KINESIOTAPE VERSUS MYOFASCIAL RELEASE IN PATIENTS WITH CHONDROMALACIA PATELLAE

A Thesis

Submitted in partial fulfillment for the Requirement of the Master Degree in Department of Physical Therapy for Musculoskeletal

Disorders and its Surgery

By

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Knee pain around the patella is inconsistently referred to as patellofemoral pain syndrome (PFPS), anterior knee pain, or runner's knee. Chondromalacia patella is often used to describe this condition as well

Chondromalacia patellae is a term used to describe softening and progressive breakdown of the articular cartilage of the patella

usually secondry to some underlying condition, such as malalignment or trauma, although the cause is often unclear. It is one of the most frequent causes of knee pain in young patients

Soft tissue structures provide both dynamic and static stabilization of the patellofemoral joint. The vastus medialis obliquus (VMO) is an important dynamic medial stabilizer of the patellofemoral joint. The iliotibial band provides dynamic lateral stabilization of the patella through the iliopatellar band

Additional dynamic. Stabilization is provided by insertion of fibers from the vastus medialis and lateralis onto the patellar retinacula. Static stabilizers consist of the medial and lateral retinaculum and the joint capsule

Myofascial release can be classified as a combined direct and indirect manual technique, which applies the principles of biomechanical loading of soft tissue and the neural reflex modifications by stimulation of mechanoreceptors in the fascia

Kinesio tape (KT), invented by Kenzo Kase in 1996, is a new application of adhesive taping. It is a thin and elastic tape which can be stretched up to120-140% of its original length, making it quite elastic

Taping is widely used to prevent injury to athletes .The therapeutic effects of knee taping include minimising pain, increasing muscle strength, improving gait pattern and enhancing functional outcome of patients with sports injury

The goal of this taping application is to facilitate the VMO to restore normal muscle balance between the quadriceps muscles and to restore alignment to the patellofemoral joint itself

Statement of the problem:

Which was more effective on pain intensity, functional disability and quadriceps isokinetic peak torque in patients with chondromalacia patellae kinesio tape or myofascial release?

Was there a difference between the effect of kinesio tape and myofascial release on pain intensity, functional disability and quadriceps isokinetic peak torque in patients with chondromalacia patellae?

Purpose of the problem:

To compare between the effect of kinesio tape and myofascial release on pain, functional disability and quadriceps isokinetic peak torque in patients with chondromalacia patellae

Significance of the study:

A more appropriate clinical diagnosis for patients with chondromalacia patellae when they first present is patellofemoral pain or pain in the front of the knee. The knee with chondromalacia patellae has reduced muscular strength and functional capacity

Myofascial Release treatment can increase muscle fiber length (stretching), and according to muscle fiber length–tension relationship, this will improve muscle strength and may be related to a change in muscle architecture

kinesio tape could decrease chronic pain resulting from chondromalacia patellae by lifting the skin to increase space between skin and muscle, reduce localized pressure and promote circulation

In addition, kinesio tape will stimulate cutaneous mechanoreceptors and deliver more signals to CNS. This may increase motor unit firing and improve quadriceps muscle strength

Therefore, this research aimed to investigate which is more effective kinesio tape or myofascial release on pain and quadriceps muscle strength

Delimitation:

This study was delimited to:
Thirty patients diagnosed clinically as chondromalacia patellae.
Age of the patients 15-30 year

Hypothesis:

There was no significant difference between the effect of kinesio tape versus myofascial release on pain intensity in patients with chondomalacia patellae.

There was no significant difference between the effect of kinesio tape versus myofascial release on quadriceps isokinetic peak torque in patients with chondomalacia patellae

There was no significant difference between the effect of kinesio tape versus myofascial release on functional disability in patients with chondomalacia patellae

Functional anatomy of patellofemoral joint

The patellofemoral joint is the portion of the knee joint between the patella and the femoral condyles. It has only one degree of freedom with a simple active interaction

The patellofemoral articulation totally depends on the function of the quadriceps. The patella forms a mobile yet firm site for the attachments of ligaments and tendons on the extensor side of the knee. It increases the angle of pull of the patellar tendon, improving the mechanical advantage of the quadriceps in knee extension

The patellofemoral pain syndrome is one of the most common conditions presenting to clinicians involved in the management of sport injuries

When medial stabilizers are weakened or disrupted, the typical lateral instability may occur. Tightness or excessive force by the lateral stabilizers typically does not cause actual instability, as long as the medial structures are normal, but may cause symptomatic abnormalities in patella tilt and tracking

The main dynamic stabilizer on the medial side, counteracting the pull of the vastus lateralis and the ITB, is the vastus medialis oblique (VMO) muscle, which has a 60 degree force vector to the anatomic femoral axis, and is most active at 0-30 degrees of knee flexion. In addition to its role as a dynamic stabilizer, the VMO also serves as a static stabilize

Chondromalacia patellae is damage to the patella cartilage. It is like a softening or wear and tear of the cartilage and the roughening or damage can range from slight to severe. Chondromalacia patellae overlaps with the knee condition known as patellofemoral pain syndrome

When the knee moves, the kneecap (patella) slides to remain in contact with the lower end of the thigh bone (trochlear groove of the femur). Normally, this motion has almost no friction

Chondromalacia patellae occurs most often in young adults and teenagers. It is more common in women. The reason why damage occurs to the cartilage is not clear. It is thought that the patella may rub against the lower part of the thigh bone (femur) instead of gliding smoothly over it. This may damage the patellar cartilage

Factors contributing to Patellofemoral pain syndrome

There are numerous factors that contribute to increased patellofemoral joint stress and propagation of pain, such as structural abnormalities and muscular weakness/imbalances .Structural abnormalities include tightness or laxity of lateral and medial patellar retinaculi and medial and. Lateral patellofemoral ligaments and inflammation or abnormalities of fat pads, bursae, and synovial plica. Structural or mechanical abnormalities arising from the femur or the tibia may contribute to excessive overloading and patellofemoral instability that causes PFPS

Therapeutic plan is to decrease areas of extensive pressure, reduce inflammation of irritated tissue, improve joint biomachanics by strenghtning tight structures that disturb normal tracking, increase strength and indurance of the lower extremeties particulary of the vastus medialis obilques(VMO) through functional training, Weight control

(cold application- massage- transcutaneous electrical nerve stimulation- low intensity ultrasound- isometric quadriceps sets- terminal knee extension ex. (open chain-closed chain). The cybex multichip machine, taping, manual resistance exercises

The Kinesio Taping Method has taken the Rehabilitation and Sports Medicine world by storm. Developed by Dr. Kenzo Kase nearly 35 years ago in Japan, Kinesio Taping has become the gold standard for therapeutic rehabilitative taping. Our proprietary method of taping uses a uniquely designed and patented tape for treatment of muscular disorders

Applying KT would have physiological effects including decreasing pain or abnormal sensation, supporting the movement of muscles, removing congestion of lymphatic fluid or hemorrhages under the skin, and correcting misalignment of joints

When targeting a weak muscle it is important to apply the tape from the specific muscles origin to its insertion with a 25-50 percent tension

to facilitate the muscles proper function. To relieve a muscle spasm, the tape is applied from the muscles insertion origin with 15-25 percent tension

A recent theory argues that the KT could unload the fascia and thereby relief pain reducing the mechanical load on free nerve endings within the fascia

Mechanism of action of medial patellar taping in PFPS:

Many hypotheses for the mechanism of action of the medial patellar tape have been proposed, including:

(1) Pain inhibition

(2) Reduction of reflex inhibition of the quadriceps with a resultant increase in force

(3) Altered quadriceps muscle recruitment with regard to timing of onset of the VMO relative to the VL

(4) Improved patellar tracking by repositioning the patella within the trochlear groove with a resultant decreased load on the PFJ

(5) Alteration of compensatory gait strategies

(6) Enhanced proprioception through directionally sensitive mechanoreceptors

Myofascial release

Myofascial release is a hands-on soft tissue technique that facilitates a stretch into the restricted fascia. A sustained pressure is applied into the restricted tissue barrier; after 90-120 seconds the tissue will undergo histological length changes allowing the first release to be felt

Many traditional therapies treat limitations in active range of motion by manually stretching joints beyond the available end ranges. This can cause micro-tears in the soft tissue resulting in further inflammation

and tightening of the soft tissue surrounding the area, followed by more pain, limitations in range of motion, and a longer recovery period

Myofascial release differs from tradition therapy in the sense that it facilitates the body's natural ability to heal. A few of the physical benefits athletes report include: improved range of motion, decreased pain

decreased cramping before, during, and after performances, and decreased recovery time needed in between performances

Breaking up these adhesions between the fascia and muscle allows the muscle and fascia to move smoothly over each other and helps alleviate the problem.

As was stated above, Myofascial Realease can help increase range of motion and decrease chronic muscle pain caused by either Myofascial trigger points or other adhesions with the myofascia

Quadriceps isokinetic peak torque assessment

The use of isokinetic dynamometers to assess muscle function has become progressively popular in sport, research and clinical settings. Isokinetic devices assess joint and muscle maximal concentric (CON), eccentric (ECC) and isometric

(ISO) strength under constant velocities throughout the whole range of motion. Several studies have used isokinetic dynamometers to assess ISO and dynamic (CON and ECC) strength of the knee extensor and flexor muscles

During the first testing bout (CON/CON) the quadriceps was working in a concentric mode for knee extension but was relaxed for knee flexion. In the secound bout (CON/ECC) quadriceps was working continuously in both movements, concentrically for knee extension and eccentrically for knee flexion and therefore there was a substantial difference in the muscular effort between the two testing modes.

Subjects:

Thirty patients of both sexes had chondromalacia patellae participated in this study with age ranged from 15 - 30 years old. They were recruited from Elhalal Elahmer Hospital .They were assigned randomly into these groups

Group A , composed of fifteen patients who were received kinesio taping in addition to strengthening exercises for quadricps muscle, three sessions weekly for one month

Group B, composed of fifteen patients who were received myofascial release in addition to strengthening exercises of the quadriceps muscle, three sessions weekly for one month.

Inclusion criteria:

Patients' ages ranged from 15-30 years old.

Patients had retro-patellar or peri-patellar pain.

Pain on ascending and descending stairs.

Pain on squating.

Abnormal Q angle (22 degree) on x-ray.

Exclusion criteria:

The Patients were excluded if they had one of the following conditions:

A history of traumatic knee injury including knee ligament or cartilage injury.

Patellar sublaxation or dislocation

Previous knee surgery or any other musculoskeletal injury to either lower extremity

1-Instrumentations used for evaluation:
A-visual analogue scale (VAS):

The pain numerical rating scale is a unidimensional measure of pain intensity which has been widely used in diverse adult populations. Pain severity was assessed by using (VAS) where 0 =no pain and 10=unbearable pain. Patient was rated the pain perceived in his knee along the scale at the point, which referred to his pain severity

B- Cybex Isokinetic dynamometer: (Cybex, New York, United States of America).

Isokinetic dynamometry provides objective measures of concentric dynamic strength. Cybex isokinetic dynamometer is frequently used to assess muscular strength, power, and endurance in a variety of performance and health related areas, e.g., physical therapy, rehabilitative medicine, and exercise physiology. It provides optimal and efficient loading of muscles and joints through range, thereby minimizing potential risk for injury

The Lower Extremity Functional Scale (LEFS):

The Lower Extremity Functional Scale (LEFS) is a widely used questionnaire to evaluate the functional impairment of a patient with a disorder of one or both lower extremities. It also can be used to monitor the patient over time and to evaluate the effectiveness of an intervention

2-Instrumentations used for treatment

A-kinesio tape:

K-tape had been designed to allow 30~40% longitudinal stretch. It is composed of 100% cotton fibers and acrylic heat sensitive glue. The tape is latex-free, very thin, and stretches in the longitudinal plane. Patients will be given a piece of Kinesio tape to apply quadriceps muscle and patella. They were instructed to leave it there for at least 24 hours and return the following day to have the area checked for any signs of a sensitivity reaction. If they notice any redness, rash, itching, or other signs of a skin reaction before returning, they were instructed to remove the Kinesio Tape immediately and wash the area with soap and water

A-Evaluation procedure:

The subject will be evaluated for pain intensity, functional disability and quadriceps muscle torque before treatment and after four weeks from treatment

1-pain severity assessment:

The patient was asked to record the intensity of their pain complaint on a visual analogue scale (VAS). The pain score will be obtained by measuring the distance in millimeters from the far left end of the VAS (zero end)

2-Isokinetic quadriceps peak torque:

1-The steps of the test were explained for each subject to allow the subject to be oriented and familiar with the testing protocol. Calibration of the unit was performed prior to use according to the manufacturer guidelines

2-patients sat on the machine chair without shoes, while the thighs and trunk were firmly strapped to the chair at 90° position and with both hands grabbing the handles.

3-Before performing any test on the system, the apparatus was adjusted and set up ready for use. Proper stabilization techniques were applied to restrict motion to the area of interest. Maximal stabilization and minimal stabilization had no significant

4-The axis of rotation of the dynamometer was aligned with the anatomical axis of rotation of the knee joint (lateral femoral condyle).

5- The researcher instructed participant to cross arms over chest to minimize involvement of upper body musculature

6-The isokinetic dynamometer permits isokinetic contraction to be at various predetermined velocities. Isokinetic dynamometer provides resistance by matching the force applied against it, then preventing acceleration beyond the preset velocity movement

Measurement of muscle strength:

1-Maximal isometric torque was measured with a velocity of zero degrees, while the lever arm is locked in a position of 65° flexion of the knee joint

2-Isokinetic concentric torque was assessed at 2 angular velocities; 60 and 180 degree. The order of tests (dominant versus non-dominant leg and isokinetic velocity) will be randomized through a counter-balanced design

3-Four repetitions of extension at 60degrees per sec., and twenty seconds rest.

4- Four repetitions of extension at 180 degrees per sec, and twenty seconds rest.

5-Each subject was given 2 familiarization trials followed by 20 seconds of rest.

6-The highest torque was recorded. A one-minute rest was given before advancing to the next angular velocity

3- Evaluation of the functional lower extremity impairment:

The LEFS is a 20-item functional status questionnaire applicable to a wide spectrum of patients with lower extremity conditions of musculoskeletal origin. The items investigate the degree of difficulty in performing different physical activities because of the problem in the lower extremity

Each item has four response options (0 5 extreme difficulty or unable to perform activity; 4 5 no difficulty.(The scores for all the items are then used to calculate a scale score ranging from 0 (low functional level) to 80 (high functional level

B- Treatment Procedure:
1-kinesio tape:

Subjects were taped with a Y-shaped Kinesio tape at the quadriceps according to the Kenzo Kase's Kinesio taping manual by the same physical therapist

Subjects lay in the supine position with the hip flexed at 30◦ and the knee flexed at 60◦.

-The tape was applied from a point 10 cm inferior to the anterior superior iliac spine, bisected at the junction between quadriceps femoris tendon and the patella, and circled around the patella, ending at its inferior side.

-The first 5 cm of tape was not stretched and acted as the anchor.

-The portion between the anchor and superior patella was stretched to 120%.

-The remaining tape around the patella was unstretched

2-Myofascial release direct techniques:

A-Separation of Compartments

B- Lifting or Rolling Muscle Compartments

These strokes depend upon bringing the muscle to the end range of easy movement and waiting to feel the release when the muscle rolls away from restrictions either adjacent to or deep to the muscle being worked

C-Expedited Lengthening Strokes:

-The muscle was placed in a relaxed or shortened position.

- Instead of stretching the muscle against resistance, however, the therapist worked in the direction of muscle lengthening and guides the myofascial compartment to efficiently lengthen in the most expedient direction for the joint

3- Strengthening exercise for quadriceps muscle:

A-Quadriceps set exercise:

Patient lie flat or sat with leg straight, researcher asked patient to tighten the muscle in the front of his thigh as much as he can, and push the back of his knee flat against floor, this pulled his kneecap up his thigh toward his hip, Then hold the muscle tight for 6 seconds

B-Quadriceps short arc exercise:

Patient lies flat or sat with leg straight and Place a roll under his knee, allowing it to bend. The patient was asked to tighten the muscle in the front of his knee as much as he can, and lifted his heel off the floor, and then hold this position for 6 seconds

Statistical analysis:

The collected data were statistically analyzed using descriptive statistics (the mean and standard deviation or median (minimum-maximum)).

In normally distributed variables, comparison between mean values of different variables measured per- and post-treatment within the same group was performed using paired t test. Comparison between values of different variables in the three studied groups was performed using one way ANOVA followed by least significant difference test if significant results were recorded.

In not normally distributed variables, comparison between median values of different variables measured per- and post-treatment within the same group was performed using Wilcoxon Signed Ranks test. Comparison between median values of different variables in the three studied groups was performed using Kruskal Wallis test followed by Mann-Whitney test if significant results was recorded.

SPSS computer program (version 19 windows) was used for data analysis. P value ≤ 0.05 was considered significant and < 0.01 was considered highly significant

Data obtained from both groups prior and following the treatment program regarding pain assessment, isokinetic quadriceps peak torque and evaluation of the functional lower extremity impairment were statistically analyzed and compared.

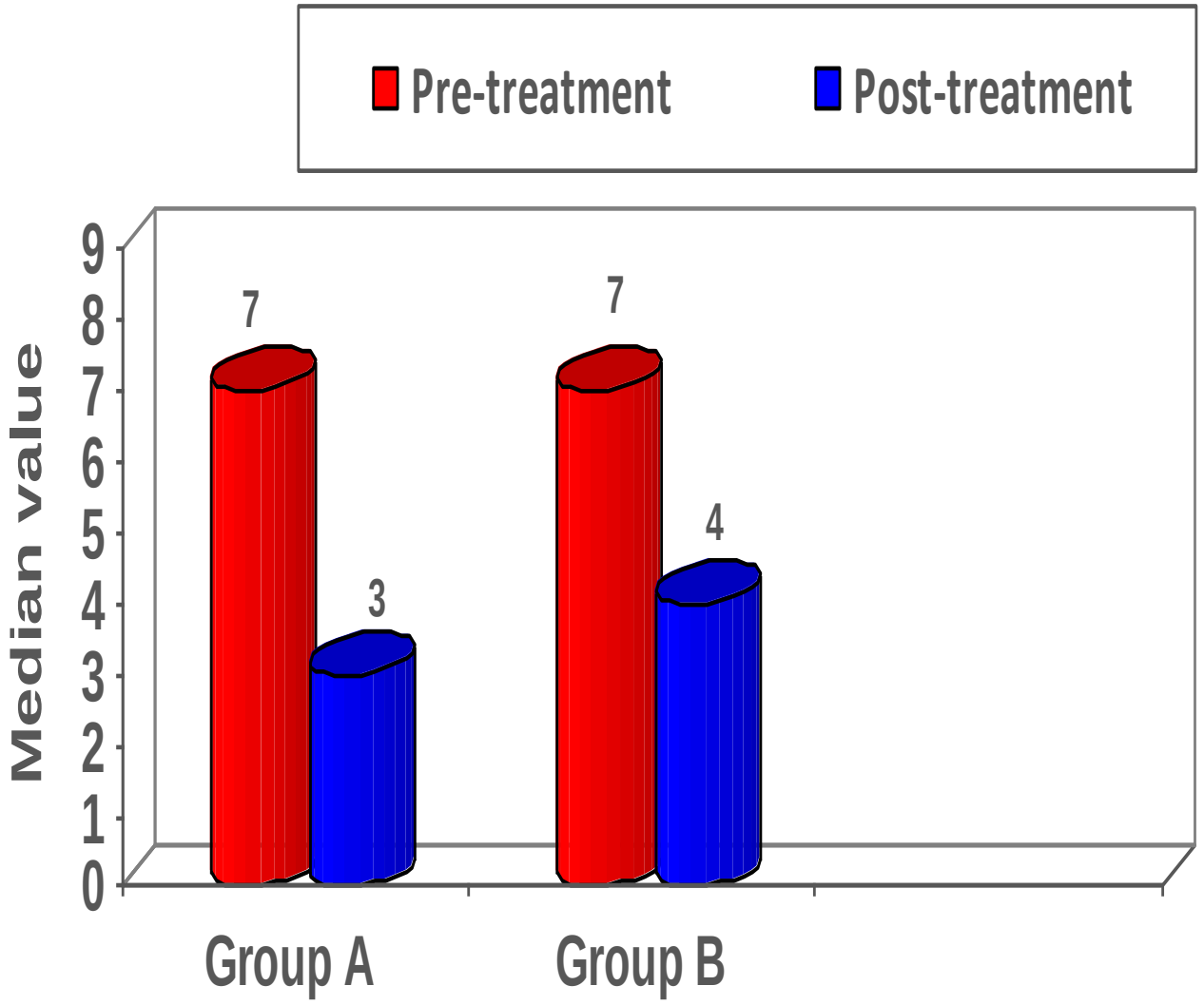
General characteristics of the subjects:

Group A:

Fifteen patients had chondromalacia patellae were included in this group that received kinesio taping in addition to strengthening exercises for quadricps muscle. Their mean ± SD age, weight and height were 21.47 ± 4.87 years, 65.33 ± 4.13 kg and 167.53 ± 3.23cm respectively (Table 1 and figure 12-14).

Group B:

Fifteen patients had chondromalacia patellae were included in this group that received myofascial release in addition to strengthening exercises of the quadriceps muscle. Their mean ± SD age, weight and height were 22.27 ± 5.09 years, 66.87 ± 5.94 kg and 167.47 ± 3.40 cm respectively (Table 1 and figure 12-14).



Fig(15): Comparison between median values of VAS measured pre- and post-treatment within the same group in the two studied groups

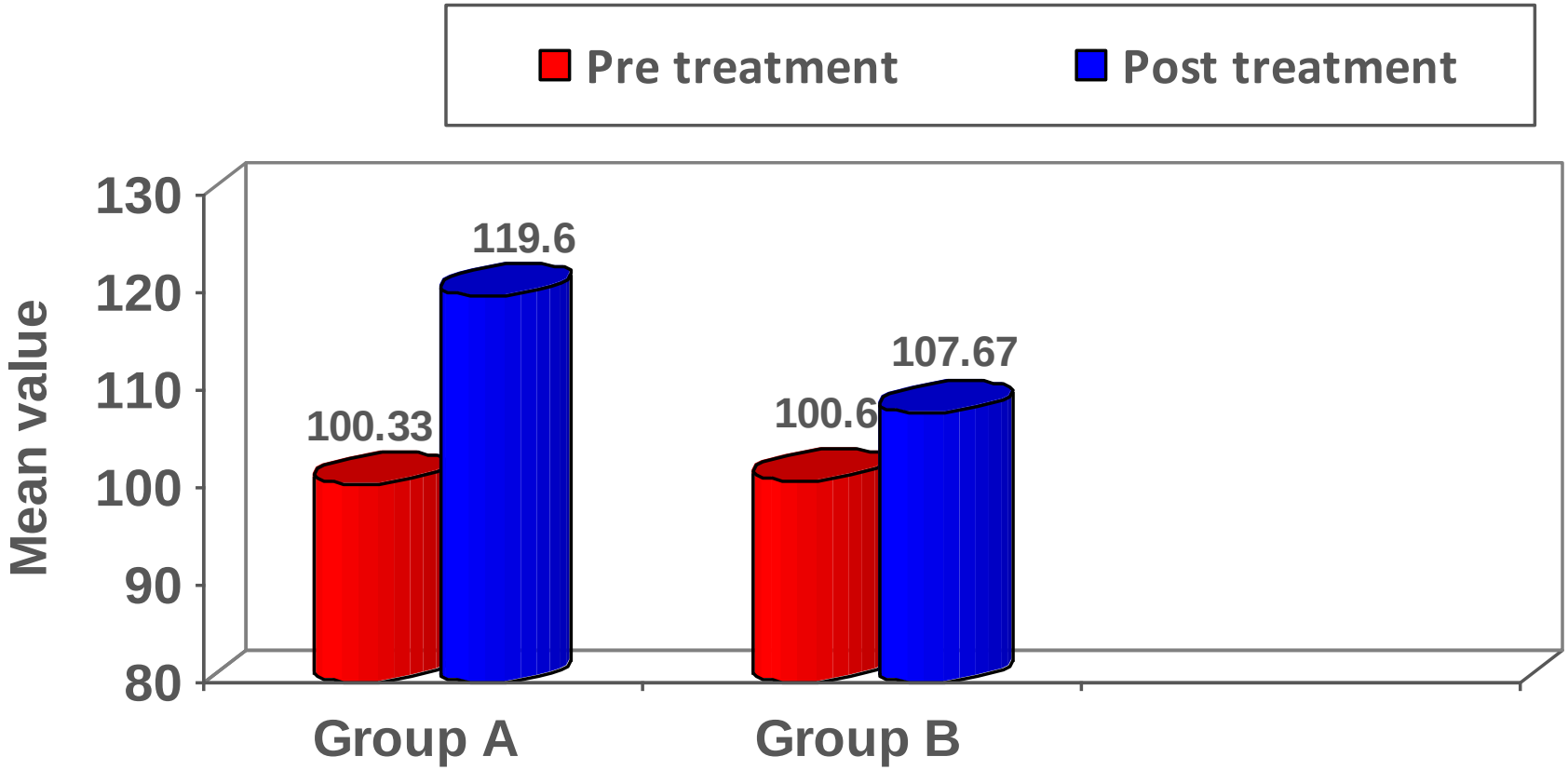


Fig (17): Comparison between mean values of peak torque at flexion 60 measured pre- and post-treatment within the same group in the two studied groups

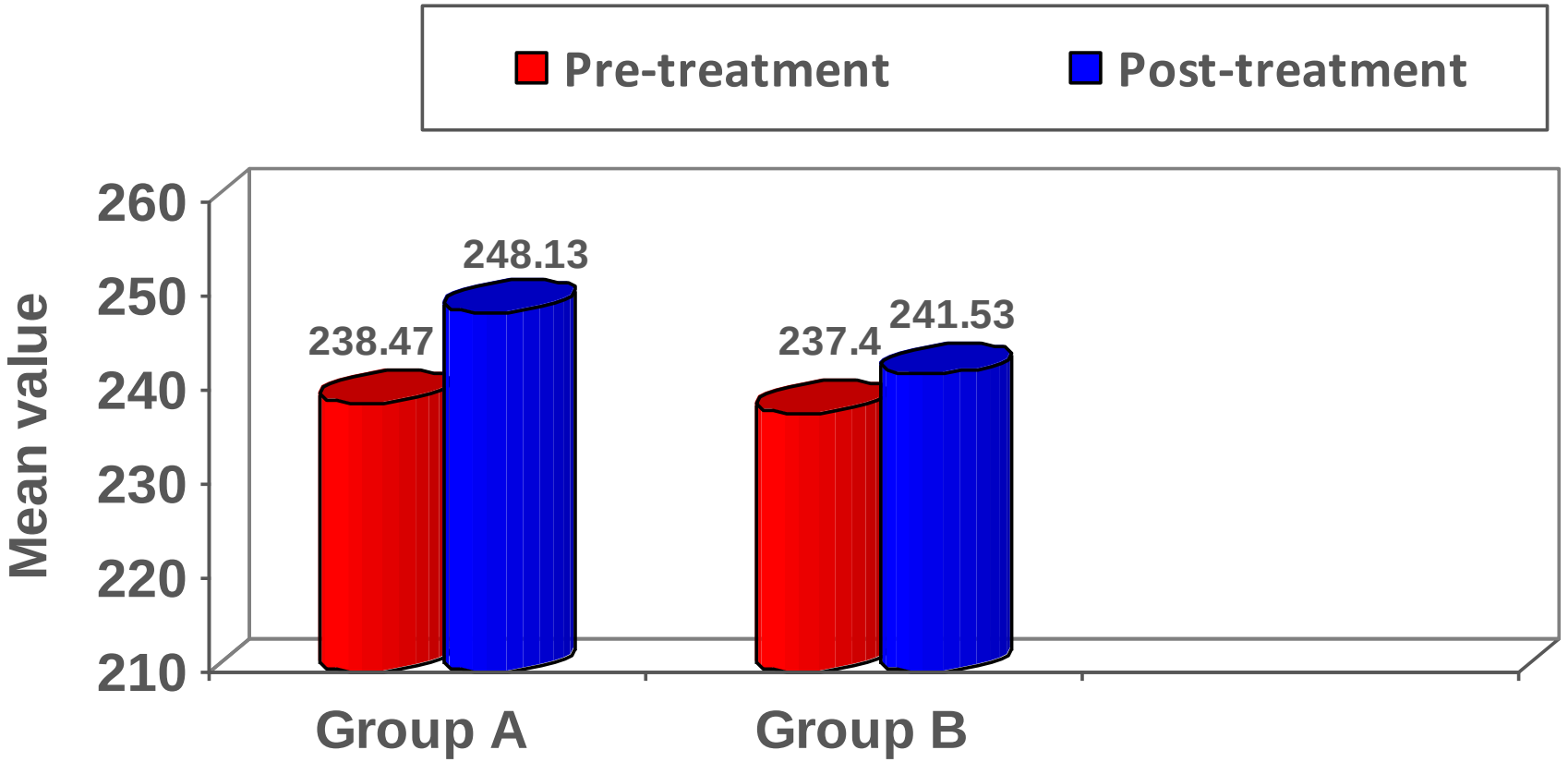


Fig (19): Comparison between mean values of peak torque at extension 60 measured pre- and post-treatment within the same group in the two studied groups.

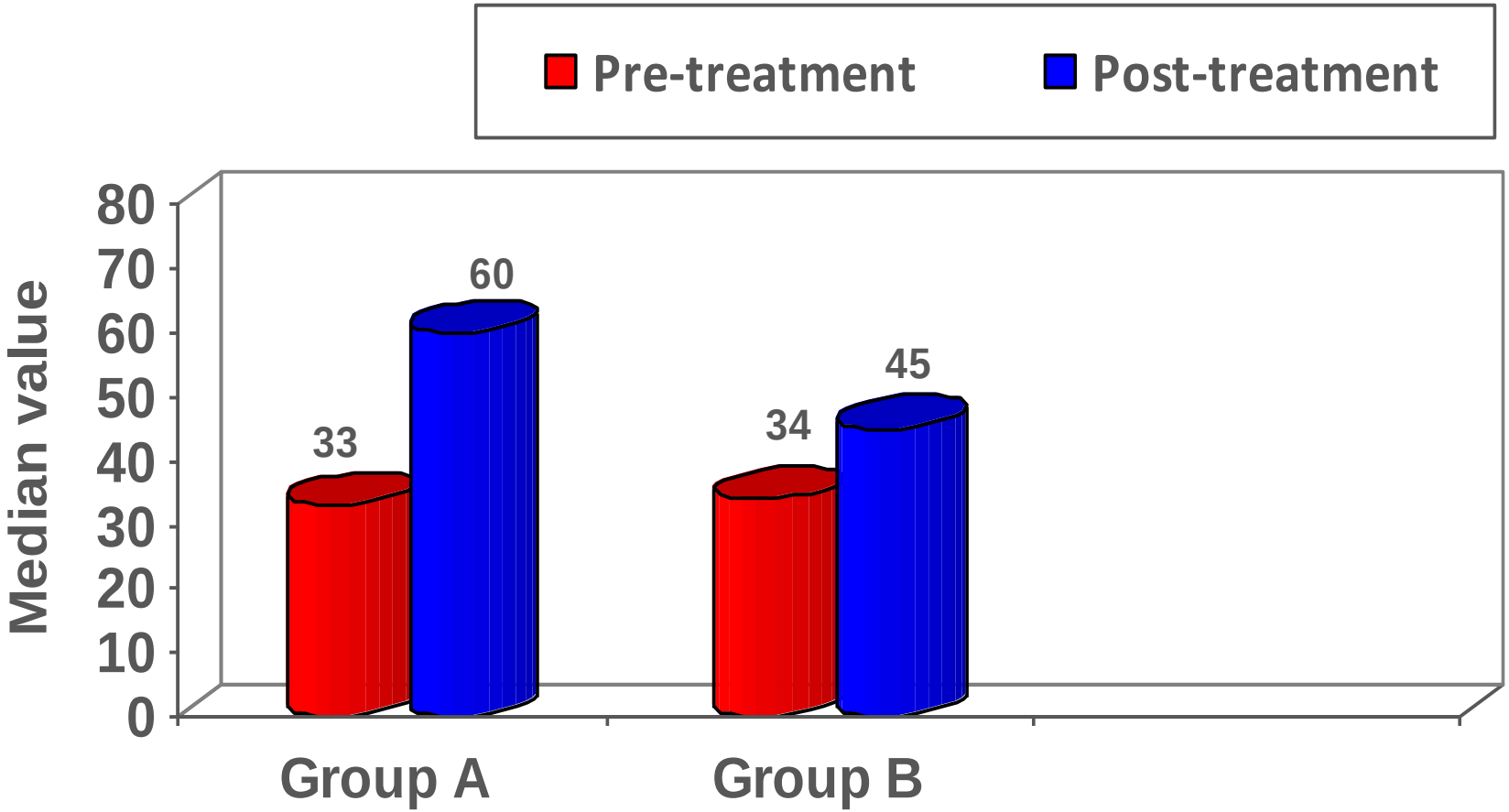


Fig (21): Comparison between median values of LEFS measured pre- and post-treatment within the same group in the two studied groups

Conclusion:

Kinesiotape, myofascial release and quadriceps muscle strengthening exercise should be recommended for patients with chondromalacia patellae due to increasing quadriceps isokinetic peak torque, decreasing pain and improve patient's lower extremity functional abilities through alter the population of recruited motor units

, thereby enhancing neuromuscular performance and possibly favoring a rise in muscle activation

Thank you