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COMPARATIVE EVALUATION OF EFFICACY OF OZONATED OLIVE OIL AND LOW LEVEL LASER THERAPY ON POST-OPERATIVE PAIN, HEMOSTASIS AND HEALING FOLLOWING EXTRACTION OF PRIMARY MOLARS

Dental Science

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ABSTRACT

Objective : To Compare and evaluate the effect of ozonated olive oil and Low Level Laser Therapy (LLLT) on post-operative pain, hemostasis and healing following the extraction of primary molars at the 1, 3 and 7 days followup.

Study design: 60 teeth (20 patients of age 4-7 years) indicated extraction were randomly selected and divided in to three groups (A,B & C)Post-operative pain was measured by visual analog scale (VAS), hemostasis was evaluated by checking the clotting time with stopwatch, and Healing was evaluated clinically by Landry et al. and Gonshor criteria at 1, 3 and 7 days followup.

Results: When comparing the haemostasis there was a significant difference in between the three groups (p value= 0.00) . Patients had less post-operative pain in the extraction sites treated with laser and ozonated olive oil than the control group .When ozonated olive oil and LLLT was compared with control group on 1, 3 and 7th day for post-operative healing the results were found to be statisically significant (p value= 0.000).

Conclusion : Both LLLT and Ozonated olive oil have a significant effect in reducing pain, discomfort, and haemostasis.

KEYWORDS

Ozonated Olive Oil, Low Level Laser Therapy, Extraction

Introduction

The experience of extraction is inherently fear inducing for most paediatric patient. It can be due to pain and hemophobia. Beside these causes, the heightened anxiety is compounded by other fear-inducing stimuli associated with the extraction appointment such as needle-phobia, transmitted dental fear from parents or siblings, fear of strangers, or a history of acute pain or previous negative experiences[1].

In addition to these unpleasant experiences of paediatric patients, the extraction appointment is a distressing experience for caregivers as well, which culminates in them receiving an anxious, bleeding child to take care of in the post-operative period in compliance with the instructions delivered to them by the dentist. The dentist also faces challenges in communicating effectively with the parent/child in emotionally-charged situations, during or after an extraction[2]. The management of postoperative pain by medications such as non-steroidal anti-inflammatory drugs and corticosteroids has been reported. However, their use is often associated with potential side effects, such as peptic ulcer disease, gastrointestinal bleeding and perforation, impaired renal function, allergic reactions, and inhibition of platelet function. To minimize these side effects, there are several methods to control postoperative pain, haemostasis and to improve healing[3].

Laser is defined as, Light Amplification by Stimulated Emission of Radiation. The use of lasers in dentistry has evolved since its introduction by Maiman in 1960's. Hard tissue lasers have large energy output and are used for cutting tissues, whereas soft tissue lasers are low-level lasers that promote tissue healing. While hard tissue lasers have large energy output and are used for cutting tissues, soft tissue lasers are low-level lasers that promote tissue healing. Low-Level Laser Therapy (LLLT) accelerates wound healing from which the concept of photobiomodulation has evolved. It further, it is found to decrease the post-operative pain and aids haemostasis[4].

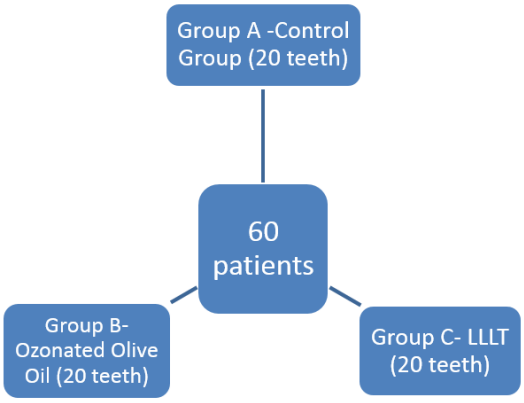
Authors have reported that Ozone has a positive influence on reparative process and bone metabolism and even decreases the microbial load at the site. It is noted that the influence of gas ends up in a better expression of cytokines, that are vital for wound healing, particularly TGF-β1, a very important substance for regulation and coordination in the initial wound healing phase. Ozone speeds up the angiogenesis, healing rate in the oral mucosa, even decreasing the bleeding in the surgical area thereby, influencing the postoperative healing and pain[5].

Thus, purpose of this present in-vivo study was to compare and evaluate the effect of ozonated olive oil and low level laser therapy on post-operative pain, haemostasis and healing following the extraction of primary molars at the 1, 3 and 7 days follow-up.

Material and Methodology

The study was conceptualised as a randomised clinical trial were healthy children in the age group of 4-7 years who were indicated for extraction of primary molars, due to early orthodontic intervention and serial extraction, or grossly destructed and/or non-restorable carious teeth, attending the out-patient department of Department of Paediatric and preventive dentistry, ITS Dental College and Hospital, Muradnagar. Exclusion criteria were determined as a history of use of non-steroidal anti-inflammatory drugs in the previous 24 h, blood disorders or any systemic health problems.

Prior approval of the study was obtained from the ethical committee of the institution. Informed consent was taken from each subject's parents/ guardians before enrolling them in the study. Sixty patients were randomly allocated to following groups by chit method,



Following recruitment, children underwent extraction of primary teeth. Dental extraction involved the reflection of gingiva and the application of appropriate forceps. All extractions were carried out by a single operator.A saline dipped cotton pellet was placed in the control group for bleeding control. Ozonated olive oil was available in 2ml preformed disposable single use syringe (Dent ozone India) . In group B-, three to four drops of ozonated olive oil were applied with cotton pellets and compressed in to the socket. 940-nm wavelength diode laser was used in this present study, in a continuous mode through a delivery system with 0.5W output power. The laser device was used for 3 cycles and each cycle for 1 min. Haemostasis was measured on a stopwatch by an independent recorder, from the point of the tooth leaving the socket following extraction to the point of complete cessation of bleeding, determined by visualisation of absence of oozing and glassy appearance of the clot. The post-operative pain was assessed using Visual Analogue Scale (VAS)[6]. On VAS the left most end represented no pain (score 0) and the right most end indicated severe pain (score 10). Healing was evaluated clinically by Landry et al. and Gonshor criteria postoperatively during follow-ups. Post-operative instructions were given[7].

Patients were recalled on 1,3 and 7th day post operatively for the evaluation of pain and healing was recorded for all the three groups.

Statistical Analysis

All the collected data was entered in to MS excel and analysis was done by using statistical software SPSS version 16.0. The normality of data was tested by Shapiro Wilks test and Hemostasis was normally distributed while Healing at different time interval and pain was not normally distributed. To evaluate the level of haemostasis achieved among the group tested by one way ANOVA followed by Tukey's Honestly Significance Difference (HSD) test were applied. The healing at different time interval and pain between the groups were tested by Krushkal wallis test followed by Mann whitny U test. The level of significance and C.I. were 5% and 95% respectively.

Results

When comparing the haemostasis there was a significant difference in between the three groups (p value= 0.00) (table 1). The results showed that haemostasis was better for both LLLT and ozonated olive oil group compared to control group. A significant difference was seen in both control v/s Ozonated oil group and control vs LLLT haemostasis with p value 0.000. But there was no significant difference in ozonated olive oil vs LLLT (P value= 0.987) (table 2). Patients had less post-operative pain in the extraction sites treated with laser and ozonated olive oil than the control group. When comparing to the control group, both the experimental groups showed significant results (p value= 0.00) but there was no significant difference for the reduction post-operative pain in ozonated olive oil and LLLT groups (p value= 0.277)(table 3).

Healing was evaluated clinically by Landry et al. and Gonshor criteria at 1,3 and 7th day post operatively. When ozonated olive oil and LLLT was compared with control group on 1, 3 and 7th day for post-operative healing the results were found to be statisically significant (p value= 0.000). Both ozonated olive oil and LLLT showed a better healing at 1,3 and 7th day post operatively, however, the difference were non-significant (p value = 0. 530, 0.865, 0.369) (table 4).

Discussion

Postoperative pain is consider to be one of the common complication of dental procedures, especially tooth extraction. Extractions most likely to cause pain and inflammation. Analgesics, Non-Steroidal Anti-Inflammatory Drugs (NSAID) and long acting anesthetics are commonly prescribed to control these complications. However, these drugs have certain adverse effects[2]. The optimal method of controlling postoperative discomfort in children undergoing dental surgery would effectively relieve pain for extended periods of time without producing any side effects. LLLT application has several beneficial effects in dentistry including, anti-inflammatory, analgesic and biostimulant effects to enhance wound healing[8].

The result of current study showed that both LLLT and Ozonated olive achieved good haemostasis when compared to control group. These findings supported by the findings of Mirdan et al who revealed that the use of 980-nm diode laser in continues mode with 0.86w power output on rabbits' tooth socket had a beneficial effect on blood coagulation and provided dressing to the wound[9]. She suggested that clot formation was accomplished due to absorption and that laser scattering confines the laser photothermal effect for clot formation without any harmful effect on the surrounding bone but rather stimulating bone healing by residual scattered light from the incident laser. Immediate hemostasis was achieved with ozone, as it increases erythrocyte filtration and oxygen carrying capacity of the cells. Ozone causes secretions which are vasodilators and hence dilates arterioles & venules. It prevents clumping of red blood corpuscles' and increases their contact area for oxygen transportation. It also activates aerobic processes like glycolysis and krebs cycle at cellular level thus stimulating circulation of blood as well causes immediate hemostasis[10].

The mechanism of the analgesic effect of LLLT can be explained with the stimulation of the synthesis of endogenous endorphins and reduction of the activity of bradykinin and c fibers with the change in pain threshold[11]. On the other hand, LLLT encourage the hyperpolarized state of the primary nerve endings, thus inhibits the painful stimuli transmission to the central nervous system, it also has a profound and rapid effect in reducing the level of mediators responsible for pain and inflammation such as prostaglandin e2, interleukin 1, cyclooxygenase 2, and tumor necrosis factor[12]. The ozone can be used as an adjuvant to anti-inflammatory and analgesics. The O2 remaining after releasing O- ion acts as healing immune modulator and helps in stimulating the cells and tissues which are damaged and rapid healing is carried out at a faster rate reducing inflammation and reducing pain instantaneously[13]. There by bringing down the use of antibiotics and painkillers to zero use and making dental practice medication free. In the present study both the LLLT and Ozonated olive proved to be a successful adjuvant to analgesics. The findings of this present study were consistent with Saber et al. who found that the pain level was significantly lower in laser compared to control group when using laser with 100 mW output power and 810-nm wavelength in continuous mode[14].

The results agreed with Landucci et al. who found that the pain intensity reduced significantly at 48 h and 7 days after extracting the lower third molars compared with the first group (control group) when a single dose of low power laser therapy was applied intraorally; at 4 points in adjacent to the socket and at 6 points extraorally along the masseter muscle[15]. These results disagree with López-Ramírez et al. who concluded that the intraoral application of low power laser 810 nm with 0.5 W output power after the extraction of lower third molar had no beneficial effect in pain reduction[16].

In this present study both the LLLT and Ozonated live oil showed comparative results for healing on 1, 3 and 7th day followups. The application of gaseous ozone has also been shown to be effective in facilitating oral wound healing following highdose radiotherapy. Petrucci et al. reported that the application of 15 days of ozone therapy was beneficial in the treatment of bisphosphonate-related osteonecrosis of the jaws[17]. Agrillo et al. performed 20 tooth extractions in 15 patients with avascular bisphosphonate-related jaw osteonecrosis and reported that ozone was effective when used for 7 days before and after the tooth extraction[18]. In contrast, Matsumura et al. reported that ozone (0.5 g/h for 5 h) did not have a major impact on stimulation of gingival cells for osteoblastic activity in the regeneration of the periodontium around implants[19]. The low-level laser therapy can lead to increased mitochondrial activity, with a consequent increase of Adenosine Triphosphate (ATP), vasodilation, protein synthesis, decrease in prostaglandin levels, presence of cellular mitosis, migration and proliferation of keratinocytes and neoangiogenesis[20]. Maghra et al in a histological analysis showed a significant increase in the area of bone trabeculae, as well as the width of compact bone, for the lasered side of gamma irradiated mandibles of rats[21]. Park and Kang demonstrated that 980-nm gallium-aluminum-arsenide (GaAlAs) low-intensity diode laser irradiation is beneficial for the initial stages of alveolar bone healing of tooth extraction socket and for further calcification in both diabetic and normal rats when applied every day at a dose of 13.95 J/cm2 for 60 s[22].

Conclusion

Based on the study findings, both LLLT and Ozonated olive oil have a significant effect in reducing pain, discomfort, and bleeding levels with the formation of a stable blood clot inside the tooth socket which aids in the reduction of postoperative complications after tooth extraction and promote post-operative healing.

Comparison of means of Haemostasis Time (sec.) between the groups by oneway ANOVA (table 1)

Group	N	Mean	Std. Deviation	F value	P value
Control	20	218.50	25.871	37.647	0.000
Ozontaed olive oil	20	158.45	23.191		
LLLT	20	157.20	27.372		

Multiple comparison of haemostasis by Tukey HSD test (table 2)

GROUP	Mean Difference	Std. Error	P value
Control vs Ozontaed olive oil	60.050*	8.075	0.000
Control vs LLLT	61.300*	8.075	0.000
Ozontaed olive oil vs LLLT	1.250	8.075	0.987

Intergroup comparison of Post operative Pain (table 3)

	Group	N	Mean Rank	P value
Pain (VAS)	Control	20	30.50	0.000
	Ozonated olive oil Total	20	10.50	
		40		
	Control	20	30.50	0.000
	LLLT Total	20	10.50	
		40		
	Ozonated olive oil LL LT Total	20	18.62	0.277
		20	22.38	
		40		

Inter group comparison of healing in different time intervals (table 4)

	Group	N	Mean Rank	P value
Healing Day1	Control	20	14.50	**0.000**
	Ozonated olive oil	20	26.50	
	Total	40		
	Control	20	13.70	**0.000**
	LLLT	20	27.30	
	Total	40		
	Ozonated olive oil	20	19.50	**0.530**
	LL LT	20	21.50	
	Total	40		
Healing Day3	Control	20	13.65	**0.000**
	Ozonated olive oil Total	20	27.35	
		40		
	Control LLLT Total	20	13.65	**0.000**
		20	27.35	
		40		
	Ozonated olive oil LL LT	20	20.78	**0.865**
	Total	20	20.22	
		40		
Healing Day 7	Control	20	13.90	**0.000**
	Ozonated olive oil Total	20	27.10	
		40		
	Control LLLT Total	20	14.70	**0.000**
		20	26.30	
		40		
	Ozonated olive oil LL LT	20	21.80	**0.369**
	Total	20	19.20	
		40		

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