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Evaluation of Dexamethasone Irrigation in Third Molar Surgery and Reduction in Pain and Post-Operative Edema – A Split Mouth Study

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ABSTRACT

Background: Disimpaction of third molars is a routine procedure performed by the oral and maxillofacial surgeon. This procedure embraces keen expertise from the surgeon to facilitate a smooth post-operative sequela. The study employs the use of diluted dexamethasone locally as intraoperative irrigation solution compared to saline being the gold standard. Aim: The study aims to evaluate the use of dexamethasone irrigation in third molar surgery and observe the reduction of postoperative pain and edema. Materials and Methods: The study consisted of 20 participants with bilateral impacted horizontal mandibular impacted teeth postion B class 2 (Pell and Gregory) who has received diluted dexamethasone with saline solution on one side(Group D) and plain saline (Group C) on one side. The first surgery was followed by the second tooth removal surgery after minimum of 15 days. The post-operative edema at both the surgeries was measured after 48 hours. The post-operative pain measurement was carried out using the VAS score at 8,16,24,48 hours post operatively. Patients were asked to maintain a 4 part diary post operatively for the same.

Results: A total of 12 males and 8 females were included in the study with a mean age of 27.35 years. The average swelling on the side receiving plain saline solution as irrigant was 10.29±0.81cm and that in the dexamethasone group 9.96±0.68cm with p=0.171. The average pain score at 8,16,24,48 hour period was found to be 5.75, 4.5, 2.7, 2.2 in Group C and 5, 2.75, 2.25, 1.6 in group D respectively with a respective p values of: p= 0.78, p=0.000, p=0.184 and p= 0.009 repectively. Conclusion: Intraoperative dexamethasone irrigation provides significant reduction of the postoperative pain and helps in managing the post-operative sequale of the disimpaction of teeth. Further research could facilitate the routine use of dexamethasone in clinical practice.

Keywords: Dexamethasone, Third Molar Surgery, n Pain and Post-Operative Edema, Split Mouth Study

INTRODUCTION

The extraction of impacted third molars is a common yet complex procedure in minor oral surgery performed globally. Despite its frequency, many aspects of third molar surgery remain ambiguous and have sparked considerable debate over the years. Although substantial literature exists on the surgical removal of impacted third molars, it is surprising how many concepts still lack clarity.[1] The majority of available research focuses primarily on managing or preventing postoperative complications following third molar surgery, rather than on the techniques and methods of the extraction itself.[2] Modern oral and maxillofacial surgery strives to minimize postoperative effects using various strategies. One such strategy involves the use of analgesics, which were initially administered postoperatively to alleviate pain. However, there is now a growing trend among surgeons to prescribe preemptive analgesics as a preventive measure to reduce discomfort immediately following third molar surgery. [1-4]

Less invasive flap designs have been shown to yield better outcomes, resulting in minimal postoperative swelling and trismus. In a comparative study examining various flap designs for third molar surgery, the author concluded that there is no significant correlation between flap design and postoperative complications. Additional methods to mitigate postoperative issues include the use of corticosteroids, sutures, and therapies such as ozone therapy, cryotherapy, platelet-rich plasma and fibrin, lasers, and piezoelectric surgery.[5-9] While a range of techniques has been employed to reduce postoperative complications, fundamental practices like thorough saline irrigation during tooth sectioning and bone removal can effectively prevent issues like alveolar osteitis and reduce swelling, trismus, and pain.

One powerful anti-inflammatory medication, dexamethasone, has long been recognized for its ability to decrease postoperative swelling. Dexamethasone has been found to alleviate swelling, pain, and trismus.[2,5] Studies have investigated the administration of dexamethasone via intramuscular and submucosal routes. However, the improper use of dexamethasone can lead to adrenal insufficiency, and since the drug's effects are needed locally, systemic administration may not be necessary. The submucosal route has fewer side effects compared to the intramuscular route. As an alternative, we have utilized an 8 mg dose of dexamethasone mixed with saline as an irrigant to assess its effectiveness in reducing postoperative complications following lower third molar surgery.

Materials And Methods

Study design

The study is a prospective, split mouth study. All patients were informed of the methodology and signed an approved informed consent form preoperatively. Institute ethical committee was notified and approval sought before the start of the study

Sample selection

Inclusion criteria for the study include patients between 18-55 years of age belonging to both genders. Pell & Gregory and Winter's classifications are used to identify symmetrical bilateral bony horizontal impaction at position B class II. Exclusion criteria include pregnancy, breastfeeding any known allergies and use of other drugs during the postoperative period except those prescribed. Patients presenting with pain during examination were also excluded as previous infection could be a confounding factor to the study. Sample size was calculated a priori as n = 40 using the mean and standard deviation of test and control groups of a previous study. Post-operative pain and edema were considered primary outcome.

Patients who are referred to the Department of Oral and Maxillofacial surgery and are willing are enrolled in the study. The teeth are randomly allowed into two groups: the side receiving dexamethasone 8mg in 50 ml saline and control side receiving saline. The side of chief complaint is selected to be operated first. Both solutions were colourless and had similar appearance.

Surgical procedures

Patients underwent removal of bilateral inferior third molar respecting an interval period of at least 15 days between each side. An oral and maxillofacial surgery specialist performed all surgeries. He was blinded to groups and to randomisation. Surgeries were carried out under local anesthesia, using 2% lidocaine with 1:80,000 adrenaline. A mucoperiosteal flap was raised distally to the second molar providing access to the impacted third molar. Osteotomy and sectioning of crown and roots were performed using a 702 straight fissure bur, under continuous irrigation with one of the solutions:dexamethasone 8mg in 50ml saline or saline. After the extraction, the dental socket was inspected, curetted, and irrigated with the remaining volume of the solution and retained in the socket for 3 minutes uniformly across the groups. Primary closure was achieved with 3−0 silk sutures. The

operating time was recorded from incision to end of suture. The any remaining solution was used for irrigating the socket so as to keep the dosage of the drug uniform among the subjects. All patients received the same postoperative medication

Edema measurements

Percentage of swelling was measured by the same surgeon blinded to the groups. Patient rested with closed mouth maintaining the Frankfurt's plane parallel to the floor. Using a flexible millimeter tape three linear distances were carried out between four fixed anatomical points, as follows: tragus to labial commissure (Tr-Lc), gonial angle to labial commissure (Ga-Lc) and gonial angle to eye corner (Ga-Yc). The measurements were obtained 48 h after surgery. Figure 1 shows collage of the measurements being performed on the 48h mark post-operatively.

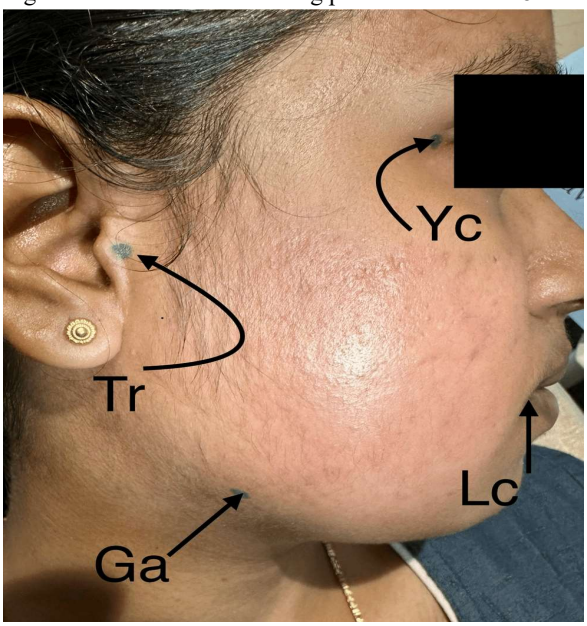

Figure 1: Post-operative edema measurement taken at 48 hours after surgical extraction of the impacted teeth.

Tr- Tragus
Lc- Labial Commissure
Yc- Lateral Canthus
Ga- Gonial Angle

Pain level assessment

Post-operative pain assessment was identified using the Visual Analog Scale (VAS), amount of analgesic intake, interval between the end of the surgery and the use of the first analgesic tablet were considered pain level parameters. After surgery, beside routine postoperatory recommendation patients were instructed to fill out a 4-part diary indicating the same.

Statistical Analysis

The data were collected and analyzed using the various statistical vehicles so as to provide relevant scientific data. Statistical analysis was conducted using SPSS software version 23.0 (IBM Corp., Armonk, NY). An independent sample t-test was employed to compare means of the variables. The Shapiro-Wilk test was embraced to understand the normal distribution of data. Significance was fixed at a p-value < 0.05.

Results

The participants included in the comparative study were 12 males and 8 females. The mean age of the participants was 27.35 years and the most common chief complaint was food lodgment and therapeutic extractions as a result of orthodontics. Pell & Gregory and Winter's classification are used to identify symmetrical bilateral bony horizontal impaction at position B class II were included in the study. Table 1 illustrates the patient wise collected data from the two groups.

Table 1: The post-operative pain and edema measurement done in Group C (normal saline) and Group D (Dexamethasone) among the 20 patients.

Patient No.	Type of Impaction	Tooth Extracted	Group	Measured Edema (cm)	VAS Score				Group	Measured Edema (cm)	VAS Score			
					8h	16h	24h	48h			8h	16h	24h	48h
1	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.4	6	4	2	2	D	9.7	5	2	2	2
2	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.3	6	5	3	3	D	9.3	6	4	2	2
3	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	11.2	5	5	2	2	D	10.4	4	4	4	2
4	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.5	8	7	4	2	D	10.1	5	1	1	1
5	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.7	6	5	2	2	D	11.2	3	3	2	2
6	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.3	6	5	3	3	D	9.3	3	2	2	1
7	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	11.8	4	3	2	2	D	8.9	6	3	3	1
8	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	11.2	4	4	1	1	D	9.7	8	3	3	2
9	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.3	5	4	3	2	D	10.2	5	2	2	2
10	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.1	7	4	3	3	D	10	4	3	2	1
11	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.6	6	3	2	2	D	11	6	3	2	1
12	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.4	5	4	1	1	D	10.5	6	1	1	1
13	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.3	5	5	2	2	D	9.4	6	3	2	2
14	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.4	4	4	3	3	D	9.7	5	2	2	2
15	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.7	8	7	5	1	D	9.3	3	3	3	2
16	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	11.5	8	5	5	4	D	9.9	4	3	1	1
17	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	10.9	5	4	3	3	D	10.4	4	2	2	2
18	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	11.2	5	3	2	2	D	9.3	6	4	3	2
19	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.9	6	5	3	1	D	9.6	4	2	1	1
20	Pell and Gregory Class II, Position B ,Horizontal	38,48	C	9.1	6	4	3	3	D	11.3	7	5	5	2

Edema measurement:

The average edema measured in the side using dexamethasone irrigation was 9.96±0.68cm and that in the group receiving plain saline was 10.29±0.81cm the difference was found to be statistically insignificant (p=0.171). The individual 20 patients and their respective edema measurements are charted as illustrated in Figure 2.

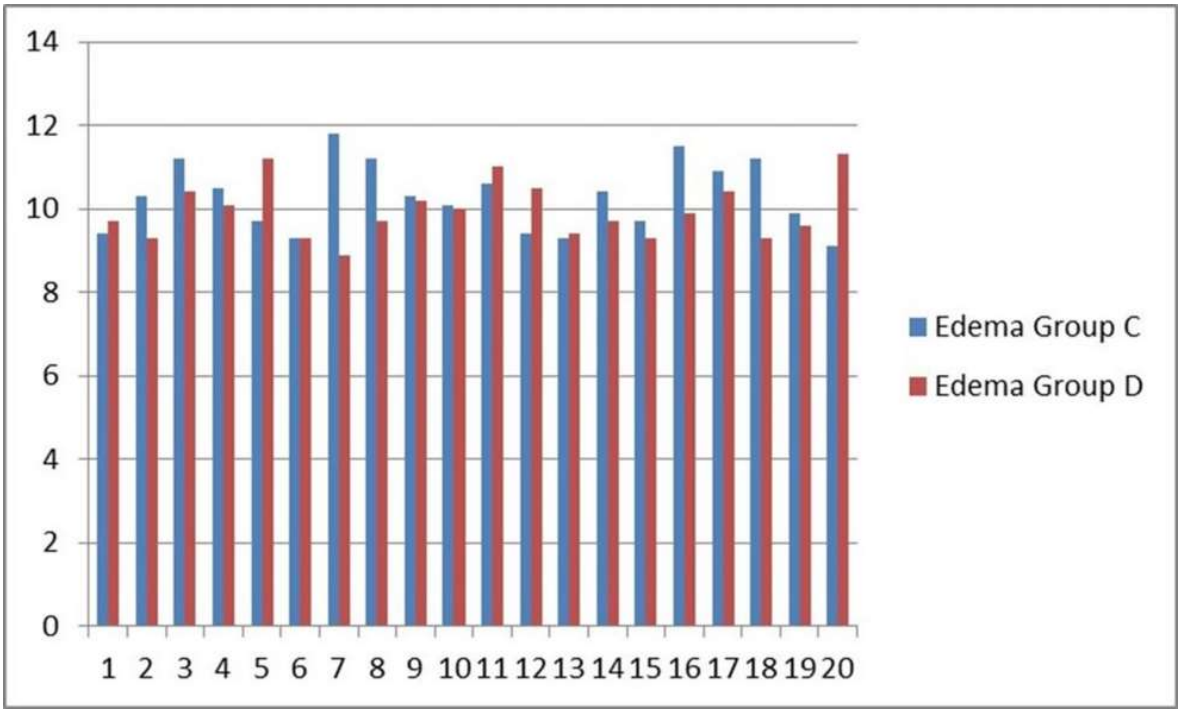

Figure 2: Graphical illustration of the swelling experienced by the 20 patients

Pain Assessment:

The analogue scale- visual analogue scale was employed to measure the pain measurements post-operatively. The post-operative period was monitored using the 4 part diary in which the VAS score was incorporated. None of the patients had to take additional analgesics or encountered any adverse reactions such as bleeding, dizziness, anxiety, vomiting and allergic reactions. The patients were prescribed analgesics two times a day. The average pain score in the group irrigated with plain saline at the 8,16,24 and 48 hour mark was 5.75, 4.5, 2.7, 2.2 respectively. While that in the group irrigated using dexamethasone was 5, 2.75, 2.25, 1.6 respectively. The difference between the groups was calculated and significant reduction in pain was observed at the 16th hour p=0.000($p<0.05$). While the difference in the 8h and 24h time period was statistically insignificant p=0.079 and p=0.184 respectively. At the 48 th hour patient was recalled to assess the swelling. During this period patients reported a higher pain in the side receiving dexamethasone irrigation which was statistically significant p=0.009($p<0.05$). Figure 3 illustrates the fall in the pain score consecutively at the 8h,16h,24h,48h time periods in both the groups.

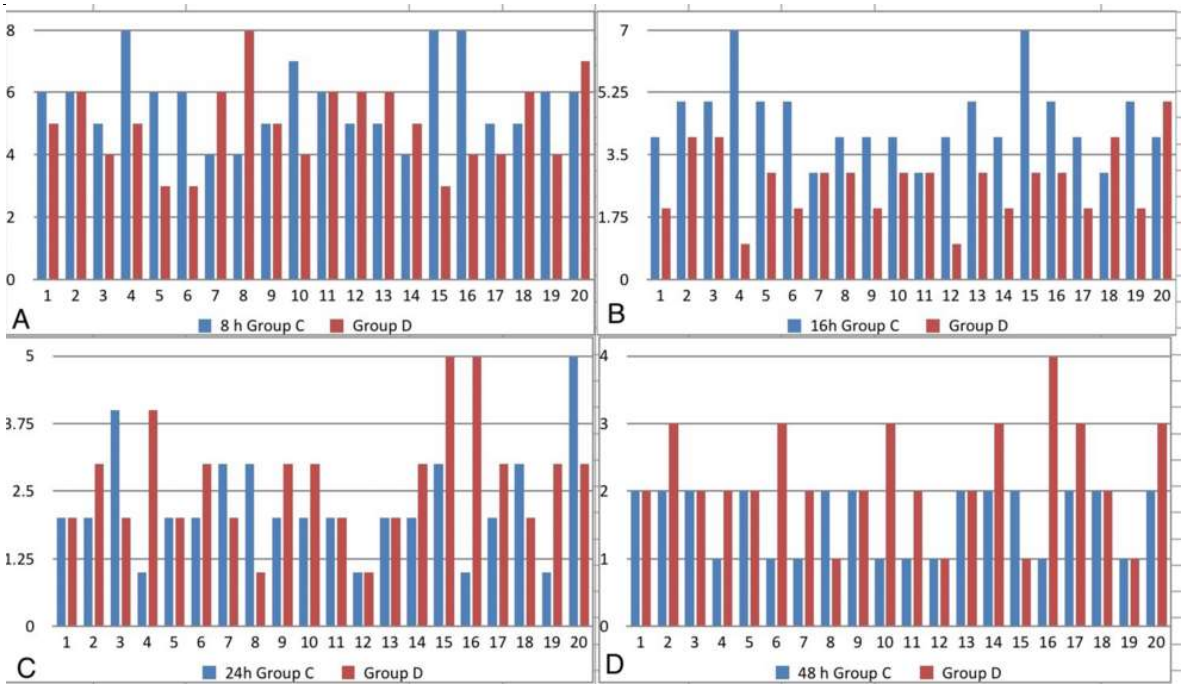

Figure 3: Visual Analogue Scale recorded at various time periods. A- 8 hours post-operatively, B- 16 hours post-operatively, C- 24 hours post-operatively, D- 48 hours post-operatively

Discussion

Being a common procedure in minor oral surgery, the extraction of impacted lower third molars requires extensive expertise to effectively manage prevalent postoperative issues such as pain, swelling, and trismus. These complications frequently dissuade patients from undergoing surgery. Typically, discomfort peaks in the initial three to four days following the procedure, necessitating robust management strategies.[11]

Numerous studies have explored a plethora of methods to alleviate early postoperative discomfort, primarily focusing on the administration of analgesics. However, while these provide temporary relief, pain often recurs before the next dose is due. To address swelling, corticosteroids like dexamethasone are commonly administered intravenously or intramuscularly. Recent research has also investigated the localized application of dexamethasone, demonstrating significant reductions in pain, swelling, and trismus following surgery.[12]

Moreover, dexamethasone's ability to inhibit prostaglandin production has been linked to its efficacy in pain management.[10] Comparative trials have shown dexamethasone to be superior to other corticosteroids like methylprednisolone in controlling pain and swelling associated with lower third molar surgery. However, existing studies primarily administer dexamethasone via systemic or localized routes. This could prove too invasive and provide undesirable systemic effects. Hence a local delivery with minimal systemic uptake is ideal.[2,11-12]

In the current study, split mouth study design facilitated best sample standardization. The participants belonged to the age group where systematic conditions could not confound the result. The edema measurement from the 4 points is a repeatedly tested method of facial swelling measurement by various previous studies. The difference in edema, although not statistically significant, was clinically appreciable. The 16h pain reduction could indicate the specific role of the corticosteroid in controlling inflammation. The 48h pain spike among the group irrigated with dexamethasone is a very interesting observation. This could be as an effect that either could be attributed to the stress of revisiting the surgeon (as edema measurements were performed at the 48 h mark) or underlying physiology of the drug dexamethasone having a half-life of 36-56 hours. Besides, significant post-operative sequel modification could be achieved with the use of dexamethasone as an irrigant.

Limitation

The study has limited sample size and employs subjective scales to measure pain. The samples being split mouth study are highly specific hence generalizability could be achieved with a diverse group of samples.

Conclusion

Dexamethasone irrigation effectively reduces post-operative pain 16 hours after the procedure amongst the included groups. The clinical practice using dexamethasone as an intraoperative irrigant could improve the postoperative sequel following third molar impaction surgeries. With further research the findings of this study can be embraced for routine clinical practice

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