How to Cite:
Majeed, D. M. A. A., & Gorgees, S. H. (2022). The effect of using a rehabilitation program in conjunction with the use of infrared radiation for a fracture of the scaphoid bone. *International Journal of Health Sciences*, *6*(S4), 4692–4698.
https://doi.org/10.53730/ijhs.v6nS4.9164

The effect of using a rehabilitation program in conjunction with the use of infrared radiation for a fracture of the scaphoid bone

Dalal Mustafa Abd Al Majeed
Department of Physical Education and Sports Sciences, Faculty of Education for Women, University of Mosul, Iraq
Corresponding author email: dalal.20gep10@student.uomosul

Shatha Hazim Gorgees
Department of Physical Education and Sports Sciences, Faculty of Education for Women, University of Mosul, Iraq
Email: Shatha.h.al-sada@uomosul.edu.iq

***Abstract*---**LLLT is used for the treatment of scaphoid bone fracture. Laser energy is given as a dose of medicine with the right parameters and it is proved a blessing in the treatment of a scaphoid injury. The research aims to understand the use of the LLLT in the treatment of the scaphoid fracture. Also, clinical differences are observed while treating a group of patients. LLLT is performed with a laser diode with a wavelength of 905nm. At the end of the study, it is observed that the pain is decreased, the swelling is reduced and the range of the movement is increased in the patients. This study indicates that low-level laser therapy is an effective way of treatment for the scaphoid fracture. Moreover, when applied with a proper rehab program it increases the healing process of the bone.

***Keywords*---**scaphoid bone fracture, LLLT, bone healing, fracture.

Introduction

Human life is very uncertain. No one knows what will happen in the next breath. Accidents and injuries are a part of life. Fractures are one of the most traumatic and dangerous injuries. When a bone is broken, the doctor will call it a bone fracture. The fracture of a bone is very painful. It can break a bone into two pieces or it may split into pieces. Usually, the shape or size of the bone is changed upon treatment. The treatment of a bone is a regenerative process. The body of the patient has the natural capacity to regenerate the broken part of the bone by rejoining the broken pieces. This process is done on both the cellular and tissue

level of the body. The structure and function of the bone is restored to their original status. Despite the regenerative power of the bone, about 10% of the fractures cannot be healed properly through the natural process. Thus advanced medical treatment is required (Einhorn & Gerstenfeld, 2015). Such fractures which are not joined with the regular treatment and required an advanced method are known as delayed union fractures (Bahney et al., 2015).

Scaphoid bone fracture is one of the delayed union fractures. It is a fracture of the wrist. A scaphoid is a small bone near the base of the thumb. It is one of the carpal bones of the wrist. The wrist is made up of 8 carpal bones. The bone is usually fractured as a result of a fall when the arm is out-stretched a bit more. Accidents are also a cause of this fracture. The chronic injury required surgery to cure. Recovery time for the fracture is almost 3 months when it is not an acute stage injury but it can be prolonged in case of chronic injuries.

Different types of treatment methods can be used for the healing of the bone. Traditionally a cast or splint is used and it immobilizes the injured wrist for about 3 to 5 weeks. Closed reduction of bone is a non-surgical method for localizing the dislocated bone. Some new techniques are also used which involve radiation. These include the use of Electro-magnetic field, LLPUS (low-intensity pulsed US), Electric stimulation, and LLLT (low-level laser therapy) (Griffin et al., 2011).

Problem statement

Previously, conventional methods are used for the treatment of any disease or injury. With the advancement in science and medicine, there are now a lot of new techniques and processes by which the treatment can become quick and easy. The traditional rehabilitation methods were used for the healing of a scaphoid bone. This fracture is delayed and requires time to heal. With the latest technology and the use of laser and infrared radiation now the treatment has become a lot easy and quicker than before. But the importance of the traditional rehabilitation processes is also a known fact. So, a study is required which finds a bridge between the rehabilitation program and the use of laser in the treatment of the breakage of a scaphoid bone.

Aim of the study

The purpose of the study is to show a connection between the rehab program and the use of laser or infrared radiation to heal a scaphoid bone fracture. Shakouri and partners (2010) are of the view that Low-level laser treatment LLLT has been introduced for the treatment of breaks as a trial model. It was found by Liebert (2005) that LLLT when overseen for a brief time allotment had progressed the development and division of human osteoblasts when stood out from non-enlightened cells Thus in this review, it is figured out what the utilization of LLLT means for the treatment of scaphoid break.

Literature review

Fracture is the breakage of a bone into two or more parts. A scaphoid fracture is the breakage of scaphoid bone into two or more parts. The scaphoid bone is one

of the 8 carpals of the wrist. It is a small bone present at the base of the thumb. It has three parts, they are stated as follows:

- Distal pole (the end of the bone away from the forearm).
- Waist of the scaphoid (the mid of the bone).
- Proximal pole (the end of the bone pointing towards the body) (Tajali et al.,2010).

Scaphoid bone can be fractured due to multiple reasons. Any stress on the wrist can cause a fracture. It may happen due to any fall, sports injury, or accident. The common symptoms of a scaphoid fracture may include pain, tenderness, inflammation, swelling, immobility of the wrist, and in case of severe cases bruising and discoloration can also happen (Shakouri et al., 2010). A scaphoid bone fracture may be a displaced or non-displaced fracture. A gap is formed and the parts of the bone are able to move, this is called a displaced fracture. While non-displaced fracture means the pieces of the bones are not moved far enough and no gap is formed (Hove LM., 1999).

The diagnosis of the scaphoid bone is not an easy job. After the physical examination of the injury, the doctor can ask for the imaging. X-ray, MRI (Magnetic resonance imaging), and CT scan are done to find out the exact location and type of fracture. An X-ray will show the intensity of the fracture. MRI gives a complete picture of the damaged bones and tissues around them. It is an advanced test that shows whether muscles or any other connective tissue is damaged or not.

The treatment is based on the severity of the injury. If the break is mild or hairline and the bone is not moved out of place then it can be treated with the traditional rehab plan. A Splint or a cast is used and the wrist is immobilized for about 3 to 5 weeks. In case of severe injuries other methods are used as close reduction of the bone, applying LLLT, and even in case of displaced fracture surgery is required (Grover R., 1996).

LLLT is studied as a technique that helps in the treatment of any type of fracture including scaphoid fracture. It works on the principle of photo i.e. radiations along with the physical, chemical, and biological properties of the cells and tissues. It works evidently on the affected area and helps in the process of healing (Karu, 1989). It speeds up cell proliferation and helps in the healing of damaged tissues (Ueda and Shimizu, 2001). LLLT is used as a bio-stimulatory instrument to be associated with different limits used in the treatment like recurrence, treatment segment, power thickness, and the repeat of the purpose of LLLT (Pinheiro and Gerbi, 2006). Low-level laser treatment LLLT has been introduced for treatment in preliminary models (Shakouri et al., 2010). It was found that LLLT when overseen for a brief period had progressed the augmentation and detachment of human osteoblasts when diverged from non-lit cells (Liebert, 2005). In a meta-assessment performed by Tajali et al., 2010 appearance LLLT is exceptionally compelling in treating the bone break in creatures as well as people. A human two-overlay study coordinated LLLT with 830nm recurrence for the treatment of contained bone breaks of wrist and hand and found that LLLT

influences bone recovery recalling of torture and had additionally fostered the handwork (Hui-ju et al., 2017).

Methodology

Firstly, the ethical requirements of the study are completed. The approval is taken from the Laser Institute Research Ethical Committee and the authorities of the National Hospital as the research is going to take place in the department of orthopedic and surgery. A group of patients is selected and their consent is also taken their identities are also kept anonymous.

All the patients are clear of any infections or tumors in the injured area. This is the protocol of any research because it can affect the results of the study. The control group has the following characteristics in common:

a) Delayed scaphoid fracture
b) No therapy is received earlier
c) Patients are following their pattern of life as usual

At the beginning of the data collection, the patients are given a brief description of LLLT and how it works. The patients are recruited for the study for about a month. Every patient received LLLT through a laser diode with a wavelength of 905nm. It was utilized to release laser energy 3 times each week. The prolonged treatment uses an infrared beat laser Giotto LED SPA 2003 made in Italy with a frequency of 905 nm. The spot size breadth of the LED SPA is 5 mm, its recurrence is 10000 Hz with a normal power of 12 W, energy of 4 J, and heartbeat width of 100 ns. Its region is 0.2 cm2.

The clinical appraisal was performed for torment, edema, and capacity for development. Radiographic assessments were performed before the start of treatment to choose the logical sensible regions for receptiveness to the laser treatment and to be the reference for the improvement of the ampleness of the laser treatment show, another radiographic examination was performed around the completion of the course of treatment to overview the consequence of LLLT treatment.

Findings and Discussion

The scaphoid of every patient was recognized by actual assessment and radiological imaging. Then, at that point, various boundaries of the injury are taken into thought. Pain, edema, and capacity to move the harmed wrist are taken a look at utilizing VAS (visual simple scale). The patient imprints on the line the spot for the aggravation power which is then estimated (Dixon and Bird, 1981). The joints above and beneath the harmed region are inspected for the scope of the movement. It is recorded when the treatment. It is viewed that a large portion of the Patients with deferred bone mending have critical edema at the crack; the actual specialist estimated the circumference of the edematous part before the beginning of treatment and toward the finish of treatment.

After the treatment, the intensity of pain, edema, and the range of movement is relatively less than before the treatment. Most of the patients give positive remarks regarding the use of LLLT on their injury and they feel good about themselves. Also, the patients who have used a splint or cast before and are not satisfied with the results as it delayed the process of healing. The use of LLLT is far better than the splint or cast. An important factor is that LLLT is only effective when proper and complete treatment is received. No session is missed and proper exercises advised by the doctor should be done for quick healing.

The positive influence of LLLT on scaphoid bone fracture is characterized by the fact that it removes the inflammatory factors that can affect the fracture area. The enhancement in the cell proliferation and remolding stage of the broken bone is accelerated when the low-level laser therapy is received (Lee et al., 2018). The natural reaction of LLLT for upgrading the postponed break recuperating is one of the previously mentioned systems even though there is no positive proposed component for making sense of what truly occurred, further examinations addressing extra examinations added to the utilization of clinical serologic marker to decide the mending of crack could draw the method of what is true may be diving on deep in the bone.

Conclusion

LLLT is proved to be effective in the treatment of the scaphoid fracture. Evident improvement in pain, decreased edema, swelling and inflammation and increased movement is observed. Thus, it is proved that the traditional methods of treatment are not enough for the healing the scaphoid bone fracture. New methods should be implemented.

References

Aarif, Mohd. "A STUDY ON THE ROLE OF HEALTHCARE INDUSTRY IN THE PROMOTING OF HEALTH TOURISM IN INDIA." *A CASE STUDY OF DELHI-NCR* (2018).

Anju, Afsana, et al. "A Mysterious and Darkside of The Darknet: A Qualitative Study." *Webology (ISSN: 1735-188X)* 18.4 (2021).

Aprianto, D. R., Parenrengi, M. A., Utomo, B., Fauzi, A. A., & Subagyo, E. A. (2022). Autograft and implant cranioplasty in pediatric patients. *International Journal of Health & Medical Sciences*, *5*(1), 129-136. https://doi.org/10.21744/ijhms.v5n1.1852

Bahney, C. S., Hu, D. P., Miclau III, T., & Marcucio, R. S. (2015). The multifaceted role of the vasculature in endochondral fracture repair. *Frontiers in endocrinology*, *6*, 4.

Burayk, Dr & Mohammed, Dr & Kaur, Chamandeep. (2022). PURCHASE INFLUENCE DETERMINANTS OF PRESCHOOLERS AND PRIMARY SCHOOL-GOING CHILDREN. International Journal of Early Childhood Special Education. 14. 2022.

Chang, W. D., Wu, J. H., Wang, H. J., & Jiang, J. A. (2014). Therapeutic outcomes of low-level laser therapy for closed bone fracture in the human wrist and hand. *Photomedicine and laser surgery*, *32*(4), 212-218.

Chopra, Pooja, et al. "Automated Registration of Multiangle SAR Images Using Artificial Intelligence." *Mobile Information Systems* 2022 (2022).

Dixon, J. S., & Bird, H. A. (1981). Reproducibility along a 10 cm vertical visual analogue scale. *Annals of the rheumatic diseases*, *40*(1), 87-89.

Ebrahimi, T., Moslemi, N., Rokn, A. R., Heidari, M., Nokhbatolfoghahaie, H., & Fekrazad, R. (2012). The influence of low-intensity laser therapy on bone healing. *Journal of Dentistry (Tehran, Iran)*, *9*(4), 238.

Gerbi, M. E. M., Marques, A. M., Ramalho, L. M. P., Ponzi, E. A. C., Carvalho, C. M., Santos, R. D. C., ... & Pinheiro, A. L. B. (2008). Infrared laser light further improves bone healing when associated with bone morphogenic proteins: an in vivo study in a rodent model. *Photomedicine and laser surgery*, *26*(1), 55-60.

Grover, R. (1996). Clinical assessment of scaphoid injuries and the detection of fractures. *The Journal of Hand Surgery: British & European Volume*, *21*(3), 341-343.

Holm, B., Kristensen, M. T., Bencke, J., Husted, H., Kehlet, H., & Bandholm, T. (2010). Loss of knee-extension strength is related to knee swelling after total knee arthroplasty. *Archives of physical medicine and rehabilitation*, *91*(11), 1770-1776.

Kaur, Chamandeep, et al. "Incorporating Sentimental Analysis into Development of a Hybrid Classification Model: A Comprehensive Study."

Kaur, Chamandeep. (2019). The Study of Resource Management in Big Data Using Cloud Computing. 7. 91-94.

Kaur, Chamandeep. (2020). The Cloud Computing and Internet of Things (IoT). 7. 19-22. 10.32628/IJSRSET196657.

Lee, J., Chiang, M., Chen, P., and Ho, M. 2018. Anti-inflammatory effects of low-level laser therapy on human periodontal ligament cells : in vitro study, 469–477.

Liebert, M. A. (2005). Low-Level Laser Irradiation Promotes Proliferation and Differentiation of *Human Osteoblasts in Vitro, 23*(2), 161–166.

Mourad, Hanan & Kaur, Chamandeep & Aarif, Dr. (2020). CHALLENGES FACED BY BIG DATA AND ITS ORIENTATION IN THE FIELD OF BUSINESS MARKETING. 10. 8091-8102.

MOURAD, HANAN MOHAMMED, CHAMANDEEP KAUR, and DR MOHD AARIF. "CHALLENGES FACED BY BIG DATA AND ITS ORIENTATION IN THE FIELD OF BUSINESS MARKETING."

Nesioonpour, S., Mokmeli, S., Vojdani, S., Mohtadi, A., Behaeen, K., Moosavi, S., andHojjati, S. (2014). The Effect of Low-Level Laser on Postoperative Pain After Tibial Fracture Surgery : *A Double Blind Controlled Randomized Clinical Trial, 4*(3).

Nicolau, R. A., Jorgetti,AE. V., Rigau, AE. J., Pacheco, M. T. T., and Luciene, Æ. M. (2003). *Effect of low-power GaAlAs laser (660 nm) on bone structure and cell activity* : An experimental animal study, 89–94.

Phieffer LS, Goulet JA. (2006). Delayed unions of the tibia. Journal of Bone and Joint Surgery – *American Volume, 88*(1): 206–16.

Rodrigo, S. M., Cunha, A., Pozza, D. H., Blaya, D. S., andMoraes, J. F. (2009). *Analysis of the Systemic Effect of Red and Infrared Laser Therapy on Wound Repair, 27(*December), 929–935.

Shakouri, S., Soleimanpour, J., Salekzamani, Y., & Oskuie, M. R. (2010). Effect of low-level laser therapy on the fracture healing process. *Lasers in medical science*, *25*(1), 73-77.

Stergioulas, A. (2004). Low-level laser treatment can reduce edema in second degree ankle sprains. *Journal of clinical laser medicine & surgery*, *22*(2), 125-128.

Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2022). Post-pandemic health and its sustainability: Educational situation. *International Journal of Health Sciences*, *6*(1), i-v. https://doi.org/10.53730/ijhs.v6n1.5949

Watanabe, Y., Matsushita, T., Bhandari, M., Zdero, R., & Schemitsch, E. H. (2010). Ultrasound for fracture healing: current evidence. *Journal of orthopaedic trauma*, *24*, S56-S61.