COMPREHENSIVENESS OF PHYSIOTHERAPY INTERVENTION TO PREVENT FALL IN DIABETIC NEUROPATHY PATIENT AT Dr . H ARJONO S PONOROGO HOSPITAL : A CASE REPORT

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Abstract

Introduction*: Diabetic Neuropathy* has a negative impact on leg and ankle function (Strength and flexibility) which in itself affect the patients's physical activity and quality of life. Physiotherapy protocols aimed at increasing intrinsic and extrinsic leg muscle strenght maybe a promosing approach to improve lower extremity function , prevent further complications and improve the patient's activities of dayli living..

Case Presentation*:* A 65-years old patients with diagnosis of *Diabetic N europathy* ,came to the Medical Rehabilitation Installation at RSUD Dr Hardjono Ponorogo with complains of burning sensation,tingling and numbness in both leg. Genu varus was seen in both legs,decreased right leg muscle strength,sensory los on feeling of touch,pain and temperature in both legs from the toes to the lower border of the knee.

Management and Outcome: Aerobic Exercise, flexibility exercise, strengthening and balance exercise as well as gait training are given to patient with Diabetic Neuropathy. Exercise is given 3 times a week for 4 week. The measuring instrument uses Time Up And Go Test where it is reported that after undergoing comprehensive exercise therapy there is decreased in the TUG score from a score 22 second to score 19 second which means there is an increase in the patients static and dinamic's balance.

Discussion*:* **A**nkle exercises theraphy has also shown good results for improving ankle Range Of Motion and Diabetic Neuropathy symptoms as well as for redistributing plantar pressure during movement. Interventions in the form of strengthening, stretching, balance and gait training are very useful in preventing foot ulcers and amputations, reducing the risk of falls, increasing daily physical activity and quality of life, all of which can be beneficial in reducing mortality and comorbidities..

Conclusion*:* Combining Exercise therapy in the form of aerobic exercise, flexibility exercise, strengthening and balance exercise for the lower limbs, and gait training is beneficial in increasing muscle strength, balance and gait so that it can reduce the risk off falling in diabetic neuropathy patient..

Keyword: *Diabetic Neuropathy , Physiotherapy , Exercise therapy , the risk of falling*

Introduction

Diabetes mellitus is a chronic metabolic disease characterized by increased levels of glucose in the blood due to relative insulin deficiency or insulin resistance or both. Risk factors for Diabetes Mellitus include aging, unhealthy eating patterns, obesity and a sedentary lifestyle. Diabetes Mellitus is one of the threats to humans in the century, is also a major cause of complex disease, increased risk of medical comorbidities such as fatigue, weight loss, limitation of motion, decreased muscle strength, and increased risk of falls . Peripheral neuropathy is caused by abnormalities in the capillaries that cause nerve damage. Chronic hyperglycemia impairs microvascular circulation by interfering with normal cell communication and initiating signaling cascades. Chronic hyperglycemia can cause nerve damage through the production of advanced glycation end products and protein kinase C signaling cascades. In particular, it causes thickening of axon and reduced capillary blood flow, leading to nerve perfusion and hypoxia in the endoneurium. Disturbance at the cellular level is manifested as loss of reflex. In addition, because of decrease in nerve conduction velocity, diabetic neuropathy patients usually have a delayed reflex response to postural disturbances, and are subsequently more likely to exhibit impaired balance and an increased risk of falling. *Diabetic neuropathy* is a complication of Diabetes Mellitus experienced by more than 50% -70% of all patients with diabetes. Where this conditions can result in decreased sensory, proprioceptive, reflexes and strength in the lower limbs .Many disorders of the feet and lower legs caused by *Diabetic Neuropathy* such as deformity of the feet, muscle weakness, decreased ROM, tissue stiffness of connective tissue, poor balance and coordination. Various kinds of complaints in the legs and lower legs of people with *Diabetic Neuropathy* will increase the risk of falling. These disorder can be prevented or remedied by the intervention of all kinds of physiotherapy including by exercise therapy.

Case Presentation

Tn . IM age 65 reported having diabetes for the last 4 years. In the last 5 months, the patient said that the feet discomfort in both feet to the soles of the feet. Complains in the form of pain, burning sensation, tingling and numbness in the sole of the feet.The patient feels tired when walking a long distance and fell almost falling. So far the patient has only taken oral drug, etc glikuidon, meloxicam and ranitidine. Finally the patient was referred to the medical rehabilitation installation rsud dr harjono to undergo a physiotherapy program. On examination, it was seen that there was genu varus in both knees, for muscle strengh, there was decrease in muscle strength in the right leg.

In the sensory system there is decrease in the sense of touch,pain an temperature in both legs from the toes to the lower limit of the knee.In the Time Up and Go test, a score of 22 second was obtained, which means that the patient needs external help and further examination and intervention is necessary.

Timed Up And Go Instruction

1.The patient should sit on standart armchair,placing his back against the chair and resting his arms chair's arms.Any assistive device used for walking should be nearby.
2. Regular footwear and customary walking aids should be used
3. The patient should walk to a line that is 3 meters (9,8 feet) away,turn around at the line,walk back to the chair,and sit down
4. The test ends when patient's buttocks touch the seat
5. Patient should be instructed to use a comfortable and safe walking speed.
6. A Stopwatch should be used to time the test (in second)

Set Up

1. Measure and mark 3 meter (9,8 feet) walkway
2. Pleace a standard height chair (seat hight 46 cm, arm height 67 cm) at the beginning of the walkway.

Performance is assessed based on total time required to carry out the task

Time	Intrepretation
<10 second	Normal mobility
11-20 second	Within normal limits
>20 second	Needs outside help and suggest further examination and intervention
>30 second	Vulnerable fall

Management and Outcome

The patient underwent a physiotherapy program 3 times a week for 4 weeks. The physiotherapy program focused on exercise therapy in the form of:

1. Aerobic Exercise

   Aerobic exercise is carried out for at least 30 minutes every day, done 3-5 times in 1 week. Patients need to do physical activity for 10 minutes after eating. Types of aerobic exercise include:

   a. Treadmill workout
   b. Cycling or using static cycle
   c. Participate in low impact exercise

d. Swim or do exercises in water

2. Flexibility Exercise

a. Calf Muscle Stretching Exercises

Picture

Feet are placed front and back. Where the rear leg ends slightly pointing inward. The knee of the front leg is slightly bent with the heel of the back foot flat on the floor. A stretch is felt in the Calf muscles. The movement is held for 10-20 seconds per leg with 3 repetitions per leg

b. Hamstring muscle stretch

Picture

Sit on a chair, one leg straight with a position pointing up. the opposite knee is bent with the feet flat on the floor. The chest is centered on the straight leg and the back is slowly straightened until you feel the stretching of the back leg. The movement is held for 15-20 seconds, 3 repetitions each leg.

c. Plantar fascia stretch

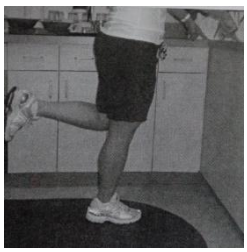
Picture

Lean against a wall with palm s facing thee wall, kness of pain straightened.. Bend the other knee forward. Both feet are kept flat on the ground. Make sure the heel and calf of the sure foot feel the stretch. The movement is held for 15-20 seconds, performed 3

repetitions.

3. Strengthening Exercises
   a. Counter Calf Raises

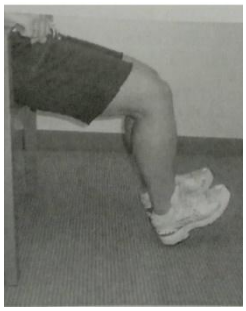
      Picture



      Standing position beside the table, both fingertips are placed on the table. Standing on one foot lifting the heel of the floor,standing on the toes. . Slowly lower the body and repeat. Once on the toes,slowly lower the foot. Repeat 10-15 times, 2 reps each leg.

   b. Dorsi flexion while sitting

      Picture



      Sit on a chair, feet flat on the ground. Gradually raise your toes and ankles as high as possible.Allow the land to be lowered. for maximum results, the feet are positioned close to the body. Repeat 10-15 times, 3 repetitions.

4. Balance training
   a. Hip flexion exercise

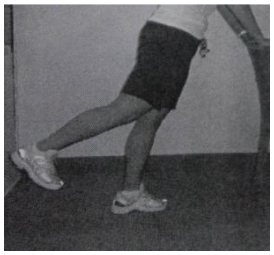
      Picture

      Holds a chair or table with one hand, then another finger without hands. Slowly bend the

knees, one knee is directed to the chest, without bending the waist or hips. Hold the position for 5-10 seconds. Slowly lower the legs down. Repeat 2 times on each leg.

b. Hip extension exercises

Picture



One hands holds a chair or table, then one fingertip, then one fingertip,then without the handle,Standing 12-18 inches from a table or chair. Bend at the hips, holding a chair or table. Slowly lift one leg straight back. Hold position for 10-15 counts. Slowly lower your leg and switch to the other leg.

c. Side leg raise

Picture

Standing position beside the chair with one hand holding the chair, legs slightly spread apart. Lift one leg to the side 6-12 inches slowly. Alternate with the other leg. Each movement is held for 5-10 seconds. Repeat 2 times.

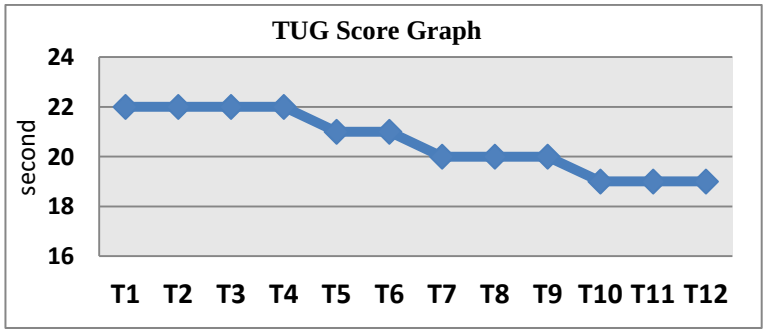
5. Gait training

It's important to give him training that goes his way.Physiotherapists need to identify the missing phase of walking.

Physiotherapy Programs:

Intervention	Dose	Information	Aim
Aerobic Exercise	F: 3-5 times/week I : Patient tolerance T: 30 minutes	Treadmill workout Cycling or using a static cycle Follow low impact exercise Swimming or doing exercises in water	Increase muscle mass Increase resting metabolic rate Increase muscle endurance Improves insulin sensitivity and attenuates loss of muscle mass during calorie restriction and aging
Flexibility Exercise	F: 3-5 times/week I : Patient tolerance T: 5-10 minutes T: Stretch	Calf muscle stretch Sitting hamstring muscle stretch Plantar fascia stretch	To maintain muscle flexibility
Strengthening Exercises	F: 3-5 times/week I: Patient tolerance I:5-10 minutes T: Strengthening	Counter calf raises Chair squats Dorsi flexion when sitting	To strengthen leg muscles
Balance Exercise	F; 3-5 times/week I : Patient tolerance Q: 5-10 minutes T : Balance exc	Counter calf raise Hip exercise flexion Hip exercise extension Side Leg raise	To train the patient's balance when standing and walking
Gait training	F: every day I: Patient tolerance T: gait training		To practice walking according to the phases

After carrying out a comprehensive exercise therapy program for 12 times for *Diabetic Neuropathy* patients , in the form of aerobic exercise, flexibility exercise, strengthening and balance exercises as well as walking exercises, the Time and Up Go Test score decreased from a score of 22 second to 19 second (as shown in the Figure below). The patient has felt a change in him that walking feels more stable and less tired.



Discussion

The development of *Diabetic Neuropathy* affect the integrity of the small joint and intrinsic muscles of the foot. This effect is a major factor in the development of deformity, increased plantar pressure and increased risk of plantar ulceration. These changes affect the dynamic stability of the foot, resulting in inadequate mobility for activities of daily living. Exercise therapy has been shown to result in diabetic foot results, especially in increasing nerve velocity conduction of the lower limbs. Additional benefits induced by exercise therapy in patients with diabetes mellitus, such as skin sensitivity and intraepidermal nerve fiber density, may inhibit the progression of diabetic neuropathy, delay skin breakdown and ulceration. Therapeutic ankle exercises have also shown great results for improving ankle range of motion and diabetic neuropathy symptoms as well as for redistributing plantar pressure during movement. Interventions in the form of strengthening, stretching, balance and gait training are very useful in preventing foot ulcers and amputations, reducing the risk of falls, increasing daily physical activity and quality of life, all of which can be beneficial in reducing mortality and comorbidities.

Conclusion

After patients underwent a physiotherapy program of exercise theraphy in the form of aerobic exercise, flexibility exercise, strenghthening exercise, balance training and gait training, the TUG score was obtained from 22 second to 19 second, there was increase in static and dynamic balance. This means that it can be concluded that the comprehensiveness of exercise is effective in preventing fall in diabetic neuropathy patients.

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