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Effect of exercises on pain, physical function and quality of life in female patients with knee osteoarthritis

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Abstract---Background: Different exercises are used in the treatment of osteoarthritis (OA). However, there are a few researches that study the effects of exercises and physical therapy (PT) modality including electrotherapy in the treatment of female patients with knee OA. Objectives: To know the effects of exercises and physical therapy modality in the treatment of patients with knee OA. Methods: A comparative study was conducted on sixty female subjects with acute stage of primary OA, aged 40-80 years old, who were randomly assigned into two groups; exercises group A (n=30) received isometric, proprioception, balance, and closed kinetic chain exercises, and PT group B (n=30) received infrared radiation, TENS and continuous US. The 2 groups were treated by 3 supervised sessions weekly for 8 weeks and a daily home exercise program for exercise group only. Outcomes measures: included; knee pain during motion evaluated with VAS, physical function measured with 30-s chair stand test, and quality of life (QoL) evaluated through Knee Injury and Osteoarthritis Outcome Score (KOOS). All variables were evaluated at pretreatment and after the intervention Results: the group (A&B) reported a significant results than to their pretreatment in all measures, and the

exercise group (A) had higher scores than the PT group (B) in all variables after 8 weeks of intervention. Conclusion: both groups were effective and the exercise is superior to PT group in the treatment of female patients with knee OA.

Keywords---knee osteoarthritis, physical therapy, strengthening exercise, pain, QoL.

Introduction

Osteoarthritis (OA) is a degenerative disease affecting joint cartilage causing pain, functional disability and reduces joint mobility (van Middelkoop et al., 2018). The knee joint is the most involved especially in female, about 25% affect age above 65 years (Cross et al. 2014). Practically, it is leading to more functional disability beside joint pain, limitation and decreased QoL (Cross et al. 2014). QOL is an essential to assess and detect the important of treatment (Brown et al., 2015). Patients with knee osteoarthritis (KOA) have lower QOL compared to those with other diseases (Picavet and Hoeymans, 2004).

Many predisposing factors lead to OA and affect QOL as age, jobs, family history, congenital anomalies, trauma, and body mechanics, leading to disability affect daily living performance and QOL (Sharma et al 2003). OA have several treatments. The main aim of treatment is to decrease pain, limitations and improve mobility in the joint, and to improve QOL. Treatment of OA may use medications, conservative and operative treatment (Parmelee et al. 2015; Taylor et al. 2018).

Therapeutic drugs as non-steroidal anti-inflammatory, analgesic usually used which may lead to many side effects as gastrointestinal, renal, and cardiovascular, so conservative treatment essential especially for old age patients, also both medication and non-pharmaceutical treatments may be used (Hochberg et al. 2012; Mcalindon et al. 2014; Tuncer et al. 2018).

Conservative or non-pharmaceutical treatments include therapeutic exercise, PT, manipulation, mobilization, and acupuncture. Physical therapy modalities such as ultrasound, TENS, shortwave, and laser (Yang et al. 2017; Özkuk et al. 2018). OA is one of the foremost disabling conditions which lead to many problems as socioeconomic problem (Lawrence et a., 1998; Adelman et al., 2001).

There is a lack of literatures studying the effects of exercises and physical therapy modality in treatment of female patients with knee OA. For that reason, the current study aimed to compare the effects of therapeutic exercises and PT in treatment of female patient with knee OA and their effects on knee pain, physical function, and QoL.

Subjects and Methods

Study design

In the period between June 2018 and June 2020 a randomized comparative study was performed in the outpatient clinic of Zagazig university hospital. All subjects were fully informed about the aims and methods applied in the study.

Enrollment

A specialist doctor (orthopedic surgeon) referred sixty female patients with OA knee to the physical therapy clinic. Before enrollment, patient's agreement to share in the study was evaluated.

Participants

Sixty female subjects with knee OA were included in the study and randomly divided into 2 groups, group (A) received exercises (n=30) and group (B) received physical therapy modality (PT) (n=30). Subjects were included in the study, if they diagnosed with either one or both the following; primary knee OA, aged between 40-80 years, Patients had local and general physical examinations performed by orthopedic surgeon, knee pain for more than 3 months according to the American College of Rheumatology (ACR) criteria (Altman et al., 1986). Individuals were excluded if they have pathology of the pelvis, hip area, and lower extremity affecting results, inflammatory rheumatic disease, or other diseases interfere with the rehabilitation exercise as stroke, cardiac problems, uncontrolled hypertension, high obesity, chest disease, uncontrolled diabetes mellitus, infectious disease, and use of intra articular injection in the last 3 months. Patients with any psychological or cognitive dysfunction (Dilekçi et al., 2019)

Intervention

- Exercise group (A)

The exercise programs consists of isometric, proprioception, balance, and closed kinetic chain exercises, The isometric exercises for both the quadriceps and hamstrings performed during the session, for ten repetitive cycles of six-s contractions and two-s rest periods. The balance exercises as standing on one leg, tandem walking, backward walking, and side-to-side stepping exercises., beside closed kinetic chain exercises. The closed kinetic chain exercises were performed in three sets of ten repetitions with five s rest between each exercise as mini-squats, wall sits and lunges (Jan et al., 2009; Smith et al., 2012). The total duration of these exercises was 20–30 min. also daily home exercise was instructed. A list of exercises was given to the subjects, it was observed regularly by the same qualified physiotherapist to ensure the accuracy of performed movements thus through video record.

- Group (B)

Patients in group (B) received 20min of infrared radiation and 30min of TENS (80 Hz frequency) and 5min of continuous ultrasound (1 MHz: 1.5 W/cm²) (ENRAF NONIUS company) performed each session the total

duration of each session 55 minutes, three times per week, day by day for 8 weeks (Dilekçi et al., 2019).

Outcome Measures

1. Knee pain.

Patients' pain scores during motion were evaluated by visual analogue scale (VAS) (0–100 mm; 0 means no pain and 100 means maximum pain).

Subjects were instructed to point on horizontal line and measure the distance with mm (Lee et al., 2003; Diaz-Heredia et al., 2015).

2. Physical function.

Physical function was evaluated using the 30-s chair stand test. Subjects sit in a chair with both knees flexed more than 90 degrees and the feet behind the knees on the floor. Subjects asked to stand up and down with arms are crossed on the chest and lower limbs fully extended and sit down (standing up and sitting down is considered as one cycle), and counting the number of cycles during the 30-s period is measured. High degree means improvement (Dobson et al., 2013; Jones et al 1999; Smith et al., 2019).

3. Quality of life (QoL).

Subjects were evaluated by the QOL subscale of the Knee Injury and Osteoarthritis Outcome Score (KOOS), which formed of five subscales as pain, symptoms, activities of daily living, sports and QOL. Each question is scored on a five-point scale ranging from 0 to 4. High scores near to 100 means better outcome. The assessment was performed at pretreatment and after intervention (Paker et al., 2007).

Sample size

All female patients with knee OA enrolled to physical therapy clinic from the period 2018 to 2020 were included in the study. The all numbers through the two years were 70 patients. Ten patients not met the inclusion criteria, which made the sample as 60 patients, randomly divided into two groups, 30 patients in each group.

Randomization

Patients were randomly a signed into therapeutic exercises or PT programs, using a computer-generated randomization card. The cards were placed in sealed envelopes opened by a blinded and independent research assistant.

Statistical Analysis

Statistical analysis was conducted using (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA). Patient's characteristics of subjects were measured by the unpaired t-test. The ShapiroWilk test was used to evaluate the normal distribution of data. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. The current test involved two independent variables. The first one was the (tested group); between groups factor which had two levels (group A received therapeutic exercises and group B received PT). The within-group factor (pre and post). In addition, this test involved three tested

dependent variables (knee pain by VAS during motion, physical function and QOL).

Results

Participant characteristics

Sixty female's patients were randomized into two groups. The age and BMI for group A, and B, revealed no significant differences ($P = 0.14$, $P=0.54$) (table 1).

Table (1): Demographic Data

Variables	Exercise Group (A)	PT Group (B)	P-Value
Age (years)	54.5±14.19	54.1±12.78	0.14
BMI	27.4 ± 4.8	27.1 ± 5.21	0.54
Affected side (Rt /Lt or both)	14 /10/6	15/11/4	

Intragroup comparison

Within group difference after 8 weeks of intervention the mean values revealed a significant improvements in knee pain during motion, physical function and QOL thus after intervention in the 2 groups ($p < 0.05$) (Tables 2).

Intergroup comparison

Before rehabilitation we found no difference as regard to knee pain, physical function and QOL ($p > 0.05$). After 8 weeks of rehabilitation the results revealed significant differences in all variables with favor to group (A) where ($P = 0.000$), (Table 2).

Table (2): The intragroup and intergroup comparisons at pre- and post-intervention

Variables	Duration	Group (A)	Group (B)	p- value
1.knee pain During motion	Pretreatment	55.9±8.42)	53.13±3.55	0.09
	Post	28.8±5.98	38.66±5.63	0.000
	P value	0.000	0.000	
Physical function	Pretreatment	8.63±1.75	8.1±1.37	0.19
	Post	11.56±1.5	9.8±1.09	0.000
	P value	0.000	0.000	
KOOS- QOL	Pretreatment	25.83±5.36	24.86±2.76	0.38
	Post	45.33±4.36	36.43±3.8	0.000
	P value	0.000	0.000	

Discussion

The current study assessed the effects of therapeutic exercises (isometric, proprioception, balance and closed kinetic chain exercises beside daily home exercises), and the effects of PT modality (infrared radiation, continuous US, TENS), and to compare the both approaches in treatment of female patients with knee OA. Although the results revealed no inter-group differences at pretreatment, this results means that exercises and PT approaches, experienced significant improvements on knee pain during motion, physical function, and QoL after 8 weeks of intervention, and importantly, there were significant differences intergroup and better to exercise group (A) than PT group, thus indicating that subjects receiving the therapeutic exercises exhibited a good degree of physical function, a decrease the degree of pain and improved QoL.

In our study, we found that exercise and PT lead to decrease in movement pain, these results as the results of Lin et al., (2020). Ahmed et al., (2011) found more quadriceps torque values with exercises in the study group more than in the control group, which performed only strengthening and stretching exercises to knee muscles. Also Ahmed et al., (2011) and Lin et al., (2020) found that exercises improve QoL better than a traditional program in treatment KOA which agreed with our study, we found an improvement in physical function or QoL in both groups with favor to exercise group.

Tanaka et al., (2013) studied the effect of strengthening exercise on pain relief in patients with knee OA, and found that exercises for knee OA rehabilitation improve pain and functional capacity. Also Osteoarthritis Research and Society International also recommended that osteoarthritis subjects should be encouraged to perform regular aerobic exercise, muscle strengthening. To ensure effective treatment, the defined exercise must be performed accurately (Zhang et al., 2010; Brosseau et al., 2017).

Our results found that both exercise and PT approaches were effective in improving pain on movement, physical function, and QoL which consistent with Ferreira et al., (2018) who found that there is moderate to good level evidence for electrotherapy and exercise for KOA subjects.

Also Vos et al., (2016) reported that TENS is usually a conservative method which increases secretions of endogenous opioid with low-frequency electrical current and stimulating sensory nerves in acute and chronic pain situations. Also US therapy usually used in physical therapy practices which are based on application of high frequency sound waves to body tissues leading to mechanical or thermal effects and softening tissue, high blood perfusion and metabolic activity, and decrease the inflammatory response and pain (Loyola-Sánchez et al., 2010).

Juhl et al., (2014) found that only exercise or added with other methods give good results in improving pain, physical function of KOA. Zwart et al. (2018) showed that KOA is accompanied with decrease muscle power, physical limitation, joint degeneration, high pain degree, and high signs and symptoms of the diseases. Exercise is a very important treatment method advised for patient with knee pain

especially chronic pain the aims of exercises are to decrease pain and joint limitation, increase muscle power and improve functions. Also many authors have shown that hamstring, quadriceps and balance-proprioception exercises decrease pain, physical function in subjects diagnosed with KOA (Runhaar et al., 2015; Hafez et al., 2013; Knoop et al., 2015).

Limitations

- No control or placebo group.
- The long duration of treatment not performed or planned.
- The study concentrates on only female patients which affect generalization of the results.

Conclusion

After 8 weeks of treatment among female patients with knee OA, both therapeutic exercises and PT were effective and the exercise group give better results than the PT group regarding to knee pain during movement, physical function, and QoL. Thus means the important of exercises in treatment of OA patients.

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