EFFECT OF PROPHYLACTIC INFILTRATION INJECTION OF DEXAMETHASONE IN RELIEVING POST ENDODONTIC PAIN

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ABSTRACT:

The ability of prophylactic infiltration injection of dexamethasone to control the post endodontic pain was compared with that of placebo infiltration injection and oral administrated NSAID. 208 patients were divided into four groups, each of 52 cases. The first two groups received a preoperative periapical infiltration injection in a double-blind base, of either 0.2ml of dexamethasone diluted with 1.6 ml local anesthetic solution or placebo (1.8 local anesthetic solution alone), as close to the apex of treated tooth.

The patients of the other two groups, orally administrated single dose (two tablets 20mg each) of fast dissolving piroxicam preoperatively. While in the fourth group, additional regular dose of the same drug, twice daily, was given for three days postoperatively. The pain intensity was recorded 24 hours and 3 days after endodontic treatment and statistically analyzed by chi-square test. The results showed that the intra-oral infiltration injection of dexamethasone significantly reduced pain with no further complication after root canal obturation. No patient of dexamethasone infiltration group complained of severe pain. On the contrary, 51.9% of patients infiltrated with placebo and 50% of the patients, orally administrated preoperative single dose of piroxicam, complained of severe pain after 24 hours while 38.5% and 36.5% after 3 days of such treatments. However, the additional regular dose of piroxicam administrated for 3 days was able to reduce the intensity of pain. The oral administration of prophylactic single dose of piroxicam was insignificant difference to placebo infiltration injection.

The wide spread image of endodontic therapy is that of a painful experience\(^{(17)}\). The postendodontic pain is considered the most serious sequale that is annoying both the patient and the dentist. Severe pain has been recorded whether the root canal instrumented and/or obturated following single or multiple visit endodontic treatment\(^{(7,23)}\).

One of most common causes of post endodontic pain is the inflammation of periapical tissues produced by the chemical agents used during biomechanical instrumentation, intracanal medication and/or root canal obturation\(^{(18,22)}\).

The postoperative pain usually reaches its maximum intensity during the first postoperative 12 hours\(^{(25)}\). The severity of pain may persist from several hours to several days according to the severity and/or nature of the damaging agent and the tolerance ability of periapical tissues\(^{(14)}\).

Numerous drugs have been prescribed to manage or diminish the postoperative sequelae. The most traditional analgesics used are aspirin, acetaminophen combined with codeine and non steroidal anti-inflammatory drugs (NSAIDs). All of them have been approved for usage as dental analgesics\(^{(10,17,18)}\).

Most of analgesic drugs used may produced unwanted side effects. It was suggested that aspirin inhibited the platelet aggregation with a significantly increase in bleeding time, when used before surgery\(^{(6)}\). However, there was no significant difference of pain experience on third day after surgery\(^{(10)}\). It may also induce gastric ulcer in some patients. Acetaminophen was recommended in such patient, having no side effect limitation\(^{(6)}\), however, it had weak anti inflammatory activity producing mild pain.

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Non steroidal anti-inflammatory drugs are proved to be effective in reducing the post endodontic pain\(^{(17,18,22)}\). Statistical analysis by Negm 1989\(^{(18)}\), revealed that both piroxicam and diclofenac significantly reduced the mean pain score. He reported that the pain was relieved 2 hours after the initial dose of piroxicam while diclofinac required longer time to reach maximum effectiveness. He also recommended the use of drug for three consecutive days, where the pain return shortly after the medication discontinued. Furthermore, the prolonged administration of such drug may produce some gastrointestinal toxicity and intolerance\(^{(10)}\), such as drowsiness, nausea, vomiting, heart burn, headache, abdominal discomfort and indigestion\(^{(10,18)}\). Diflunisal was found to interfere with fibrinolytic activity inducing clot lysis and dry socket after extraction of third molar\(^{(10)}\).

Many attempts were tried to relief the post endodontic pain by using prophylactic local infiltration injection. Nevins et al. 1994\(^{(19)}\), used antihistamine injection (Benadryl) to prevent the pain resulting from initial instrumentation of necrotic pulp. Unfortunately, they showed no significant reduction of pain scores.

Penniston and Hargreaves 1996\(^{(22)}\), managed the endodontic pain using periapical injection of 30mg ketorolac or placebo followed by intramuscular injection of either drug. The results indicated that the intra oral infiltration of ketorolac followed by intramuscular injection of placebo, produced significant analgesic effect for 60 minutes.

Although the corticosteroids are considered to be successful anti-inflammatory agents, it is rarely used by dentist because of many theoretical complications.

It may interfere with repair process and the immune mechanism of microorganisms. The use of steroids does of course carry this hazard, however, when used for short duration it may seem to be no practical contra indications with symptomatically free patients\(^{(2)}\).

The aim of the present study was to evaluate the effect of prophylactic periapical infiltration injection of dexamethasone versus placebo infiltration injection and the oral administration of NSAIDs (piroxicam) in eliminating post endodontic pain.

**MATERIALS AND METHODS**

Total of 208 adult patients was chosen for this study. The selected cases came to the clinic requiring conventional endodontic treatment because of exposure, inflammation or necrosis of the pulp. Any patient complaining of systemic disease or acute periapical abscess was excluded from this study.

The preoperative data for each treated case were recorded in the patient’s chart including age, sex, condition of the pulp whether vital or non vital, experience of pain, intensity and duration of pain (if present), sensitivity to percussion and condition of periapical tissues (with or without radiolucency). Any tooth with open apex was also discarded to avoid the high probability of post operative pain due to the possibility of over instrumentation.

The treatment was performed either in single or multiple visit technique depending on the time available for treatment and the condition of the tooth. Each root canal was instrumented to the length 1mm short of radiographic apex. Instrumentation was carried out by means of hand reamers and files under copious irrigation of 2.5% sodium hypochlorite, up to a size that would allow an acceptable lateral condensation gutta percha filling technique to be performed. After root canal obturation, the access cavity was temporary sealed, to ensure that the patients would come for follow up.

On entry of the study, labeled carpules were prepared with either 0.2 ml of 4mg/ml dexamethasone (0.8mg) (decadron E.I.P.I.Co. A.R.E), diluted with 1.6 ml of anesthetic solution (Mepecaine -L Alexandria Co. pharmaceuticals, Egypt), or placebo (1.8ml of local anesthetic solution alone).

The selected cases were randomly divided into four groups (52 of each). In the first two groups, each treated tooth received preoperative prophylactic intra-oral infiltration
injection of either solution in a double-blind base. The solution was injected as close to the root apex as of treated tooth possible.

The patients of the other two groups orally administrated prophylactic single dose of two tablets (20mg/ tablet) of fast dissolving piroxicam (Feldene Flash, Pfizer, Egypt. A.R.E.) preoperative to endodontic procedures.

In the fourth group, the patients received additional regular dose of the same drug twice daily, for three days postoperatively.

The patients were asked to recall 24 hours and 3 days after treatment. The degree of pain can be recorded at each observation period according to the following:

No pain: where there was no pain or tenderness to percussion.
Mild pain: where there was slight pain or tenderness to percussion but not need any additional analgesic.
Moderate pain: where there was pain requiring additional dose of analgesic.
Severe pain: where the patient complained much pain and tenderness with occlusion, persisted with additional dose of analgesic.

The data of pain incidence were statistically analyzed by chi-square test to determine the significant relationship between the tested groups.

RESULTS

A total of 208 patients were evaluated for postoperative pain. The ability of different medications used to control the post endodontic pain was represented in table (1). The dexamethasone intra-oral infiltration injection was highly significant the post endodontic pain versus placebo infiltration injection ($\chi^2 = 124.349$ at $P < 0.005$) and oral administration of piroxicam ($\chi^2 108.998$ and $60.959$ at $P < 0.005$).

No of patients received preoperative prophylactic dexamethasone injection complained of severe pain postoperatively. While 51.9% of patient infiltrated with placebo and 50% of the patients orally premedicated with single prophylactic piroxicam exhibited severe pain in the first day. This experience of severe pain persisted for three days in 38.5% and 36.5% of these groups. There was insignificant difference between the prophylactic orally administrated single dose of piroxicam versus placebo infiltration ($\chi^2 = 2.161$ at $P < 0.05$).

In the fourth group, 19.2% of the patients complained severe pain in the first 24 hours. This percentage decreased to 7.7% at the third day with regular administration of piroxicam.

84.6% and 94.2% of patient infiltrated with prophylactic dexamethasone were completely comfortable without any complaint of pain or even tenderness with occlusion. The use of periapical dexamethasone, infiltration injection preoperatively highly significantly relieved the post endodontic pain ($\chi^2 = 94.329$ and $88.394$ at $P < 0.005$).

There was no evidence of swelling or subsequent infection after root canal obturation in patients of this group. Only one case (1.9%) attended the clinic at the first 24 hours after root canal instrumentation, complaining of moderate pain. When the temporary filling was removed, there was pus oozing from the root canal. The root canal was managed with calcium hydroxide dressing and then obturated without any further complication postobturation.

Figures (1 and 2) showing histograms for pain incidence in all tested groups at the first and third days postoperatively.
Table (1): Representing number of patients exhibiting different type of pain following different methods used.

<table>
<thead>
<tr>
<th></th>
<th>Dexamethasone infiltration</th>
<th>Placebo infiltration</th>
<th>Single oral dose of piroxicam</th>
<th>Reg. oral dose of piroxicam</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 hours</td>
<td>3 days</td>
<td>24 hours</td>
<td>3 days</td>
<td>24 hours</td>
</tr>
<tr>
<td>Nopain</td>
<td>44*</td>
<td>84.6%</td>
<td>49*</td>
<td>94.2%</td>
<td>6</td>
</tr>
<tr>
<td>Mild</td>
<td>5</td>
<td>9.6%</td>
<td>2</td>
<td>3.9%</td>
<td>8</td>
</tr>
<tr>
<td>Moderate</td>
<td>3</td>
<td>5.8%</td>
<td>1</td>
<td>1.9%</td>
<td>11</td>
</tr>
<tr>
<td>Severe</td>
<td>0*</td>
<td>0%</td>
<td>0*</td>
<td>0%</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>100%</td>
<td>52</td>
<td>100%</td>
<td>52</td>
</tr>
</tbody>
</table>

$X^2$ (at 24 hours) = 94.3287   Highly Significant at $P < 0.005$

$X^2$ (after 3 days) = 88.3942   Highly Significant at $P < 0.005$

There was a highly significant difference at $p < 0.005$.

Fig. (1): Histogram of pain incidence in the four treated groups, 24 hours postendodontic treatment.

Fig. (2): Histogram of pain incidence in the four treated groups, 3 days postendodontic treatment.
DISCUSSION

Management of postoperative pain is a problem for dentists. The inhibition of inflammatory process is one of the methods employed to reduce or prevent the pain during and after treatment. As the tissue is injured during the biomechanical instrumentation, local chemical mediators (such as bradikinin, histamine, prostaglandin and leukotrienes) can be released at the site of injury subsequently causing vascular changes, inducing the postoperative sequelae of pain and/or swelling\(^{(26)}\).

Arachidonic acid is released from the damaged cell membrane leads to formation of prostaglandin in the presence of cyclooxygenase enzyme. This prostaglandin has a significant role in initiating pain by sensitizing nociceptors. Recently, prostaglandins and the interleukins were detected in acute and chronic inflammations\(^{(3,15,21)}\). On the other word, the interleukin-1 was considered a proinflammatory cytokine that potentially activate synthesis of prostaglandins\(^{(12)}\).

A general feature of the present study, the patients with no evidence of periapical lesion who exhibited the most post endodontic pain than those with periapical radiolucency. It is in agreement with other studies\(^{(1,13)}\).

During the statistical analysis, there was a significant reduction in pain incidence in patients received prophylactic intra-oral infiltration dexamethasone infiltration versus the placebo injection or oral administration of nonsteroidal antiinflammatory drug (piroxicam).

The intra oral injection of corticosteroid is not a new approach in dentistry. It has been used previously to reduce the post operative swelling and trismus following surgical removal of impacted third molar\(^{(8)}\). It was able to produce a significant reduction of edema in the first 4 postoperative days as compared to systemic administration of the drug.

Recently, dexamethasone was reported to be a potent inhibitor to the prostaglandin and interleukins in inflamed gingival and periodontal tissues, to almost control level\(^{(21)}\).

The ability of steroid to eliminate the post endodontic inflammation and pain may be impaired by its danger of causing adrenal suppression and masking some signs of infection\(^{(9,24)}\). However, the single or short term use at high dose was proved to be safe procedures in the absence of contraindication to its use\(^{(2,27)}\). This seems to support the present results where there was no evidence of infection subsequent to intraoral local injection of dexamethasone. Only one case exhibited pus oozing after root canal instrumentation. This patient had previous history of repeated flaring-up. This observation may be attributed to the presence of obligate anaerobic organisms that activated with the root canal instrumentation\(^{(5)}\). The same result was obtained previously. It was detected that dexamethasone is a powerful anti-inflammatory agent when immediately injected intraorally. While only one case recorded with postoperative infection\(^{(8)}\).

Covington et al. 1985\(^{(7)}\), suggested that the parenteral injection of steroids may cause atrophy at the site of injection, depending on the size of dose, its duration and repeated injection in the same site. There was no complication in the present study where the drug was used in small single dose (0.8mg) diluted with local anesthetic solution. According to Brown and Pearson 1962\(^{(4)}\), 0.75mg of dexamethasone was needed to induce a metabolic effect.

Williamson et al.1980\(^{(27)}\), demonstrated that the use of 2ml of 4mg/ml solution of dexamethasone (total of 8mg) produced initial suppression of hypothalamic pituitary system that was responsible for preventing postoperative sequelae. A complete return to normal function has occurred with one week of short term of dexamethasone. While the undesirable hormonal effects were reversible and disappeared by discontinuity of steroids\(^{(16)}\).

Using nonsteroidal anti-inflammatory drug (piroxicam) was also effective for pain control. However, the single oral administration of the drug failed to reduce the
pain incidence. 50% of this group exhibited severe pain in the first 24 hours following endodontic treatment. This percent was reduced only to 36.5% after 3 days. The prophylactic single oral administration of piroxicam was insignificantly reduce the post endodontic pain versus placebo infiltration injection.

Krasner et al. 1986(11), also determined that the oral administration of dexamethasone significantly reduced the postoperative pain than those of placebos, when 7 tablets were taken along the first day(11).

The regular oral administration of piroxicam was able to reduce the severity of pain incidence. However, some patients complained of gastrointestinal pain. Morse et al. 1990(17), reported that the posttreatment prophylactic administration of diflunisal resulted in a statistically significant reduction in endodontic postoperative pain than that of on-demand usage of diflunisal. It was also suggested that the nonsteroidal anti-inflammatory drugs inhibited the cyclooxygenase enzyme preventing the formation of prostaglandin(9,28). While the medication must be extended for 3 days to obtain successful results(18).

Recently, indomethacin, can also inhibit the interleukins and prostaglandins with subsequent inflammatory process(12,21). The intraoral injection of Ketorolac was proven to be a useful adjunct in management of endodontic pain patients. It reduced the pain for 60 minutes, however, it combined with intramuscular injection of either ketorolac or placebo(22).

CONCLUSION

From this study we can conclude the following:
1- Prophylactic periapical infiltration of 0.2ml of 4mg/ml dexamethasone (total 0.8mg) diluted with 1.6ml local anesthetic solution prior to endodontic treatment was significantly effective for relieving the post endodontic pain.
2- This dose seems to be safe in healthy patients without further complications following root canal obturation.

3- Prophylactic preoperative oral administration of nonsteroidal drug (piroxicam) failed to reduce the severity of post endodontic pain unless it was followed with regular oral dose of the drug for 3 days postoperatively.

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