COMPARATIVE STUDY BETWEEN LOW LEVEL INFRA RED LASER WITH ULTRA SOUND ON FROZEN SHOULDER [+]

دراسة مقارنة بين ليزر الواطىء القدرة (تحت الحمراء) والامواج فوق الصوتية على انجماد الكتف

Tariq Al-Taweel [*] **Baida Ajeal Bader** [**]

Abstract:

Aim of the study:- to investigate the efficiency of low power laser therapy (infra red laser) compared with ultra sound therapy for relief of pain in patients with soft shoulder disorder (frozen shoulder).

Subjects and Methods:- This study is carried out at the Medical Institute/ Baghdad, Rehabilitation center and Al-Kirks hospital during the period from November 2009 till March 2010. 40 patients with frozen shoulder with age ranged from 30-70 years assigned into one of two groups. In the active laser group(n=20),patients aged ranged from 30-70 years old were treated with 904 nm infra red laser, 3 times weekly for 2 week applied to eight points on the shoulder for 30 second each. In the ultra sound group (n=20) ,patients aged ranged from 30-70 years old were treated with pulsed ultrasound(Figure4)(frequency=890 HZ; intensity 2.5W/cm^2 pulsed mode) three times weekly for 2 weeks. total pain score were calculated before and after ultra sound and laser treatment by using International Shoulder pain score .

Results:- for the studied samples of laser technique ,the results showed that from 12 male and 8 female with mean value of male =52.67 ,SD=11.69 and of female M=53.38,SD=9.47 which indicated that similarity age group in general since that the total sample of mean age group was 52.95 of both gender. Also, in this study we observed in the ultra sound group , which included 14 male and 6 female with Mean value of male=52.93,SD=9.19 and of female Mean=51,SD=11.9 which indicated that similarity age group in general since the total sample of mean age group was 52.35 of both gender. in general the results showed that highly decreased in pain score where obtained in all items of scores especially in the total pain score which indicated along space of decrease range from 75.6 to 38.6(laser group). While during 2 weeks of ultrasound technique, in general the results showed that highly decreased in pain score where obtained in all items of scores especially in the total pain score which indicated range from 84.9 to 65.4. In addition to that ,in the laser group cases analysis we observed that pain scale respondents registered to high significant difference at P<0.001 for whole items of pain score with positive sited of improvement included with total pain score which represented the same significant as it is represented with each items . While at the ultrasound group ,the results showed that pain scale respondents registered to high significant difference at P<0.001 for whole items of pain score with positive sited of improvement included with total score which represented the same significant as it is presented with each items.

Conclusion:- Throughout our study, we concluded that frozen shoulder syndrome sometimes treated in our hospitals in the physiotherapy centers with a beam of light

---

[+]**Received on 22/7/2010 , Accepted on 17/4/2011 .**

[*]**Assistant Prof./ Institute of Medical Technology**

[**]**Assistance Lecturer/ Institute of Medical Technology**

known as laser ,although that the low level laser (I.R. laser) has a significant effect in this type disorders. laser therapy and ultrasound therapy showed that are effective methods for reducing pain , each technique can be used to achieved the same results in other way each technique can be substituted each other .
Recommendations:- We recommended to use of low level laser for the management of the a variety of musculoskeletal disorders for pain reliving.

المستخلص:

الهدف:- اختبرت هذه الدراسة فعالية العلاج بالليزر الواطيء الطاقة(ليزر تحت الحمراء) مقارنة بالعلاج بالأمواج فوق الصوتية لتخفيف الألم وتقليل عدم القابلية في المرضى المصابين بانجماد الكتف .
المنهجية:- أنجزت هذه الدراسة في المعهد الطبي التقني /بغداد ومركز التأهيل ومستشفى الكرخ للفترة مابين تشرين الثاني ٢٠٠٩حتى آذار ٢٠١٠. ٤٠ مريض بانجماد الكتف أعمارهم تتراوح بين ٣٠-٧٠ سنة قسموا إلى مجموعتين ،المجموعة الأولى تمت معالجتهم بليزر تحت الحمراء والمجموعة الثانية عولجت بالأمواج فوق الصوتية النبضية
النتائج:- وضحت النتائج بالنسبة للمجموعة المعالجة بالليزر ١٢ذكر(بمعدل٥٢,٥٧ وانحراف معياري١٤,٦٩)و٨ إناث(بمعدل ٥٣,٣٨ وانحراف معياري٩,٤٧)،بينت هذه النسبة نسبة التشابه في المجموعات العمرية بصورة عامة بمعدل=٥٢,٩٥ لكلا الجنسين.كذلك لاحظنا في مجموعة الأمواج فوق الصوتية والتي تضمنت ١٤ ذكر(بمعدل٥٢,٩٣ وانحراف معياري٩,١٩)و١٦ أنثى (بمعدل٥١ وانحراف معياري١١,٩) والتي بينت التشابه في المجاميع العمرية بصورة عامة بمعدل ٥٢,٣٥ لكلا الجنسين.بصورة عامة أوضحت النتائج أعلى تقصان في درجة الألم في جميع درجاته خاصة عند درجة الألم الكلي والتي بينت اكبر مدى في تقصان للألم من ٧٥,٦ إلى ٣٨,٦ ،بينما خلال أسبوعين من استخدام تقنية الأمواج فوق الصوتية أوضحت النتائج أعلى نقصان في درجة الألم في جميع درجاته خاصة عند درجة الألم الكلي والتي بينت اكبر مدى في نقصان للألم من ٨٤,٩ إلى ٦٥,٤ .بالإضافة بالنسبة للحالات المعالجة بالليزر سجلت النتائج أعظم استجابة لتقليل الألم وبفرق عالي التميز(باحتمالية خطا اقل من ٠,٠٠١)لجميع درجات الألم مع تحسن كبير وملحوظ والذي تضمن درجة التحسن الكلي المتضمن نفس درجة التميز لجميع درجات الألم . وكذلك بالنسبة للحالات المعالجة بالأمواج فوق الصوتية سجلت النتائج أعظم استجابة لتقليل الألم وبفرق عالي التميز(باحتمالية خطا اقل من ٠,٠٠١)لجميع درجات الالم مع تحسن كبير وملحوظ والذي تضمن درجة التحسن الكلي المتضمن نفس درجة التميز لجميع درجات الالم
الاستنتاج:-استنتجنا من خلال دراستنا بان متلازمة انجماد الكتف تعالج في بعض الاحبان في مستشفياتنا بمراكز العلاج الطبيعي بحزمة من الضوء المسمى بالليزر بالرغم من انه ذو تاثير فعال ومتميز في علاج مثل هذه العلل لذلك نحن نوصي باستخدام ليزر الواطيء المستوى لعلاج أنواع متنوعة ومختلفة من الاضطرابات العضلية الهيكلية، كل تقنية من هذه التقنيات (الليزر والأمواج فوق الصوتية) نستطيع استخدامها لإنجاز نفس النتائج وبمعنى آخر كل تقنية يمكن إن تستبدل مكان الأخرى وبنفس النتيجة والتأثير
التوصيات:- نوصي من خلال دراستنا باستخدام الليزر الواطيء القدرة لعلاج أنواع مختلفة أخرى من التضررات العضلية العضلية الهيكلية لتخفيف الألم.

Introduction:

Light amplification of stimulated emission of radiation (laser) is a light beam from the electromagnetic spectrum. Lasers produce nonionizing, electromagnetic radiation that is extremely monochromatic, polarized and coherent[1]. Laser light has been reported to penetrate human tissue in the ranges of 8-15mm, but the majority of the light will be absorbed within the first 4mm. Although this may seem superficial [2,3], it should be noted that chemical processes may be initiated and mediate physiological effects at a deeper level. Low level laser therapy (LLLT) is a conservative procedure that utilized visible red and/or infrared regions of the electromagnetic spectrum [Figure 1]. It is used as a physiotherapy modality for a variety of articular, neural and soft tissue conditions[4,5,6,1]. The goal of laser therapy is to deliver light energy units, in the form of photons to damaged cells. The consensus of experts is that photons absorbed by the cells through laser therapy stimulate the mitochondria to accelerate production of ATP [7,3,8]. This biochemical increase in cell energy is used to help transform live cells from a state of illness to a stable, healthy state. Laser therapy is commonly used to increase the speed, quality and tensile strength of tissue repair, resolve inflammation, and provide pain relief [9]. Laser therapy has been found to offer superior healing and pain relieving effects compared to other electrotherapeutic modalities, especially in the early stages of acute injuries, and for chronic problems[10,11]. Laser therapy can also be used for acupuncture point stimulation. Also, it is a universal method of treating muscle, tendon, ligament, connective tissue, bone and skin tissue with one simple piece of equipment, however, the best results are achieved when it is used to compliment other manual therapy techniques[12,13]. It is non-invasive, drug-free, pain free and of short duration-usually 2-5 minute per treatment .

Frozen shoulder is an inflammatory condition of the shoulder ligaments with shoulder movements. Along with stiffness, there is also varying degree of pain affects the patients quality of life. Though the shoulder joint is protected by a very reliable group of strong ligament of these ligaments and muscles can significantly affect the function of this high agonizing pain[9][Figure 2]. As inflammation occurs, it also results in scarring of the capsular joint which further add up to the restriction of movements. While the specific cause of a frozen shoulder is not well understood, some persons suffer from a frozen shoulder caused by:-

- Shoulder injuries and accidents
- Previous shoulder surgery
- Prolonged immobilization of the shoulder joint
- Diabetes
- Thyroid disease

Although frozen shoulder is a condition which develops gradually over month noticed by the patient. The hallmarks of this condition are pain in the shoulder and development of the frozen shoulder can be thought of as being divided into three stages:-

*Painful stage: as the name indicates, the painful stage is the one in which patient degree of pain as he/she offers movements at shoulder joint in different movements also starts to limit at this stage.

* Frozen stage: the onset of the frozen stage occurs when pain starts to disappear but the joint are further compromised as the joint becomes more and more stiff stage that we term the disease as frozen shoulder.

*Thawing stage: this stage is also known as the stage of resolution and is characterized from the stiffness and pain in shoulder joint[10,15].

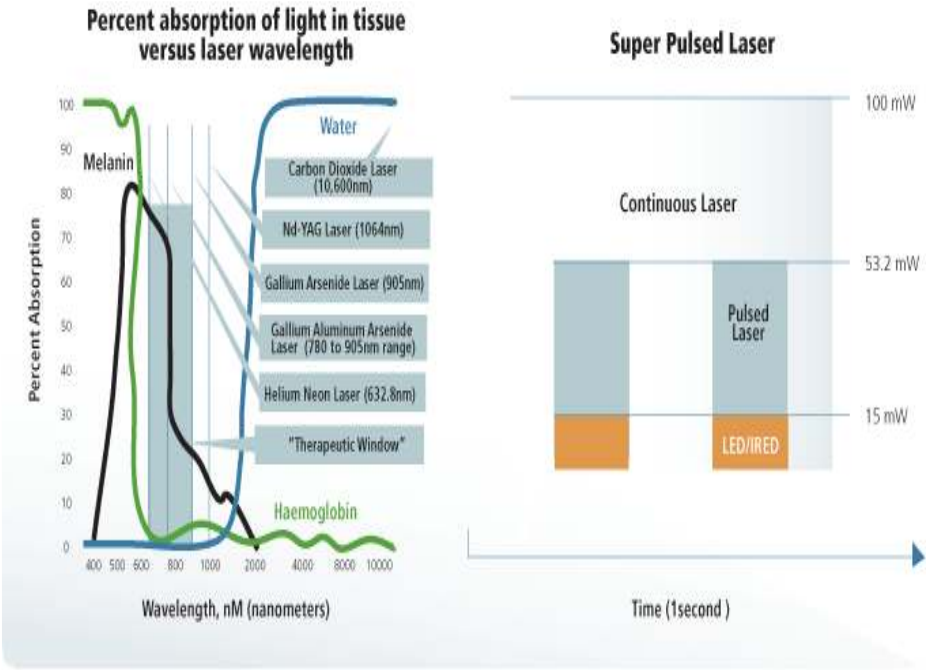


Figure 1:percent absorption of light in tissue versus laser wavelength [8]

Figure 2:Frozen shoulder [15]

Aim of the study:

This study investigated the efficiency of low level laser therapy (infra red laser) compared with ultra sound therapy for relief of pain in patients with frozen shoulder.

Subjects and Methods:

This study is carried out at the Medical Institute/ Baghdad, Rehabilitation center and Al-Kirks hospital during the period from November 2009 till March 2010. 40 patients with frozen shoulder were aged ranged from 30-70 years old assigned into one of two groups. In the active laser group(n=20),patients aged ranged from 30-70 years old were treated with 904

nm infra red laser(Figure 3) , 3 times weekly for 2 week applied to eight points on the shoulder for 30 second each. In the ultra sound group (n=20) ,patients aged ranged from 30-70 years old were treated with pulsed ultrasound(Figure4)(frequency=890 HZ; intensity 2.5W/cm^2 pulsed mode) three times weekly for 2 weeks. total pain score were calculated before and after ultra sound and laser treatment by using International Shoulder pain score (Figure 5) .

Figure(3):Infra red laser device

Figure(4):Ultra sound device

Pain Scale

How severe is your pain?

Circle the number that best describes your pain where 0=no pain and 10 =the worst pain imaginable.

1	**At its worst?**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2	**When lying on the involved side?**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	**Reaching for something on a high shelf?**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
4	**Touching the back of your neck?**	**0**	**1**	**2**	**3**	**4**	**4**	**6**	**7**	**8**	**9**	**10**
5	**Pushing with the involved arm?**	**0**	**1**	**2**	**3**	**4**	**4**	**6**	**7**	**8**	**9**	**10**

(6)-Total pain score----------/50×100= ----------%

(Note :If a person does not answer all questions divide by the total possible score, e.g. if 1question missed divide by 10

Results and Discussions:

Forty patients with frozen shoulder were included in this study(Table 1) ,which represented the summary statistics of gender and age for the studied samples of laser technique ,the results showed 12 male and 8 female with mean value of male =52.67 ,SD=11.69 and of female M=53.38,SD=9.47 which indicated that similarity age group in general since that the total sample of mean age group was 52.95 of both gender. this findings was in agreement with those found in(Apostolos,2008)[1].

Table (1) : Summary statistics of Gender and Age for the studied sample using laser

		N	Minimum	Maximum	Mean		Std. Deviation
Gender		Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Male	age year	12	30	67	52.67	3.37	11.69
Female	age year	8	42	66	53.38	3.35	9.47
age year	20	30	67	52.95	2.37	10.6	

In this study, We observed in the ultra sound group (Table 2), which included 14 male and 6 female with Mean value of male=52.93,SD=9.19 and of female Mean=51,SD=11.9 which indicated that similarity age group in general since the total sample of mean age group was 52.35 of both gender. these findings were in agreement with those found in the (Green S.,2006).

Table (2) : Statistics of Gender and Age for the studied sample of using Ultra Sound technique

Gender		N	Minimum	Maximum	Mean	Std. Deviation
Male	age year	14	38	67	52.93	9.19
Female	age year	6	33	65	51	11.9
Total	age year	20	33	67	52.35	9.79

In table 3,which showed the summary statistics of pain scale respondents for the studied sample before and after laser technique ,in general the results showed that highly decreased in pain score where obtained in all items of scores especially in the total pain score which indicated along space of decrease range from 75.6 to 38.6,this our findings was similar to (Ryan et.al,2005).

Table (3) : Pain scale respondents for the studied sample in two repeated periods for laser technique

Question	Mean	N	Std. Dev.	Std. Error Mean
1(before)	8.55	20	1.28	0.29
1(after)	4.55	20	1.1	0.25
2(before)	8.40	20	1.1	0.24
2(after)	4.15	20	0.99	0.22
3(before)	9.10	20	1.07	0.24
3(after)	5.00	20	0.92	0.21
4(before)	5.60	20	1.5	0.34
4(after)	2.45	20	0.94	0.21
5(before)	7.20	20	1.51	0.34
5(after)	3.20	20	0.89	0.2
6(before)	75.6	20	10.23	2.29
6(after)	38.6	20	8.8	1.97

While during 2 weeks of ultrasound treatment (Table 4),which showed the summary statistics of pain scale respondents for studied sample before and after ultrasound technique. in general the results showed that highly decreased in pain score where obtained in all items of scores especially in the total pain score which indicated range from 84.9 to 65.4.this our findings was in agreement with (Nayakanen M,1995) .

Table (4) : Pain scale respondents for the studied sample in the two repeated periods of using Ultra Sound technique

Question	Mean	N	Std. Dev.	Std. Error Mean
1(before)	9.35	20	1.09	0.24
1(after)	7.7	20	1.3	0.29
2(before)	9.15	20	0.75	0.17
2(after)	7.15	20	1.18	0.26
3(before)	9.55	20	0.76	0.17
3(after)	7.55	20	1.05	0.23
4(before)	6.6	20	0.75	0.17
4(after)	4.4	20	0.68	0.15
5(before)	7.8	20	1.15	0.26
5(after)	5.9	20	1.25	0.28
6(before)	84.9	20	6.85	1.53
6(after)	65.4	20	9.25	2.07

In addition to that ,in the laser group cases analysis we observed (table 5),the results showed the comparison significant of pain scale respondents registered to high significant difference at P<0.001 for whole items of pain score with positive sited of improvement included with total pain score which represented the same significant as it is represented with each items .these results where similar to(Jan Magnus ,2003) .

Table (5) : Comparison of Pain scale respondents for the studied sample between the two repeated periods

Paired Differences	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
1 (before)– 1 (after)	4.00	0.56	0.13	3.74	4.26	31.83	19	0.000
2 (before) -2 (after)	4.25	0.85	0.19	3.85	4.65	22.34	19	0.000
3 (before)– 3 (after)	4.10	0.79	0.18	3.73	4.47	23.27	19	0.000
4 (before)– 4 (after)	3.15	0.81	0.18	2.77	3.53	17.33	19	0.000
5 (before)– 5 (after)	4.00	1.08	0.24	3.50	4.50	16.62	19	0.000
6 (before)– 6 (after)	37.0	6.27	1.40	34.06	39.94	26.37	19	0.000

HS :too Highly Significant at P<0.001

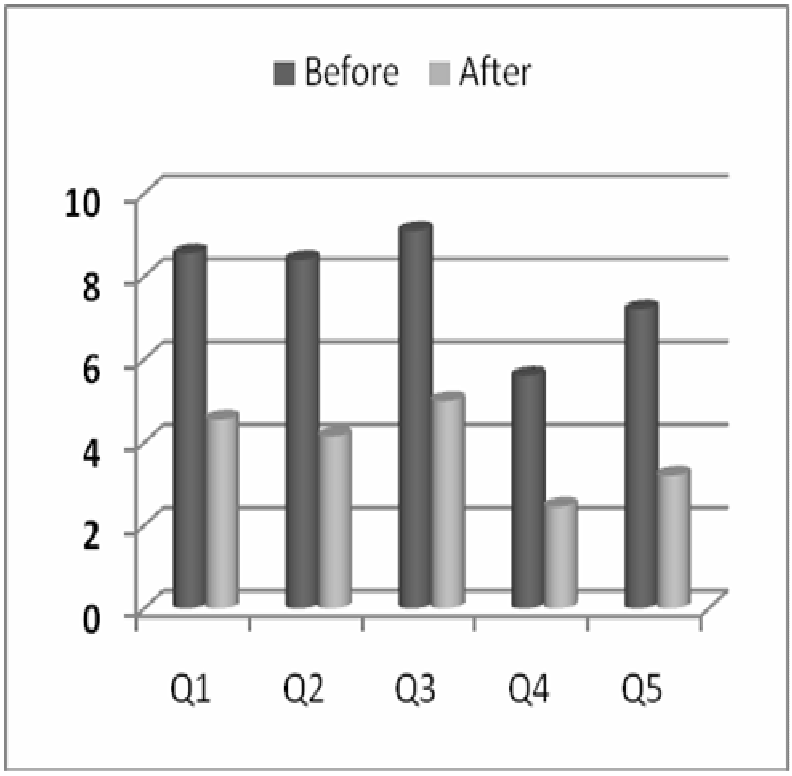
While at the ultrasound group ,the results showed in table 6,which represented the comparison significant of changes of pain scale respondents registered too highly significant difference at P<0.001 for whole items of pain score with positive sited of improvement included with total score which represented the same significant as it is presented with each items. these findings ,was similar to (Paul A,2004) [11].

Table (6) : Comparison of Pain scale respondents for the studied sample between the two repeated periods of using Ultra Sound technique

Paired Differences	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
1 (before) – 1 (after)	1.65	0.49	0.11	1.42	1.88	15.08	19	0.000
2 (before) -2 (after)	2.00	0.56	0.13	1.74	2.26	15.92	19	0.000
3 (before)– 3 (after)	2.00	0.65	0.15	1.70	2.30	13.78	19	0.000
4 (before)– 4 (after)	2.20	0.41	0.09	2.01	2.39	23.97	19	0.000
5 (before)– 5 (after)	1.90	0.55	0.12	1.64	2.16	15.38	19	0.000
6 (before 0– 6 (after)	19.50	3.10	0.69	18.05	20.95	28.10	19	0.000

HS : Highly Significant at P<0.01

When we compared the results of the laser group with ultrasound group we found that (Figure 6)and (figure 7), according to the grades of changeability in both technique which obtained the same results of improvement, which enable as to say that each technique can be used to achieved the same results in other way each technique can be substituted each one to the other coincidently ,which for the first time as far as we know.



Figure(6): Cluster Bar – Charts of (Pain scale respondents) in the two periods of Ultra sound Tech.

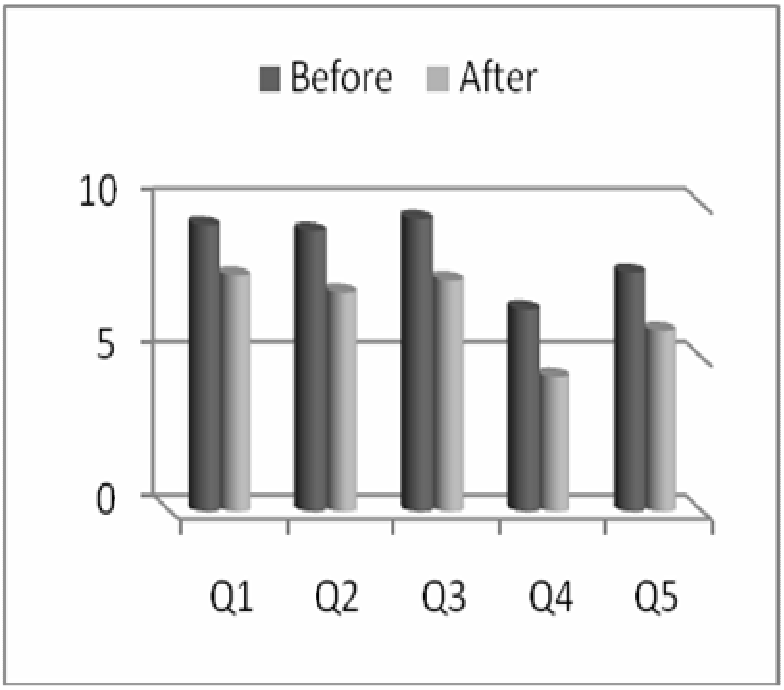


Figure (7) : Cluster Bar – Charts of (Pain scale respondents) in the two periods of Laser Tech.

Conclusions:

Throughout our study, we concluded that:-

1-frozen shoulder syndrome sometimes treated in our hospitals in the physiotherapy centers with a beam of light known as laser Although that the low level laser(I.R. laser) has a significant effect in this type disorders.

2-laser therapy and ultrasound therapy showed that are effective methods for reducing pain , each technique can be used to achieved the same results in other way each technique can be substituted each other .

3-additional researches is required to obtain data concerning success rated in treating another specific conditions with this type of therapy (laser therapy).

4- Each technique (laser and ultra sound)can be used to achieved the same results in other way each technique can be substituted each one to the other coincidently ,which for the first time as far as we know.

Recommendations:

1-We recommended to use of low level laser for the management of the a variety of musculoskeletal disorders.

2-additional researches is required to obtain data concerning success rated in treating another specific conditions with this type of therapy (laser therapy).

References:

1. Apostolos Stergioulas "Photo-medicine and laser surgery" Scand J Rehab. Med ,26(2):99-105,2008.
2. England S., Farrell A.J. "Low power laser therapy of shoulder tendonitis" Br. J Rheumatol, Vol. 18, No.6 , p.427-431,1989.
3. Withrington RH " A comparative study of the a etological factors in shoulder pain" Br. J Rheumatol,24:24-6,1985.
4. Krasheninnikoff M. Ellisgaard N. "No effect of low power laser in lateral epicondylritis " Scandinavian Scandinavian J. of Rheumatolog, 22, 3,79-84, 2003.
5. Thorson H.,Gam A.N. "Low level laser therapy for Myofacial pain in the neck and shoulder girdle.Adouble–blind,cross-over study " Scandinavian J. of Rheumatolog ,21,3,139-141, 1992
6. Green S, Buchbinder R, Hetrick S. ,*Physiotherapy intervention for shoulder*.In:The Cochrane Library . Isse1,2006.Chichester,UK:John Wily & Sons, Ltd. search date 2002:primary source medline.
7. Dowing D,Weinstein A. "Ultrasound therapy of subacromial buritis ".Phys J. , 66:194-199,1986.
8. Nykanen M. "pulsed ultrasound treatment of the painful shoulder :a randomized,double-blind study "Scand J Rehab. Med,27:105-108, 1995
9. Roach k E, Budiman-Mak E. " Songsiriide N.: Develpoment of a shoulder pain and disability index " Arthritis Car Res. J., 4,143-149, 1991.
10. Williams JW, Holleman DR " Measuring shoulder function with the shoulder pain and disability index" Rheumatol J , 22:727-732, 1995
11. Paul A, Lewis M. " A comparison of four shoulder-specific questionnaires in primary care " Ann Rheum Dis,63:1293-1299, 2004.
12. Michener La, leggi BG. "A review of self –report scale for the assessment of functional limitation and disability of the shoulder" J Hand ther. 14:68-76, 2001.
13. Ryans I, Montgomery A. Galway R. " A randomized controlled trial of intra-articular triamcinolone and /or physiotherapy in shoulder capsulitis" Rheumatology J., 44:529-535, 2005.
14. Hamdan A,Alessa KA. " Manpuluation under anesthesia for the treatment of frozen shoulder " international Orthopedics J. 27,107-109, 2003.
15. Jan magnus bjordal : " A Quantitive study of bias in systemic review" Advances in physiotherapy, 5,2,83-96 Online publication date:1-Jan-2009.