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Effect of ultrasound on relief of pain and swelling after dental implant surgeries

[1*]Mahmoud Sedky Adly, [2]Sulaiman Mohammed Alselaiti, [2]Talal Salah Haidar

[1]Member of the Royal College of Surgeons of Edinburgh, DDS, MSc, Cairo, Egypt

[2]GPD at Ministry of Health

Corresponding Author: Mahmoud Sedky Adly, Member of the Royal College of Surgeons of Edinburgh, DDS, MSc, Cairo, Egypt

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Abstract

Aim: To assess the effect of ultrasound in relieving pain and reducing swelling after implant surgery.

Methods: Thirty patients were admitted who meet the inclusion criteria with missing lower posterior teeth and was equally and randomly divided into two groups one was subjected to ultrasound treatment and the other was subjected to the probe of the ultrasound device without turning on the device. The ultrasound device applied extra-orally on the area of the surgery. Swelling and pain assessments were measured at 24 hours, 72 hours, and seven days after the procedure.

Results: The mean of the two groups for the horizontal swelling showed a statistical significant difference after 24 and 72 hours while there was no significant difference after 7 days. There were no statistical significant differences for pain between the control and the ultrasound group.

Conclusion: Pulsed ultrasound appears to be an effective method to control swelling after implant surgery in lower molar area.

Keywords: ultrasound, pain, swelling, dental implant, surgery.

Introduction

Dental implant insertion is a common surgical procedure. This procedure is usually accompanied by pain and swelling during the healing period (Raico Gallardo et al., 2017). Proper post-operative care can minimize the pain and decrease the risk of complications after surgery (Chrcanovic et al., 2016).

Ultrasounds are vibrations that have the same nature of sound waves but the frequency of these waves are much higher (Ebadi et al., 2014). It was found that the waves of ultrasound are able to produce both mechanical and thermal effects on tissues. These effects can result in an increased circulation, tissue regeneration, and metabolism (Watson, 2008).

As the waves of ultrasound penetrate the tissues it causes vibration of molecules with alternating cycles of compression and rarefaction waves. High intensity of ultrasonic waves cause a significant rise in the kinetic energy of molecules which in turn cause micro-frictions between them (Jorge et al., 2018). These micro friction lead to heat generation inside the tissues, which was found to improve healing and lowers pain perception. The non-thermal effect of ultrasound was also described. These include a process called cavitation and micro-massage mechanisms. In this process, vibrations cause minute gas

bubbles to invade the tissue fluids leading to cavities or bubbles inside these tissues. These bubbles cause pulsation or oscillation leading to an increase in the permeability of cells and thus enhancing cell growth (Draper et al., 2018).

The aim of this study is to assess the efficiency of ultrasound in relieving pain and swelling after implant Surgery.

Material and Methods

A sample of 30 patients between 19 and 35 years were recruited into this study; all patients were informed of the possible risks of oral surgery and experimental treatment, and they signed a consent form before beginning of treatment. Inclusion criteria included: missing lower molar teeth for more than 6 months, no medical conditions or use of medication that would influence or alter the wound healing, no temporomandibular joint disorder that may affect the pain after surgery. The sample was equally and randomly divided into two groups with the first group (US group) was subjected to ultrasound treatment and the second group (control group) was subjected to the probe of the ultrasound device without turning on the device.

The ultrasound device (Enraf Nonius ultrasound machine) was utilized in the US group and adjusted to a frequency of 1 MHz and intensity of 1 W/cm^2 with pulsed mode and a 20 min session applied extra-orally on the area of surgery every day for 3 days.

Patients underwent the surgical treatment in accordance with the guidelines of asepsis. The operator who performed the ultrasound in all subjects was different from the surgeon; also another operator made the measurements and was blind to which patient was in control or in experimental group.

Both inferior alveolar and buccal nerve blocks were administered using articaine containing 1:100,000 epinephrine. Incisions were made and a full-thickness mucoperiosteal flap was elevated and the implant was inserted (Straumann SLA, AG, Basel, Switzerland). This was followed by suturing and postoperative instructions were given.

After the end of surgery, the patients were told to write their postoperative pain on VAS scale, with 0 indicating no pain and 100 indicating the worst pain ever experienced. The assessment of the postoperative pain was done at 24 hours, 72 hours, and seven days after the procedure.

Evaluation of swelling was done by utilizing a vertical and horizontal guide with a flexible ruler. For the horizontal guide 2 points marked at the tragus of ear and the buccal commissures, and then distance was measured. For the vertical guide a point at the lateral chanthus of the eye and another one at gonion was measured. Assessment was done at 24 hours, 72 hours, and 7 days after the procedure. The amount of swelling was evaluated by subtracting the measurement at the postoperative time from that obtained at baseline.

Statistical analysis was done using the software SPSS ver. 20.0 (SPSS 20.0, Chicago, IL, USA), with a significance level of $\alpha = 0.05$. For analysis of the swelling Wilcoxon test for the paired samples was used since the data were not normally distributed. Regarding the pain statistical analysis were performed by the unpaired t test.

Results

Of the thirty patients initially admitted, only twenty-eight completed the trial. The swelling mean values are shown in figure 1. The horizontal and vertical swelling assessments are presented in table 1 and table 2 respectively. The mean of the two groups for the horizontal swelling showed a statistical significant difference after 24 and 72 hours while there was no significant difference after 7 days. Assessments of pain are shown in figure 2, and presented in table 3. There were

no statistical significant differences between the control and the ultrasound group after all periods.

Table 1: Horizontal Swelling Assessment

Period	24 hours	72 hours	7 days
Mean of Control Group	4.2±3.7	3.3±3.1	0.8±1.9
Mean of Ultrasound Group	3.1±2.9	1.6±2.2	0.6±1.7
P value	0.038	0.002	0.785
Significance	S	S	NS

*N= Significant, NS= Non Significant

Table 2: Vertical Swelling Assessment

Period	24 hours	72 hours	7 days
Mean of Control Group	6.1±6.7	4.2±6.1	1.1±3.2
Mean of Ultrasound Group	5.1±7.3	3.3±6.4	0.7±3.7
P value	0.372	0.629	0.0723
Significance	NS	NS	NS

Table 3: Pain Assessment

Period	24 hours	72 hours	7 days
Mean of Control Group	40.7±33.4	27.6±31.8	8.2±14.9
Mean of Ultrasound Group	45.9±35.1	24.9±30.6	8.7±16.5
P value	0.536	0.337	0.851
Significance	NS	NS	NS

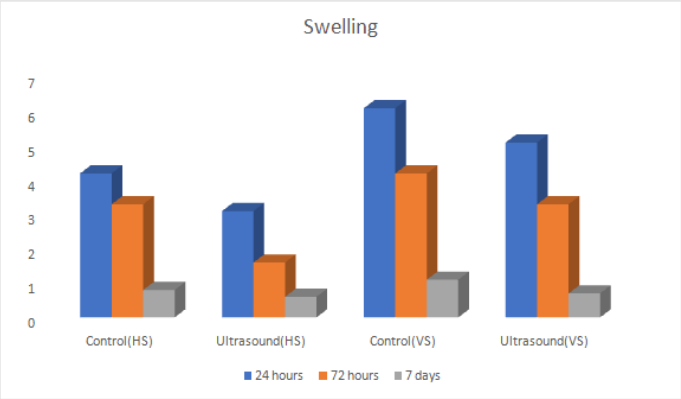

Figure 1: Horizontal swelling assessment of the control group, horizontal swelling assessment of the ultrasound group, vertical swelling assessment of the control group, and vertical swelling assessment of the ultrasound group.

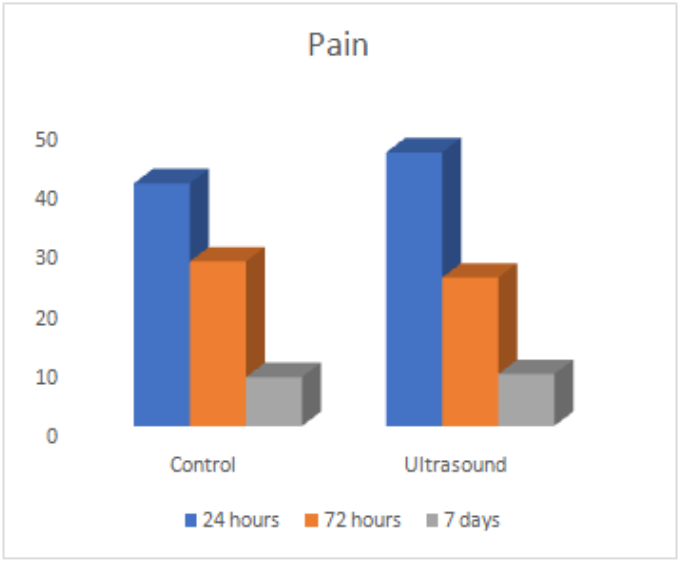

Figure 2: Pain assessment of the control group, and pain assessment of the ultrasound group.

Discussion

Implant surgery may lead to trauma in both soft tissue and bone. Postoperative signs and symptoms usually include pain, edema and limited mouth opening. The use of ultrasound as treatment for pain and swelling has been studied for many decades (Baker et al., 2001).

In this study, no improvement in pain score was observed in the US group as they experienced the same pain during the whole follow up period of the study when compared to the control group.

Although it was reported that ultrasound has the ability to generates pain relief by increasing the nociceptive threshold and modulation of nerve conduction velocity. This effect was mainly observed in chronic muscular and joint diseases(Ebenbichler et al., 1998, Bakhtiary and Rashidy-Pour, 2004).

It was also found that ultrasound has the ability to increase the anti-inflammatory effect by reducing swelling after surgery and thus further contribute to enhance normal life style soon after surgery with less facial morbidity (Ter Haar, 1999).

Waves of ultrasound are generated by the piezoelectric

effect resulting from vibrations of the crystals inside its probe. The therapeutic effect is mainly caused by the absorption of the mechanical energy and heating inside tissues. This thermal effect can increases in local blood flow, which induce tissue regeneration and reduction of inflammation.

Continuous mode ultrasound was shown to heat tissues and thus indicated mainly in chronic pain conditions. For acute soft tissue injuries, a high thermal change which may lead to an increase in swelling and inflammation may not be desired; so, a better option in the pulsed therapy (Ilter et al., 2015, Rodríguez-Grande et al., 2017). Pulsed therapy tends to decrease the heat generated in the soft tissue, but they keep other beneficial acoustic effects of ultrasound therapy, such as acoustic streaming and cavitation which can significantly reduce pain and swelling and enhance healing of tissues (Cruz et al., 2016) (Cain et al., 2017).

A pulsed ultrasonic waves were chosen in this study which are predominantly having non-thermal effects, because according to many studies it was found that the pulsed mode cause more improvement of bone and soft tissue repair combined with analgesic and anti-inflammatory actions without causing any damaging to the patients by acute inflammation due to the thermal effect (Ebenbichler et al., 1998) (Bakhtiary and Rashidy-Pour, 2004) (Yildiz et al., 2011).

Conclusions

Pulsed ultrasound was shown to be an effective method to control swelling after implant surgery in lower molars. Ultrasound was able to significantly decrease swelling causing less post-operative morbidity and faster tissue healing allowing the patients to recover faster from the surgery and restore their normal life style.

References

1. BAKER, K. G., ROBERTSON, V. J. & DUCK, F. A. 001. A review of therapeutic ultrasound: biophysical effects. *Physical therapy,* 81**,** 1351-1358.
2. BAKHTIARY, A. H. & RASHIDY-POUR, A. 2004. Ultrasound and laser therapy in the treatment of carpal tunnel syndrome. *The Australian journal of physiotherapy,* 50**,** 147-51.
3. CAIN, C. A., XU, Z., FOWLKES, J. B., HALL, T. L. & ROBERTS, W. W. 2017. Pulsed cavitational ultrasound therapy. Google Patents.
4. CHRCANOVIC, B., KISCH, J., ALBREKTSSON, T. & WENNERBERG, A. 2016. Factors influencing early dental implant failures. *Journal of dental research,* 95**,** 995-1002.
5. CRUZ, J. M., HAUCK, M., PEREIRA, A. P. C., MORAES, M. B., MARTINS, C. N., DA SILVA PAULITSCH, F., PLENTZ, R. D. M., PERES, W., DA SILVA, A. M. V. & SIGNORI, L. U. 2016. Effects of different therapeutic ultrasound waveforms on endothelial function in healthy volunteers: a randomized clinical trial. *Ultrasound in medicine & biology,* 42**,** 471-480.
6. DRAPER, D. O., KLYVE, D., ORTIZ, R. & BEST, T. M. 2018. Effect of low-intensity long-duration ultrasound on the symptomatic relief of knee osteoarthritis: a randomized, placebo-controlled double-blind study. *Journal of orthopaedic surgery and research,* 13**,** 257.
7. EBADI, S., HENSCHKE, N., ANSARI, N. N., FALLAH, E. & VAN TULDER, M. W. 2014. Therapeutic ultrasound for chronic low-back pain. *Cochrane Database of Systematic Reviews*.
8. EBENBICHLER, G. R., RESCH, K. L., NICOLAKIS, P., WIESINGER, G. F., UHL, F., GHANEM, A.-H. & FIALKA, V. 1998. Ultrasound

treatment for treating the carpal tunnel syndrome: randomised "sham" controlled trial. *Bmj,* 316**,** 731-735.

9. ILTER, L., DILEK, B., BATMAZ, I., ULU, M. A., SARIYILDIZ, M. A., NAS, K. & CEVIK, R. 2015. Efficacy of pulsed and continuous therapeutic ultrasound in myofascial pain syndrome: a randomized controlled study. *American journal of physical medicine & rehabilitation,* 94**,** 547-554.
10. JORGE, A. E. S., MLD, S., FERNADES, A. C., CHIARI, A. & DE AQUINO JR, A. 2018. Ultrasound conjugated with Laser Therapy in treatment of osteoarthritis: A case study. *J Sports Med Ther,* 3**,** 024-027.
11. RAICO GALLARDO, Y. N., DA SILVA-OLIVIO, I. R. T., MUKAI, E., MORIMOTO, S., SESMA, N. & CORDARO, L. 2017. Accuracy comparison of guided surgery for dental implants according to the tissue of support: a systematic review and meta-analysis. *Clinical oral implants research,* 28**,** 602-612.
12. RODRÍGUEZ-GRANDE, E.-I., OSMA-RUEDA, J.-L., SERRANO-VILLAR, Y. & RAMÍREZ, C. 2017. Effects of pulsed therapeutic ultrasound on the treatment of people with knee osteoarthritis. *Journal of physical therapy science,* 29**,** 1637-1643.
13. TER HAAR, G. 1999. Therapeutic ultrasound. *European Journal of ultrasound,* 9**,** 3-9.
14. WATSON, T. 2008. Ultrasound in contemporary physiotherapy practice. *Ultrasonics,* 48**,** 321-329.
15. YILDIZ, N., ATALAY, N. S., GUNGEN, G. O., SANAL, E., AKKAYA, N. & TOPUZ, O. 2011. Comparison of ultrasound and ketoprofen phonophoresis in the treatment of carpal tunnel syndrome. *Journal of back and musculoskeletal rehabilitation,* 24**,** 39-47.