Study of Lower Limb Neuromuscular characteristics in Postmenopausal Women with Osteoarthritis

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Research Article

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ABSTRACT :

The Osteoarthritis (OA) is age related degenerative joint disease. Osteoarthritis is the most common disease of women after menopause. There are many factors to develop the disease. Hormones play important role to in this context.

The objective of the present study is to compare the neuromuscular performance characteristics in the two group of subjects. A total 100 menopausal women's with OA and 50 normal menopausal women's were included in the study. The Ground reaction forces, Peak instantaneous power, Concentric net impulse, Knee extension force, Knee flexion force are collected in the study.

The postmenopausal women's having mild osteoarthritis showed the lower neuromuscular performance characteristics. Data between the two groups represent that the regular exercise is needed to prevent such condition.

Keywords: Neuromuscular characteristics, Postmenopausal Women, Osteoarthritis, lower limb

INTRODUCTION:

Osteoarthritis (OA), also known as degenerative joint disease or age-related arthritis, is the most common type of arthritis. Osteoarthritis is more likely to develop as people age. The changes in osteoarthritis usually occur slowly over many years, though there are occasional exceptions. Inflammation and injury to the joint cause a breaking down of cartilage tissues, resulting in pain, swelling, and deformity of the joint.

There are two main types of osteoarthritis:

- **primary**: more generalized osteoarthritis that affects the fingers, thumbs, spine, hips, and knees
- **secondary**: osteoarthritis that occurs after injury, such as repetitive or sports-related injury, or inflammation in a joint

Primary generalized osteoarthritis affects women more than men, often occurring shortly after menopause. Most people with primary osteoarthritis have other family members who are affected by the same problem, and usually have swelling and or pain of the finger joints, base of the thumbs, and knees or hips. Secondary osteoarthritis may occur in a joint that was previously injured from trauma, or after the joint has been damaged by some other cause, such as infection or rheumatoid arthritis.

Although the exact mechanisms of cartilage loss and bone changes are unknown, great advancements have been made in recent years. It is likely that complex signalling processes during joint inflammation – and defective repair mechanisms in response to injury – gradually wear down cartilage within the joints. Other changes cause the joint to lose mobility and function, resulting in joint pain with activity.

In addition to hereditary factors (genes) and other forms of arthritis, several other risk factors increase the risk for developing osteoarthritis, including other hereditary disorders, obesity, and injuries to or around the joint.

- **Heredity** plays a role in osteoarthritis, as individuals born with other diseases are more likely to develop osteoarthritis. Examples include conditions associated with increased joint laxity (being «double-jointed»), some dysplasias (abnormal growths of bone and cartilage), and Paget's disease (a type of inflammation in bone that oc-

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curs in older people).

- **Obesity** is a risk factor for osteoarthritis of the lower extremity and spine. Being overweight also may speed the rate of development of osteoarthritis. Maintaining ideal body weight or losing extra weight is important for those at risk.
- **Injuries** (such as those occurring in many athletes) contribute to the development of osteoarthritis. An injury that results in abnormal stress on a joint is another important risk factor for osteoarthritis. Overuse injuries are more controversial, as many people who have similar lifestyles do not develop osteoarthritis. However, repetitive trauma – which may result from overuse – does increase that risk.
- **Other conditions** that may lead to the development of osteoarthritis include peripheral neuropathies (diseases of the nervous system) and neuromuscular disorders that put abnormal stress on the joint.

The female hormone estrogen protects cartilage from inflammation, Inflammation can lead to osteoarthritis. But after menopause, when women's estrogen levels go down, they lose that protection and may have a higher risk of developing osteoarthritis even if they are on hormone-replacement therapy

Study Methodology (4):

The present study was conducted in the Hospital in the North India. A total 100 menopausal women's with OA and 50 normal menopausal women's were included in the study. The The menopausal women's between age of 50-65 years without any other diseases were selected in the study. The menopausal women's with OA having knee pain daily once or twice. The other menopausal women's having body mass index more than 35 kg/m^2 and undergone any surgery were excluded from the study. The Counter movement jump test, Knee extension and flexion force are noted done for the observation.

Observations & Discussion:

The Counter movement jump test (CMJ) was done on all the enrolled womens. Dynamic maximal muscle power of lower limbs was examined by measuring ground reaction forces in newtons (GRFs, N), peak instantaneous power production during the takeoffphase in watts (W) and concentric net impulse in newton seconds (Ns) with a force platform during counter movement jump test. Also the Knee extension force and knee flexion force is measured in the two study group.

This study provided new information that neuromuscular performance predicted bone strength along lower limb at femoral.

Table : Neuromuscular Performance Characteristics

Characteristics	Normal Group: Menopausal women's	Menopausal women's with OA
Ground reaction forces (N)	140 ± 18	124 ± 15
Peak instantaneous power (W)	1800 ± 140	1680 ± 210
Concentric net impulse (N)	140 ± 15	121 ± 19
Knee extension force (N)	560 ± 30	410 ± 41
Knee flexion force (N)	210 ± 27	179 ± 30

The Neuromuscular performance characteristics performance were presented in the above table.

Concentric net impulse and peak power production during counter movement jump were the strongest predictors of the lower limb bone strength indices. In addition, knee extension force were among strongest predictors of bone strength in the both groups lower limb.

The lower limb concentric net impulse and power production parameters in both groups predict ts the lower limb neuromuscular strength. These findings may mirror the fact that bones adapt their strength through increased strain and stress which are caused by increased loads through forceful muscle contractions (5).

The study indicated that gradually implemented high-impact jumping exercise did not have unfavourable effects on the biochemical properties of the knee cartilage. Among postmenopausal women with OA, impact jumping exercise did not cause knee pain and it had favourable effects on physical function (e.g. lowered fall risk factors for osteoporotic fractures) (6).

Better neuromuscular performance is found to be associated with better skeletal rigidity (7) and regular exercise has other beneficial benefits on human body than just weight reduction, such as improved muscle strength, joint range of motion, balance, proprioception and cardiovascular fitness. Thus exercise increases daily physical activity and decreases risk of falling in OA patients (8). Therefore regular exercise can be recommended as a means to improve skeletal health.

Conclusion:

Data between the two groups represent that the regular exercise is needed to prevent such condition. The postmenopausal women's having mild osteoarthritis showed the lower neuromuscular performance characteristics.

The high impact jumping exercise did not affect the biochemical properties of knees. The regular exercise will have less chances of the knee pain. Also the regular exercise will reduce the weight but also have improved muscle strength, joint motion, body balance.

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