Direct effect of short wave diathermy therapy and exercise with quadriceps bench against knee osteoarthritis patients with functional capabilities

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Abstract. Osteoarthritis (OA) is a disorder of joint cartilage characterized by changes in the clinical, histological and radiological. OA knee associated with various pathological deficits such as pain, decreased range of motion of the knee joint and the quadriceps muscle nirguna atrophy. This study was observational analytic and design research using cross-sectional design. Subjects in this study were 30 patients with osteoarthritis of the knee in outpatient IRM Hospital Dr. Soetomo aged 40-70 years were taken with consecutive sampling technique the period from March to April 2015, an assessment of functional ability before and after treatment using a scale jette. The data in normal distribution and statistical test was then performed using paired t-test. Jette scale mean pre- and post-treatment with Short Wave Diathermy (SWD) modalities and exercises with Quadriceps Bench (QB) in patients with knee osteoarthritis show was different, with a value of less significance (p <0.05). This can occured because, blood flow in the tissues increase, throw away the metabolite residual, and decrease muscle spasms, so the pain is reduced and the functional ability of the knee increases.

1. Introduction
Osteoarthritis (OA) or degenerative joint disease is an abnormality in the joint cartilage which is characterized by clinical, histological and radiological changes. This disease is bilateral, not inflamed and there is no systemic component. The symptoms that often appear are: (1) pain, (2) joint stiffness, (3) muscle weakness and joint stability, all of them will cause joint deformities, limitation of movement and disability [9]. The knee is the most common joint affected by osteoarthritis. Predisposing factors include injury to the joint surface, meniscus tears, ligamentous instability and hip or knee deformity. But in many cases no clear cause can be found. Knee osteoarthritis is associated with various pathological deficits such as pain, range of motion decreased and quadriceps muscular atrophy. Pain in knee OA is strongly associated with a decrease in quadriceps muscle strength which is the main stabilizer of the knee joint causing knee joint instability and a decrease in functional ability [13].

Osteoarthritis is the most common arthritis and will increases as you get older. The knee is the most common joint affected by osteoarthritis [13]. Almost 75% of OA patients have a limited range of joint motion and 25% of them cannot carry out daily activities. The 10 most diagnosis data in Dr. Soetomo
in the period 01 January to 30 November 2014 showed that 18.31% of patients suffered from knee osteoarthritis, which ranked 2nd.

Based on these data it can be concluded that knee OA requires handling in a team that includes: medical aspects by the doctor, physical aspects by the physiotherapist, psychological aspects, and other aspects needed. Physiotherapy plays an important role in cases of OA whose problems are identified based on physiotherapy studies which include: assessment, diagnosis, therapy planning, intervention and evaluation. Physiotherapy interventions are in the form of promotive, preventive, curative, rehabilitative and maintenance aspects with physiotherapy modalities. Physiotherapy modalities that can be used are exercise therapy, manual therapy, electro therapy, physiotherapy, education or counseling, actino therapy and hydrotherapy. Electrotherapy used in knee osteoarthritis includes Short Wave Diathermy (SWD), in combination with exercise therapy using Quadriceps Bench.

Considering the fact that OA problems often occurred in the knee joint, and interfere with the functional abilities and therapies that are often used for knee OA in the IRM outpatient unit Dr. Soetomo are SWD and Quadriceps Bench exercise therapy, the researchers are interested in seeing the functional ability of patients after receiving this treatment.

2. Research methods
2.1 Type and design of research
This study was an observational analytic and research design using cross-sectional design. This study aimed to determine the direct effects of SWD and Quadriceps Bench therapy on patients with knee osteoarthritis on functional ability.

2.2 Research subject
The study was conducted at the IRM outpatient unit at Dr. Soetomo, Surabaya in February - March 2015. The population of the study was patients with knee osteoarthritis in the IRM outpatient unit at Dr. Soetomo, Surabaya. The sample size was 30 people or patients obtained within a month if the number of 30 samples is not reached, male and female subjects with an age 40-70 years were chosen in the scope of the Medical Rehabilitation Installation Dr. Soetomo Surabaya Hospital that has been diagnosed with knee osteoarthritis and get a therapeutic prescription from SPKFR doctors in the form of Short Wave Diathermy (SWD) and Quadriceps Bench (QB), as well as functional ability tests using the Jette scale.

3. Results and Discussion
3.1 Jette Scale
Data from the pre- and post-Jette scale test results showed that there was a mean reduction from 18.60 to 14.63. The mean decrease shows a decrease in the jette scale value, which means that there is an increase in functional ability in the subject or patient.

| Table 1. Average value of Jette Scale |
|---------------------------------------|
| Data source                           | (n=30)          |
| Jette scale                           | Pretest 18.60   |
|                                      | Posttest 14.63  |

3.2 Test the normality data
The results of the data normality test with the Kolmogorov-Smirnov test showed a significance value of 0.067 greater than 0.05, so it can be concluded that the tested data analysis was normally distributed and then statistical tests were performed using Paired t-test.

| Table 2. Test the normality of the Jette Pre-Post SWD and QB scales |
|-------------------------------------------------------------------|
| Variable                        | Mean ± SD     | P value (sig.2) |
| Jette scale Pre - Post SWD and QB                                    | 3.97 ± 3.146  | 0.067           |
3.3 Jette Scale before and after treatment

Paired t-test aims to analyze the difference between two observations. Paired t-test was carried out on subjects who were tested in the situation before being given treatment (pre-test) and after being given treatment (post-test). The mean Jette scale pre- and post-treatment with SWD modality and exercise with QB in patients with different knee osteoarthritis showed a smaller significance value (p <0.05).

| Variable                         | n  | Mean ± SD  | P value (sig.2) |
|----------------------------------|----|------------|-----------------|
| Jette scale Pre SWD and QB       | 30 | 18.60 ± 6.796 | < 0.0001        |
| Jette scale Post SWD and QB      | 30 | 14.63 ± 5.417 |                |

Osteoarthritis is the most common arthritis and will increases as you get older. The knee is the most common joint affected by osteoarthritis [13]. This study observed the direct effects of SWD therapy and exercise with QB in patients with knee osteoarthritis. Homogenization is done by controlling age, sex and body weight (Body Mass Index). The age of research subjects is between 40-70 years.

The sex of the research subject data showed that most of the research subjects from a total of 30 subjects were 93.3% female, with a mean age of 59.53 years with a standard deviation of 7.026. This is consistent with the general epidemiological data of knee osteoarthritis that the most afflicted patients with knee osteoarthritis are women after the age of over 55 years [2].

In general, obesity can be a risk factor for knee osteoarthritis. Excessive weight will increase pressure or load on the knee joint. The greater of the weight load that is supported by knee, the more severe the risk of damage to the bone [1]. Based on data obtained in this study shows that 66.7% of the research subjects included in over weight category with details of 36.7% fat and 30% obese. Research subjects who received SWD therapy treatment and exercise with QB on functional abilities measured by Jette scale showed significant improvement in functional abilities. The results of this study indicated that with SWD therapy and exercise with QB gives a direct effect of pain reduction and increased functional ability after therapy. The findings of this study support the research hypothesis, namely there is the effect of SWD therapy and exercise therapy with QB on functional ability immediately after therapy.

Hypothesis testing in this study using paired t-test paired with a value of p <0.0001 (<0.05). Then it can be concluded that the mean functional ability of pre and post administration of SWD modality and exercise with QB in patients with knee osteoarthritis were assessed within a period of 30 minutes before and 30 minutes after treatment, getting lower results. In a careful library search no research with the same variables as this study was found.

These findings can be explained by the results showing that SWD can increase blood flow in the tissues so that can remove metabolic waste and reduce muscle spasm so that can reduce pain and improve the functional ability of the knee. While the mechanism of reducing pain with isotonic exercise using QB in the muscles causes an increase in the frequency of the impulse transmitter to spinal cord of the muscle spindle along the fibers, which results in an increase in the frequency of motor nerve impulses and return to the same muscle. Isotonic exercise results in muscle tension which can activate the golgi tendon organ in the muscle, whose sensory impulses are delivered back to the spinal cord along the Ib fibers. These impulses have the effect of blocking pain impulses back to the muscles, so that the muscles relax and pain decreases [18].

4. Conclusion

Short Wave Diathermy Therapy (SWD) and exercises with Quadriceps Bench (QB) in patients with knee osteoarthritis provide a direct effect of increasing functional ability immediately after therapy as well as reducing pain immediately after therapy.

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References
[1] Corwin and Elizabeth J 2007. Buku Saku Patofisiologi (Jakarta: Penerbit Buku Kedokteran EGC)
[2] Darrow M 2002. The Knee sourcebook (Chicago: McGraw-Hill)
[3] Depkes R I 2008 Standar Pelayanan Fisioterapi di Sarana Kesehatan Jakarta
[4] Dokter IRM RSUD dr. Soetomo Surabaya Pedoman Diagnosis dan Terapi (PDT)
[5] Harry Isbagio 1998 Sub bagian Reumatologi Bagian Ilmu Penyakit Dalam. (Jakarta: FKUV RSUPN CM)
[6] Hoogland R 2010 Enraf Nonius Equipment Protocols. (Netherlands: B.V. Enraf Nonius)
[7] Kisner C and Colby L A 2007 Therapeutic Exercise: Foundations and Techniques. 5th ed. (Philadelphia, Pa: FA Davis Co)
[8] Kuntono and Heru Purbo 2005 Penatalaksanaan Fisioterapi pada Kondisi Osteo Arthritis. (Kediri: Temu Ilmiah IFI)
[9] Kuntono and Heru P 2011 Nyeri Secara Umum dan Osteoartritis Lutut dari Aspek Fisioterapi. (Surakarta: Muhammadyah University Press)
[10] Mardiman and Sri 1989 Anatomi Fungsional Sendi Bahu (Surabaya: Makalah Temu Ilmiah Tahunan Fisioterapi)
[11] Nasution 1994 Manfaat Latihan Isometrik otot quadrisept pada penderita Osteoarthritis Lutut, (Surabaya: KONAS III PERDOSI)
[12] Netter M D and Frank H 2011 Atlas of Human Anatomy, fifth edition (Philadelphia)
[13] Parjoto S 2002 Assesment Fisioterapi pada Osteoarthritis Sendi Lutut (Semarang: TITAFI XV)
[14] Sujatno I G, et. al 2002 Sumber Fisis. Jurusan Fisioterapi (Surakarta: Politeknik Kesehatan)
[15] Tulaar B M A 1999 Rehabilitasi Medik pada Osteoarthritis Cermin Dunia Kedokteran
[16] Wachjudi, Rohmat G, et. al 2006 Diagnosis dan Terapi Penyakit Rheumatik. (Bandung: Sagung Seto)
[17] Wibowo D S and Paryana W 2009 Anatomi Tubuh Manusia. (Singapore: Elsevier)
[18] William E P 5th ed 2004 Rehabilitation techniques for sports medicine and athletic training