



ISSN: 1813-1638

The Medical Journal of Tikrit University

Available online at: [www.mjotu.com](http://www.mjotu.com)

العراقية  
المجلات الاكاديمية العلمية  
IRAQI  
Academic Scientific Journals

Samera H.Abdulla\*

Technical institute of Kirkuk  
Northern Technical University  
Kirkuk  
Iraq

## Effects of infrared radiation and microwave diathermy in treatment of severe neck and upper back muscle spasm

### ABSTRACT:

**Background** Physiotherapy is a branch of internal medicine, radiation therapy is one of the most important treatments in this branch. In this study, we used infrared radiation and microwave diathermy in the treatment of severe neck and upper back muscle spasm. It occurs during involuntary contractions of muscle and causes pain, discomfort in the muscle. Disc problems (disc herniated) in the cervical spine are the main causes of severe neck and upper back muscle spasm and lead to severe pain and difficulty in movement. **The aim** of this study is to assess and compare the effects of infrared radiation with microwave diathermy in the treatment of severe neck and upper back muscle spasm.

**Patients & Methods:** This study was conducted in the physiotherapy department of Azadi Hospital in Kirkuk city for patients with severe neck and upper back muscle spasm due to acute and chronic disc problems (disc herniated). The study included 60 female patients aged between 35-55 years and weighing between (58-68kg). These patients were divided into two groups, each group included 30 patients prepared for physiotherapy treatment. The first group received infrared treatment and the second group received microwave diathermy treatment.

**The Results** The results showed the percentages of patients' responsibility for infrared and microwave diathermy treatment (100%, 66.6%) in four physiotherapy sessions for infrared and microwave diathermy treatment, respectively. **Conclusion:** Infrared radiation has more effects than microwave diathermy in the treatment of severe neck and upper back muscle spasm in non-contact instrument practice due to microwave reflection at the air-skin interface and this effect in microwave skin and under the skin penetration ability because of the loss in radiation.

DOI: <http://dx.doi.org/10.25130/mjotu.24.02.17>

### Keywords:

Infrared,  
Microwave,  
Muscle spasm,  
Physiotherapy,

### ARTICLE INFO

#### Article history:

Received 10 Jan 2014  
Accepted 02 June 2014  
Available online 01 Dec 2018

\*Corresponding author E mail: Sameras44@yahoo.com

## **Introduction:**

### **Physiotherapy :**

Physiotherapy is one of the medicine branches ,the treatment in this branch included mechanical force using and movement (electrotherapy ,exercise therapy and manual therapy ) [1].

### **Muscle spasm:**

1-Muscle spasm is a state that the muscle or group of muscles in any part of the body get strained or turned stiff .It is occur during involuntary contractions of muscle and causes pain,discomfort in the muscle [2].In this study we talk about the spam occur in skeletal muscle which are (anchored to bone directly or by tendons most of these type of muscles are conscious control of the brain .The sever neck and upper part back muscle spasm occur about 60% of people [3] .

There are many causes of neck and upper back muscle spasm, the main causes are: 1-injuries:due to trauma or injury occur in the muscles ,soft tissue,ligaments and tendons are anchored to the body [4].

2-Disc problems (disc herniated ) it is the main causes of sever muscle spasm in neck and upper back and lead to severe pain difficulty in movement[5]

3-Spine and joint disease :when the joint infected the soft tissues and the muscles around the joint effected then the spasm occur (facet joint,cervical spondylosis[6]

4-Damage of nerve this condition lead to muscle spasm because the nerve in

able to transmit the proper signal to muscle for normal movement [7]

5- Deficiencies of nutritional (vitamins and mineral level lower than normal),Muscle weakness, poor posture[8]

### **3- Infrared radiation:**

Infrared is an electromagnetic radiation lay between the microwave and visible light with wave length (750nm-1mm),the range of infrared frequency are (300GHz-400THz)[9].The sun is the main source of natural infrared ( near infrared short (750-1500nm) ,far infrared long(1500-15000 nm) and every dark body can emit infrared[10] ,the artificial source included :1-Luminous( visible ) it is electrically heated filament with wave length( 350-4000nm ) its near infrared can penetrate under skin about (5-10mm) [11].

2-Non –Luminous (invisible) it is electrically heated resistance wire coiled with wave length (1500-1200nm)maximum 4000nm,its far infrared can penetrate 2mm under the skin[12].

There are many factors effect in absorption and penetration of infrared to the skin:

1-The frequency of infrared radiation.

2- The conductivity of tissue.

3- Patient tissue thickness and skin types .

4-Reflection ,scattering,refraction of infrared[13].

When the skin irradiated by infrared from infrared physiotherapy instrument the temperature of skin is raise and can penetrate 4cm beneath the skin lead to increase the molecular movement ,blood vessel amplifiy,so the oxygen ,blood component,nutrients reach the muscles and became soft and relax[14]

#### 4- Microwave diathermy:

Microwave diathermy is an electromagnetic radiation locate between short wave and infrared waves ,it has frequency(915-2456MHz) and wave length (10mm-1m)[15] the frequency of microwave generated from therapeutic device is 2450MHz with wave length of 12.25cm and can penetrate 1-7cm under the skin and the muscle and 11-20cm in bones and fat, 915MHz frequency with wave length 32.79 and 433.9 frequency with wave length 69.14cm[16].It has individual properties will be used in clinical advantage when absorbed by tissues contain high water so it is very important in pathologic processes treat[16].The microwave diathermy therapeutic generator can be used direct contact with the skin this lead to less radiation stray and deep heating of tissues while in non-contact device can be reflected such as reflection at the air- skin interface lead to radiation stray and limited in tissue penetration [17].

The microwave diathermy energy used in:

1-Musculo skeletal disorders such as ( sprain,tendon,muscle tear and joint desaease)

2-Superficialinfection(synovitis-surgical incision)

3-Inflammatory and traumatic lesions [18].

#### Aim of study:

The aim of this study is to assess and comparing between the effects of infrared radiation and microwave diathermy in sever neck and upper back muscle spasm treatment.

#### Patients and methods:

This study was done in physiotherapy department in Azadi hospital in Kirkuk city for patients with severe neck and upper back muscle spasm due to acute and chronic disc problem (disc herniated).

The study included 60 female patient age between 35-55 years and weight between (58-68kg).

These patients divided into groups each group included 30 patients

The first group of patients treated with infrared radiation

The second group of patients treated with microwave diathermy radiation .

We used Zimmer infrared device (Barcelona-Spain) and microwave in same 60-70 Hz The distance between the patient and device 20cm.

Duration time of treatment is 20 min at each physiotherapy session. Frequency was daily at four day.

#### Result :

The total number of patients were 60 only women they had sever neck and upper back muscle spasm due to disc problems ( cervical disc herniated ) , these patients divided in tow groups each group included 30 patients prepared for physiotherapy treatment ,first group for infrared treatment and second group for microwave diathermy treatment ( table 1).

The result showed the percentage of patients whom gradually respond to infrared physiotherapy at each physiotherapy session(each session was 20 min) in first physiotherapy session

the percentage of patients responsibility for treatment was 13.3% , in second session was 46.6%,in third was 83.3% and in four was 100%,(table2).

The( table 3) showed the percentage of patients was gradually respond to microwave diathermy treatment at each physiotherapy session (each session was 20 min) we can see the percentage of patient responsibility for treatment in first physiotherapy session was 0% , in second session was 16.6%,in third was 30% and in four was 66.6 %.

**Table (1) Total number of patients prepared for physiotherapy sessions.**

Total number of pt	First group infrared treatment	Second group microwave diathermy treatment
60	30	30

**Table (2) the percentage of patients number would gradually respond to infrared physiotherapy at each physiotherapy session(each session was 20 min)**

First physiotherapy session	Second physiotherapy session	Third physiotherapy session	Four physiotherapy session
13.3%	46.6%	83.3%	100%.

**Table (2) the percentage of patients number would gradually respond to microwave diathermy physiotherapy at each physiotherapy session(each session was 20 min)**

First physiotherapy session	Second physiotherapy session	Third physiotherapy session	Four physiotherapy session
0%	16.6%	30%	66.6 %.

### Discussion:

The infrared radiation is a radiant heat transmits energy by radiation. Infrared radiation can penetrate the body deeply about (1-10cm) by a process known thermal conversion therefore can reach to the muscles, ligaments, joints and bones [19]. The muscles locate under the skin in deep about 2-3 inch when the infrared irradiated to the skin the energy of it converted to the heat leading to skin temperature increasing from (36 to 45) when this energy reach the muscles effect in ending of nerve caused the nerve stimulation and effect in blood vessels cause increasing in blood supply, the metabolites and acids removing increased so the nutrients and oxygen supply to the muscle increase these lead to muscles relaxation then the spasm gradually removed pain reduced at each physiotherapy session this is clearly appeared in (table 2). Our result were in agreement with [20], referred that the infrared radiation reduces the pain.

The microwave diathermy has the same effect and can penetrate deeper than infrared but the responsibility to microwave treatment was less than infrared may be due to microwave reflection at air-skin interface in noncontact microwave applicators so reflection at the air-skin interface lead to radiation stray and limited in tissue penetration [21]. Our result were in agreement with [22], referred that the

microwave diathermy dose not provide additional benefit to a treatment of severe neck and upper back muscle spasm.

### Conclusion:

It was concluded that the infrared radiation more effects than microwave diathermy in treatment of severe neck and upper back muscle spasm in non-contact instrument practice due to microwave reflection at air-skin interface and this effect in microwave skin and under the skin penetration ability because of radiation stray.

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