time of T1: 20.58 seconds, which is the amount of time that is more than 12 seconds,

it shows that the patient has dynamic balance disorders and is at risk of falling. From the evaluation results on T4 the total time becomes 20.10 seconds.

Table 6. Test your balance and fall risk with the Four Stage Step Test

Position	T1	T4	Interpretation
Stand with both feet parallel	10 seconds	10 seconds	Able to do
Stand with the other half of the foot forward	10 seconds	10 seconds	Able to do
Stand with one foot in front	6 seconds	10 seconds	Able to do
Standing on one leg	8 seconds	10 seconds	Able to do

Evaluation results with *Four Stage Step Test*showed a change in T1 and T4. The patient has not been able to perform a full tandem stance and elevate one leg for 10 seconds. However, on the evaluation results, T4 was able to perform a full tandem stance and lift one leg in 10 seconds.

Table 7. Test your balance and fall risk with the Thirty Second Chair Stand Test

Standard	T1	T4	Interpretation
< 12	7	12	Does not have balance disorders and risk factors for falling.

From the results of the examination, it was found that scoring 7 times in doing a chair stand for 30 seconds at an age range of 65-69 with a score interpretation <11, i.e. if the total score is below 11 then there is an indication of the risk of falling. On the results of the T4 evaluation with the results of 12 repetitions. This shows that the patient does not have balance disorders and risk factors for falling.

Discussion

The principles of knee OA management include assessment by adjusting the needs and conditions of each patient according to and by giving the appropriate dose of exercise. The goals of knee OA management are to minimize pain, optimize function and participation. Management planning guidelines for knee OA are also reviewed from the number of joints involved, the degree of pain, movement barriers and functional disorders, and the presence of comorbidities. Based on the exercise protocol from RACGP

(2014) and Higgs., et al (2014) explained that exercise in knee osteoarthritis patients was carried out in a tolerable pain level according to the exercise method described, as follows:

Ultrasound

Ultrasound has a deep penetration effect that produces changes in the tissue through thermal and non-thermal (mechanical) mechanisms. The effects of ultrasound can also increase the speed of tissue repair, increase blood flow, increase tissue extensibility, reduce pain, and muscle spasm. The application of ultrasound that produces a thermal effect that causes relaxation of tense tissues by increasing blood flow, increasing oxygen delivery and promoting muscle fiber elongation can reduce mechanical excitability. In addition, the effect that ultrasound provides can control pain directly by affecting the peripheral nervous system and from the results of other tissue changes associated with the application of ultrasound, Ultrasound directly affects the transmission of nerve impulses by eliciting changes in nerve fibers. Pain reduction does not result directly from the other effects of the application of ultrasound but from increased blood flow and increased capillary permeability of blood vessels thereby increasing oxygen delivery to hypoxic areas, reducing chemosensitive pain receptor activity so that input from mechanical pain receptors is reduced due to reduced muscle spasm and increased muscle spasm. muscle relaxation. Pain reduction in research may not only be due to muscle strengthening, but can also be due to psychological factors and adaptations of the central nervous system. Pain reduction does not result directly from the other effects of the application of ultrasound but from increased blood flow and increased capillary permeability of blood vessels thereby increasing oxygen delivery to hypoxic areas, reducing chemosensitive pain receptor activity so that input from mechanical pain receptors is reduced due to reduced muscle spasm and increased muscle spasm. muscle relaxation. Pain reduction in research may not only be due to muscle strengthening, but can also be due to psychological factors and central nervous system adaptation. Pain reduction does not result directly from the other effects of the application of ultrasound but from increased blood flow and increased capillary permeability of blood vessels thereby increasing oxygen delivery to hypoxic areas, reducing chemosensitive pain receptor activity so that input from mechanical pain receptors is reduced due to reduced muscle spasm and increased muscle spasm. muscle relaxation. Pain reduction in research may not only be due to muscle strengthening, but can also be due to psychological factors and central nervous system adaptation. reduces the activity of chemosensitive pain receptors so that input from mechanical pain receptors is reduced due to reduced muscle spasm and increased muscle relaxation. Pain reduction in research may not only be due to muscle strengthening, but can also be due to psychological factors and adaptations of the central nervous system. reduces the activity of chemosensitive pain receptors so that input from mechanical pain receptors is

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Static Quadriceps Exercise

Static quadriceps exercise is an isometric contraction exercise where the muscle being trained does not change in length and without there is movement of the joints. So practice will cause muscle tension increases and muscle length remains. The exercise begins with isometric contractions aimed at reducing pain and increasing the patient's confidence to contract the muscles. In Isometric Exercises will contraction of the contractile tissue in the muscle becomes stronger as a result there will be hypertrophy of muscle fibers and increased recruitment motor units in muscles. In the increase in muscle strength, phases will occur at the beginning of the exercise and that is because when the muscles contract there will be changes in muscle fibers and neurological adaptations, namely increasing coordination and recruitment of motor units and if contractions are carried out routinely and specifically, it will increase muscle strength.

Land Base Exercises:

Brigding Exercise

Bridging exercise consisting of hip bridge and single leg bridge up is a strengthening movement of the quadriceps and hamstring muscles, resulting in biomechanical optimization that reduces the level of joint pressure, local stress on the articular cartilage or balance disorders. The strong quadriceps muscles increase the stability of the knee joint in the proper position, dampening shock transmitted to the joint and minimizing its impact on a wider area. This exercise also controls the femur in the knee joint which affects the other bones in the joint so that they work synergistically. Bridging exercises performed by the elderly can affect the work of the brain cortex in cognitive and emotional aspects, resulting in positive perceptions and relaxation. Bridging exercises can indirectly help maintain a balanced body homeostasis via the hypothalamic-pituitary-adrenal (HPA) axis, to produce corticotropin-releasing factors. The provision of bridging exercise interventions is carried out in a relaxed family atmosphere in the local environment, so that respondents can do the exercises with a happy and relaxed feeling. This has a good impact on increasing the level of adaptation and the level of stimulation, so that respondents respond positively. When the respondent has a positive perception there will be a state of relaxation and changes in neurology or endocrine chemistry in the body so that it will be easier to accept the healing advice given. The provision of bridging exercise interventions is carried out in a relaxed family atmosphere in the local environment, so that respondents can do the exercises with a happy and relaxed feeling. This has

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Weight Bearing Functional Exercise

This exercise is to build body awareness and increase proprioception which plays a role in informing motion precision and increasing sensory input which will be processed in the brain as central processing, so that it will retrain afferent neurons to develop the sensation of movement in the knee joint and activate motoric which contributes to the formation of dynamic stabilization. The weight bearing position will also improve the performance of the hamstring muscle group, activate the quadriceps muscle group and improve postural control when standing.

Conclusion

After physiotherapy intervention in the form of ultrasound and exercise program which includes static quadriceps exercise, land base exercise for 4 therapy sessions can reduce pain levels, increase leg muscle strength, improve balance and reduce the risk of falls and functional activities in the elderly with knee OA.

Acknowledgments

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