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Effect of Low Level Laser Therapy, Dexamethasone, and Lornoxicam on Post-Operative Pain after Periapical surgery: A comparative clinical study

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الخلاصة

الأهداف: تهدف الدراسة الى مقارنة تأثير أنواع مختلفة من العلاجات الموضعية وهي: الليزر ، اللورنوكسيكام (٤) ملغم ، الدكساميثازون (٤) ملغم على الألم المتوقع بعد ازالة ذروة الجذر للأسنان العلوية الامامية. **المواد وطرائق العمل:** تم إجراء هذه الدراسة العشوائية، مزدوجة التعمية على المرضى الذين يحتاجون علاج الجذور الجراحي للأسنان الأمامية المفردة تحت التخدير الموضعي. تم إجراء عمليات جراحية قياسية لكل المرضى وتم تقسيم المرضى إلى ستة مجاميع ، كل مريض تم إعطائه نوع واحد من العلاجات(الليزر، اللورنوكسيكام، الليزر واللورنوكسيكام ، الدكساميثازون ، مجموعة العلاج الوهمي، المجموعة الأخرى (السيطرة) لم يستعمل معها أي علاج. تم إجراء قياسات حقيقية للألم وغيرها خلال ١–٧ أيام من تاريخ العملية. **النتائج:** ألالم (على VAS) وصل الى أعلى قيمة له خلال ٦ ساعات بعد العملية واستمر بالتلاشي الى اليوم السابع.أما ما يتعلق بالألم (على VAS)، الدكساميثازون فقد وجد إن هناك فرقا معنويا في قيمة كل من الألم ، عند مستوى المعنوية (٠.٠٥) مقارنة بمجموعة السيطرة ، يليه مجموعة الليزر + اللورنوكسيكام ، مجموعة العلاج الوهمي، مجموعة اللورنوكسيكام ، مجموعةالليزر ، والمجموعة الضابطة في ترتيب تنازلي. خلال (٦ ساعات)، وقد كانت هناك فروقا ذات دلالة إحصائية بالنسبة لجميع المجموعات المعالجة، مقارنة مع مجموعة السيطرة. المجموعة التي تلقت العلاج بالليزر أظهرت انخفاض كبير في الألم خلال ٦ ساعات، وأظهرت مجموعة اللورنوكسيكام انخفاض كبير في الألم في اليوم الثاني بالمقارنة مع المجموعات الأخرى ،مجموعة الدكساميثازون و مجموعة العلاج الوهمي أظهرت انخفاض كبير في الألم لمدة ٣ أيام في مقارنة مع المجموعات الأخرى. حتى نهاية فترة الدراسة، لم تلاحظ أي حالات التهاب. ولم تظهر أي آثار جانبية من الأدوية والعلاجات المستخدمة في الدراسة. **الاستنتاجات:** وجد أن اعطاء٤ ملغم ديكساميثازون تحت الطبقة المخاطية للفم هو العلاج الفعال للحد من آلام ما بعد جراحة حوائط الذروة. هذا العلاج يوفرطرائق بسيطة، خيارات علاجية آمنة وغير مؤلمة، وتكلفة بسيطة للحالات المتوسطة والشديدة. كما وجد أنّ الليزر واللورنوكسكام الموضعي لديها بعض التأثير في هذا الصدد ولكنه غير معنوي، كما تصاحب العلاج الأخير مع بعض الانزعاج وعدم الارتياح في كثير من الحالات.

ABSTRACT

Aims: : To compare the effect of low level laser therapy (LLLT), submucosal lornoxicam, and submucosal dexamethasone to control postoperative pain after periapical surgery of upper anterior teeth. **Materials and Methods:** This randomized, double- blind, controlled trial was performed on patients who required surgical endodontics of single upper anterior tooth under local anesthesia. A case form was used. Standardized surgical procedure was followed. Patients were categorized into 6 groups; LLLT, lornoxicam, LLLT+ lornoxicam , dexamethasone, placebo, and control groups. Measurements of pain were undertaken at days 1-7. **Results: :** Pain on Visual Analog Scale (VAS) also reached it's peak on 6 hours and faded away by day 7. With respect to pain (on VAS), dexamethasone treated group continued to be the best at all intervals ($P<0.05$) followed by LLLT+lornoxicam group, Placebo group, lornoxicam group, LLLT group, and control group in a descending order. There were significant differences for all treated groups on (6 hours) post operatively as compared with control group. Laser treated group showed significant reduction in pain at 6 hours, lornoxicam group showed significant reduction in pain at day 2 as compared with other tereated groups. Dexamethasone and placebo groups showed significant reduction in pain at day 3 as compared with other tereated groups. Up to the end of follow up period, no cases of wound infection were reported. No side effects of drugs and treatments used in the trial were demonstrated. **Conclusion:** Submucosal dexamethasone 4mg injection is an effective therapy for reducing postoperative pain after periapical surgery. The treatment offers a simple, safe, painless, noninvasive and cost therapeutic option for moderate and severe cases. LLLT and submucosal lornoxicam seem to have little effect in this regard and found to be associated with some discomfort and inconvenience in many cases.

Keywords: Pain control, postoperative treatment, apicectomy**.**

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INTRODUCTION

Apicectomy is the excision of the apical portion of the tooth root and attached soft tissues during periradicular surgery. [1] The main goal is to perform a resection of the apical portion of the root of 3 mm, which reduces up to 93% of the lateral canals. [2] It has been demonstrated that pain following periapical surgery tends to peak on the operational day, whereas swelling has been found to be most pronounced 1 to 2 days postoperatively. [3-6] Several studies have found that non prescriptive analgesics were sufficient to control postoperative pain after apicectomy. [4, 6-8] However, some have suggested the use of steroids to minimize pain and swelling. [7,9] Dexamethasone is one of the most common corticosteroids in oral surgery. It has a powerful anti-inflammatory effect by inhibition of synthesis and release of inflammatory reaction mediators with the least adverse effects on leukocyte chemotaxis. [10] Lornoxicam, a newer NSAID from the oxicam class, with anti-inflammatory and analgesic effects. [11] It is frequently used for the treatment of postoperative pain following surgical interventions. A significant pain-reducing effect of prophylactic oral lornoxicam has also been shown in minor surgery by Hein *et al*. [12] Another method to minimize pain is the use LLLT. Which is supposed to reduce pain, to accelerate wound healing and to have a positive effect on inflammatory processes. [13] Many studies investigating the potential of LLLT in reducing postoperative sequelae after impacted third molar removal revealed non uniform results. Carrillo *et al*. investigated the effect of postoperative wound irradiation with an helium-neon laser (633 nm) operated in the cw-mode at an energy fluence of 10 J/cm2. LLLT also was used to reduce the postoperative pain level after periapical surgery. [13]

MATERIALS AND METHODS

Study design: This randomized, double- blind, controlled trial was performed at the Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Mosul, and included patients who required surgical removal of periapical lesion and root end resection of involved tooth under local anesthesia. The study was approved by the local academic committee according to relevant guidelines.

Sample: Seventy two patients (46 women and 26 men), average age (31.61 ± 11.317) years (range 14-57) were randomly divided into 6 groups, with 12 patients in each. Group A received LLLT only , group B received LLLT and Lornoxicam, group C received lornoxicam only, group D received dexamethasone as a submucosal injection, group E (placebo) received normal saline and laser simulation. All groups received treatment immediately after surgery. Group F (control) received no medication nor treatment.

All patients in the study routinely received 1 gm amoxicillin (500 mg in 2 capsules) orally as one dose after surgery. In addition, paracetamol (500 mg adol) on need, a chlorhexidine mouth rinse was prescribed twice daily to be started the day after surgery for 5 days.

***Inclusion criteria*:**

1. single upper anterior tooth affected by established periapical lesion.
2. medically fit patient.
3. healthy periodontal condition.
4. infection free.

Exclusion criteria:

1. patient non compliant for follow-up
2. patients taken non –study drug.
3. medically compromised patients
4. pregnant patient
5. patient who current taking medication specifically(steroidal and non steroidal anti-inflammatory drugs.

Surgical procedure: A standardized surgical procedure was performed on all patients by the same right-handed operator in the same operating room and under similar conditions. A standard infiltration as given using 1.8 ml cartridges of 2% lidoocaine hydrochloride with epinephrine 1:80 000 (Colombia).

Surgical access routinely achieved labially through a submarginal incision. [13] After the reflection of a full mucoperiosteal flap, Bone removal, if necessary around the tooth was then performed. The roots were resected at approximately 45° to the axis of the tooth and 2 to 3 mm of the

root-end was removed, then flap was sutured back by 3 to 4 interrupted stitches using a 4-0 silk suture. A small gauze pack was then applied to the surgical site, and the usual post-surgical instructions and post-operative treatment were given to the patient.

Treatment protocol after apicectomy: Seventy two patients were randomly divided into 6 groups, with 12 patients in each group. Subsequently to suturing, patients had the operation site treated with the following treatment:

Laser treatment: operation site treated with an 810 nm-Low level laser therapy (Elexxion claros, Germany). An application tip was used to ensure a constant distance of 10 mm from the and of the fibre to the surgical site. The total energy applied was 7.2 J. Laser treatment was given in one session. Laser treatment was simulated in a further 24 patients. Laser treatment was performed by a third person. The operator, the assistant and the patients wore protective glasses. as shown in Figure (1).

Figure (1): Laser treatment

Lornoxicam treatment: Group C received lornoxicam vial (Xefo 4 mg) locally injection into labial vestibule near surgical site. Group B received lornoxicam (Xefo 4 mg) locally injection into labial vestibule near surgical site then surgical site irradiated an 810 nm-Low level laser therapy (Elexxion claros, Germany).

Dexamethason treatment: Group D received 4 mg decadron ampul (Rotexmedica, Germany) as a submucosal injection immediately after surgery. It was diluted with saline and locally injected into labial vestibule near surgical site . Group E (placebo) received normal saline and laser simulation. Group F Received no studied drugs, nor LLLT (Figure 2).

Figure(2): Submucosal injection of dexamethasone

Assessment and follow up: Facial pain evaluated at the first- seventh postoperative days. Postoperative pain was quantified and documented with the help of the Visual Analogue Scale (VAS) [(15)], in the VAS, the extent of pain is expressed by the length of a line drawn by the patient. 10 cm in length, ranging from 0 = "no pain" to 10 = "the worst possible pain". Patient instructed to report the number of rescue analgesic tablets required on the day of surgery (6 hours postoperatively) and on each subsequent day of follow up for the first postoperative week, and report

the time for the first analgesic tablet taking.

***Postoperative evaluations*:** On postoperative days 1- 7 pain was evaluated with a visual analogue scale (VAS).

Statistical analysis: The data were incrementally entered during the course of study into an electronic sheet (Excel; Microsoft, Windows 2003) and then processed using the Statistical Package for Social Sciences (version 12.0, SPSS Inc., USA) and analyzed.

Descriptive statistics were calculated. The variables analyzed include demographic (age, sex, BMI, tooth type, clinic size, duration and pain of surgery), VAS for pain. The age was presented as Mean ± SD., Demographic and clinical characteristics of the patients were analyzed by analysis of variance (ANOVA) or Pearson chi square (χ^2) test, as appropriate. Post hoc analyses were performed by Duncan Multiple Analysis Rang Test. P values < 0.05 were considered significant.

RESULTS

A total of 72 patients were included in the study who completed the questionnaire and measurements. There were no missing data and all patients included in the study attended all the follow up visits. The mean age of patients in total (25 males and 47 females) was 31.61 (± 11.317) with a range of (14-57). The mean body mass index (BMI) was 25.56 kg/m^2 . The mean of duration of surgery was 40.90 minute. There were no statistically significant differences in these variables among study groups.

***Profile of measurements among groups*:** Dexamethasone treated group showed statistically significant differences in the magnitude of pain mostly at all intervals (P<0.05) when compared with all other treated groups. Similarly, the total number of rescue analgesic tablets taken on each interval was significantly lower in dexamethasone treated group .

With respect to pain (on VAS), dexamethasone treated group continued to be the best at all intervals, followed by LLLT+ lornoxicam group, Placebo group, lornoxicam group, LLLT group, and control group in a descending order at (6 hours) post operative. This effect was accordingly reflected on the total number of rescue analgesic tablets taken by the patients. However, there were signifigant differences for all treated groups on (6 hours) post operative as compared with control group except for LLLTgroup. LLLT treated group showed reduction but not significant in pain at 6 hours, lornoxicam group showed significant reduction in pain at 6 hours and day 2 as compared with other tereated groups, dexamethasone and placebo groups showed significant reduction in pain at 6 hours, day 3 and day 4 as compared with other tereated groups Table (1)

Table (1): Pain measurements (VAS) among study groups

Time interval	Control	Dexamethasone	Placebo	Lornoxicam	Laser	Laser+ Lornoxicam	*P* value †
6 hours	3.29(2.4)	0.54 (1.01)*	0.88 (1.3)*	1.50 (2.5)*	2.71 (2.8)	0.67 (1.2)*	0.004
Day 2	0.67 (1.07)	0.09 (0.28)	0.08 (0.28)	0.01 (0.02)*	0.25 (0.86)	0.33 (0.77)	0.182
Day 3	1.42 (2.35)	0.01 (0.02)*	0.08 (0.28)*	0.50 (1.00)	0.33 (0.88)	0.67 (1.30)	0.080
Day 4	1.42 (2.7)	0.01 (0.02)*	0.08 (0.28)*	0.33 (0.88)	0.25 (0.86)*	0.33 (1.15)	0.117
Day 5	0.67 (1.77)	0.01 (0.02)	0.08 (0.28)	0.17 (0.57)	0.17 (0.57)	0.01 (0.02)	0.355
Day 6	0.42 (0.99)	0.01 (0.02)	0.04 (0.14)	0.01 (0.02)	0.17 (0.57)	0.01 (0.02)	0.229
Day 7	0.17 (0.57)	0.01 (0.02)	0.04 (0.14)	0.01 (0.02)	0.08 (0.28)	0.01 (0.02)	0.660
No. of tablets	1.58 (1.56)	0.83 (0.83)	0.75 (0.96)	0.75 (1.13)	1.50 (1.62)	1.17 (1.33)	0.396
Time to 1st tablet	3.00 (3.10)	3.08 (3.84)	3.08 (4.31)	2.58 (4.01)	5.21 (4.27)	2.50 (4.66)	0.610

Data presented as mean (standard deviation). † ANOVA. * Significantly different compared with control (*P*<0.05).

DISCUSSION

Visual analogue scale for measuring pain is universally accepted method which enables making a logical comparison among different studies. It also allows parametric tests in statistics to be used as it

provides continuous data. Objective assessment of pain by counting the number of rescue painkiller also provided additional information to support the subjective measurements of pain (through VAS) . [16,17] Regarding pain, there were significant differences for all treated groups on (6 hours) post operatively as compared with control group except LLLT group. LLLT treated group showed reduction but not significant in pain at 6 hours, a finding which disagrees with kreisler *et al.* [13] who found a significant effect on the first postoperative day only. This might be attributed to a vanishing laser effect after 24 h. However the positive clinical potency of a soft laser treatment in routine endodontic surgery seems to be primarily caused by a placebo effect, which agrees with payer *et al*. [18]

The submucosal injection of lornoxicam has not been used in the periapical surgery before; in the present study we used submucosal injection of lornoxicam to reduce pain after this type of surgery, depending on previous reports which found that preoperative lornoxicam administration resulted in a significant enhancement of postoperative analgesia by peritonsillar infiltration of lornoxicam after tonsillectomy in adults, [19] and by wound after thyroidectomy. [20]Lornoxicam group showed significant reduction in pain at 6 hours and day 2 as compared with other treated groups, a finding agrees with previous studies. [20,19]

Dexamethasone and placebo groups showed significant reduction in pain at 6 hours, day 3 and day 4 as compared with other treated groups this result agreement with Shah *et al*. study . [21] The investigations in our study indicate that local dexamethasone was more effective in reducing the pain as compared to the patients without steroid injection and those receiving other types of treatment. These results imply that with a single local dexamethasone administration, the repository is significant throughout the first six postoperative days and that additional doses may not be necessary. The technique is quite simple, less invasive, painless (given in an anesthetized region), and convenient for the surgeon and patient and offers a low-cost solution for the typical patient discomfort associated with the surgical endodontic procedures. Injection after surgery offers the advantage of concentrating the drug near the surgical area with less systemic absorption. [22,23]

CONCLUSION

Submucosal dexamethasone 4mg injection is an effective therapy for reducing postoperative pain after periapical surgery. The treatment offers a simple, safe, painless, noninvasive and cost therapeutic option for moderate and severe cases. LLLT and submucosal lornoxicam seem to have little effect in this regard and found to be associated with some discomfort and inconvenience in many cases.

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