EFFICACY OF TRANSDERMAL KETOPROFEN PATCH AND DICLOFENAC PATCH IN THE MANAGEMENT OF POST OPERATIVE PAIN AFTER THERAPEUTIC EXTRACTION- A CLINICAL STUDY.

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ABSTRACT

Aim: Aim of the current study was to assess the effectiveness of two different transdermal patches (ketoprofen patch versus diclofenac patch) for managing post-operative pain after extraction of first premolars for orthodontic reasons.

Materials and Methods: Forty patients in the age range of 18-25 years regardless of the gender constituted the study group. Every study subject underwent bilateral removal of premolars in adjoining quadrants as a part of orthodontic therapy. The extraction was performed following stringent asepsis. Subsequent to removal of the teeth, all 40 (twenty in each group) patients were randomly allocated to either of the following investigational groups: Group I: Transdermal Ketoprofen Patch, Group II:Transdermal Diclofenac Patch. The outcomes of this research were evaluated on the first as well as the third day post-extraction. Post operative pain was analyzed with a four-point Visual Analogue Scale (VAS). A scale grading that ranged from very satisfied to very unsatisfied was employed to subjectively evaluate patient contentedness.

Results: The mean age of group I study participants using the transdermal ketoprofen patch was 21.20±0.96 years which was slightly less than the mean age in group II with Transdermal Diclofenac Patch that is 22.12±1.08 years. It was noted that participants using transdermal ketoprofen patch exhibited somewhat improved level of contentment compared to the participants using transdermal diclofenac patch. However, these differences in the satisfaction levels of subjects in the two groups were not significant statistically. The numbers of participants experiencing moderate pain were greatly reduced on day 3 in group I in comparison to group II. Additionally, greater numbers of study subjects documented absence of pain in group I on day 3.

Conclusion: The current research concluded that ketoprofen as well as diclofenac transdermal patches aid in the management of pain that occurs post-operatively. However, it was seen that the ketoprofen patch offered a superior analgesic effect as compared to the diclofenac transdermal patch subsequent to extraction of teeth for orthodontic reasons.

Keywords: Diclofenac, extraction, ketoprofen, transdermal
I. INTRODUCTION:

The basis of triumphant dental management is a combination of accurate operative method as well as the preclusion and treatment of complications following the operative procedures. Pain after dental extraction is a frequent menace for oral surgeons leading to continuous search for analgesia that can render an intense analgesic effect with ease of patient tolerance, thereby enhancing patient compliance.¹

For several years, the non-steroidal anti-inflammatory drugs (NSAIDs) have been used as analgesics in dental practice. Nevertheless, the toxicity associated with use of NSAIDs has become alarming owing to their prevalent use. Administration of analgesics can be done through several routes such as oral, parenteral, transdermal or inhalational. High first pass metabolism along with considerable decrease in drug amounts prior to its systemic absorption is the chief disadvantage of oral route. On the other hand, administering medicines parentally is highly painful with the risk of abrupt raise in plasma drug levels that can lead to adverse outcomes.²

Lately, medications have been developed to travel cutaneously thereby having tissue-effects adjoining the application area or be effective following delivery via the circulation.³ This rationale paved the path of transdermal patch development. The transdermal/skin patch refers to an adhesive patch that is medicated and is positioned cutaneously to carry a particular drug dose across the skin in to the circulation. Transdermal medicine delivery method renders a technique for sustained delivery of the medication, thereby reducing the strength of action and the ensuing side effects related to oral administration.⁴

Transdermal route offered by these patches have numerous benefits in comparison to oral administration including avoidance of first pass metabolism, sustained and non-rapid absorption, steady plasma levels that remain for prolonged time periods, lack of patient dependence for drugs, preventing gastric distress, plus flexibility of cease drug delivery by merely taking off the skin patch.⁵ For this reason, the current research was performed to assess the efficacy of two different transdermal patches (ketoprofen patch versus diclofenac patch) in the treatment of post operative pain following extraction of first premolars for orthodontic reasons.

II. MATERIALS AND METHODS:

The current clinical research was performed in the department of dentistry, Government medical college, Madhya Pradesh, India. Forty patients in total constituted the study group. After explaining the rationale and purpose of this research, an informed consent was taken from all the study participants. Inclusion criteria were patients in the age range of 18-25 years regardless of the gender, bilateral removal of similar teeth in adjoining quadrants and compliant individuals who consented to follow stringent study protocols. Exclusion criteria comprised of immunodeficient individuals, individuals on any form of anti-coagulation treatment, unmanageable systemic disorders, those allergic to any non-steroidal anti-inflammatory drugs, history of peptic ulcers, non-compliant patients unwilling to render commitment to suitable post extraction follow-up.

Extraction of teeth and postoperative medication:

The current study comprised forty patients in whom extraction of first premolars bilaterally was implicated for orthodontic treatment. 2% lignocaine hydrochloride consisting adrenaline 1:2,00,000 was employed as the anesthetic agent and administered in the required region. The extraction was performed following stringent asepsis. The same dental surgeon performed all the extractions to eradicate any bias induced by the operator in this research.

Subsequent to removal of the teeth, all 40 (twenty in each group) patients were randomly allocated to either of the below mentioned investigational groups:

**Group I: Transdermal Ketoprofen Patch:**
Application of a transdermal ketoprofen patch (20 mg/70 cm²) to every individual in the deltoid area soon after tooth extraction was performed in Group I.

**Group II: Transdermal Diclofenac Patch:**
Application of a transdermal diclofenac patch (200 mg/50 cm²) to every individual in the deltoid area soon after tooth extraction was performed in Group II.

Every day, the patch was replaced with a new one; consequently placing three patches in total over 3 post operative days. Every consecutive transdermal patch application was performed on a different region of skin.
devoid of hair. The individuals were allowed to take 500 milligrams of Paracetamol as a rescue medication for the post operative duration. Each patient was rendered regular post extraction directions.

**Assessment of study outcome:**

The outcomes of this research were evaluated at baseline as well as the third day post-extraction. Post operative pain was analyzed with a four-point Visual Analogue Scale (VAS):

0 = Absence of pain,

1 = Presence of mild pain (pain that was described only responsively to questioning in the absence of behavioural signs),

2 = Presence of moderate pain (pain described responsively to questioning as well as other indicative signs, or pain voiced impulsively even in the absence of questioning), and

3 = Presence of severe pain (bringing forth a stern vocal reaction or a response that was coupled with grimaces, pulling out of the arm, or tears).

A graded scale ranging from very satisfied to very unsatisfied was employed to subjectively evaluate patient contentedness.

**Statistical Analysis:**

SPSS software version 20.0 was used to analyze the gathered data. Quantitative data was assessed with T-test while Chi square as well as Fischer exact test was used to analyze qualitative data. A p value lower than 0.05 indicated statistical significance.

### III. RESULTS:

The comparison of the mean age amid both the study groups is depicted by Table 1. This study constituted patients in the age range of 18-25 years. The mean age of group I study participants using the transdermal ketoprofen patch was 21.20±0.96 years which was slightly less than the mean age in group II with Transdermal Diclofenac Patch that is 22.12±1.08 years. Nevertheless, this difference amongst the mean age of participants in both the experimental groups was not of statistical significance.

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean±SD</th>
<th>t value</th>
<th>p value and significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I: Transdermal Ketoprofen Patch</td>
<td>20</td>
<td>21.20±0.96</td>
<td>4.127</td>
<td>0.436</td>
</tr>
<tr>
<td>Group II: Transdermal Diclofenac Patch</td>
<td>20</td>
<td>22.12±1.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It was noted that participants using transdermal ketoprofen patch exhibited somewhat improved level of contentment compared to the participants using transdermal diclofenac patch. However, these differences in the satisfaction levels of subjects in the two groups were not significant statistically. [Table 2]

<table>
<thead>
<tr>
<th>Patient satisfaction level</th>
<th>Group I: Transdermal Ketoprofen Patch</th>
<th>Group II: Transdermal Diclofenac Patch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very satisfied</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Fairly satisfied</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Fairly unsatisfied</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>very unsatisfied</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 1.384, p = 0.758 \]
The degree of pain documented with VAS scores exhibited no statistically significant variations amid the two groups on day 1 as well as day 3, as delineated by table 3. Despite this, the number of participants having severe pain was noted in higher numbers in group II. The numbers of participants experiencing moderate pain were greatly reduced on day 3 in group I in comparison to group II. Additionally, greater numbers of study subjects documented absence of pain in group I on day 3.

Table 3: Evaluation of pain (VAS) among study groups at 1st and 3rd day

<table>
<thead>
<tr>
<th>Duration and groups</th>
<th>No pain</th>
<th>Mild pain</th>
<th>Moderate pain</th>
<th>Severe pain</th>
<th>Fischer exact test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>0</td>
<td>2</td>
<td>11</td>
<td>7</td>
<td>$\chi^2 = 5.218$</td>
</tr>
<tr>
<td>Group II</td>
<td>0</td>
<td>3</td>
<td>9</td>
<td>8</td>
<td>$p = 0.326$</td>
</tr>
<tr>
<td>Day 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>7</td>
<td>12</td>
<td>1</td>
<td>0</td>
<td>$\chi^2 = 8.462$</td>
</tr>
<tr>
<td>Group II</td>
<td>5</td>
<td>13</td>
<td>2</td>
<td>0</td>
<td>$p = 0.218$</td>
</tr>
</tbody>
</table>

IV. DISCUSSION:

An area of unending research is finding effective solutions to deal with pain arising post-operatively with a continual search for superior combinations and techniques that supersede the outdated ones. Pain occurring after extraction has frequently been equally menacing for both the dentists and patients owing to the substantial amount of inflammation entailed. The highly frequently employed analgesics to alleviate post-operative pain in dentistry are the Non Steroidal Anti-Inflammatory Drugs (NSAIDs). The efficiency of NSAIDs lies in decreasing pain by inhibiting COX-1 and COX-2 (cyclo-oxygenases 1 and 2) which are the principle enzymes in production of prostaglandin (PG).

A transdermal patch comprises of drug, liner, membrane, adhesive and backing as its key components. The liner is the part that protects the stored patch and is detached just before use; the drug consists of the medication solution directly in touch with the release liner, the patch constituents are adhered together with the adhesive, which also aids in attaching the patch on to the surface of the skin, drug-release from the reservoir plus the multiple layered patches is controlled by the membrane while outer environmental protection of the patch is offered by the backing.

An innovation in drug delivery systems that replaces oral plus various other conventional types of medicine administration are the transdermal patch systems. The patch holds the medication which diffuses through the skin and into the capillary network for systemic deposition. The continual drug dispersion cutaneously, permits steady plasma levels of the medicine which is a frequent therapeutic aim.

Transdermal ketoprofen patch employed in this research exhibited somewhat better results than the transdermal diclofenac patch to manage pain occurring after treatment by extraction. Talnia et al. assessed the efficacy of analgesia rendered by transdermal diclofenac patch after orthodontic extraction of premolars in patients. The authors arrived at a conclusion that diclofenac administered transdermally has superior effectiveness in treating post-operative pain that is of mild/moderate type with fewer side-effects. Similar results were documented by Krishna et al. who delineated that use of diclofenac patch offer considerably enhanced analgesic effect early in the post-operative duration. Metry et al. portrayed transdermal ketoprofen patch as an efficient as well as secure way for alleviating pain.

Considering the safety concerns, the patch did not lead to any local/systemic side-effect and was safely endured by the study subjects. However, patient’s experienced localized red rashes and itching at the site where transdermal diclofenac patch was applied by Agarwal et al. for attenuating venous cannulation. This is in contrast with the findings of the current research probably because every subsequent diclofenac patch was applied to a different location.

Shankar D et al. concluded from their research that ketoprofen patch offered superior analgesic effect as compared to the diclofenac transdermal patch after extraction of teeth for orthodontic reasons. The results of this study are also in accordance with an alike research performed by Bhargava et al. subsequent to orthodontic tooth removal. Supplemental analgesia was needed for about ten percent of study subjects using the diclofenac patch while no additional analgesic support was required for individuals using the ketoprofen containing patch. The consequence of meta-analysis performed by Sarzi-Puttini et al. indicated a statistically significant disparity in the effectiveness of ketoprofen as compared to diclofenac plus ibuprofen. Ketoprofen exhibited greater
effectiveness in comparison to diclofenac plus ibuprofen in mitigating pain as well as enhancing the patient functionality

Such differences can be accounted to the reason that diclofenac slows down formation of prostaglandins by preventing cyclooxygenase-1 and 2 with comparatively equal power, while ketoprofen additionally also prevents the lipoxygenase path of arachidonic acid surge, thus also decreasing leukotriene formation. It strongly inhibits bradykinin plus avoids lysosomal enzymatic release by rendering the lysosomal membranes stable against injury caused by osmosis, further reducing inflammatory responses.16

Drug deposition transdermally is an efficient technique of parenteral drug administration. It avoid first-pass-metabolism leading to greater bioavailable drug levels, does not cause pain/gastric distress, sustains constant levels of the medication in plasma for prolonged time-periods, is patient compliant as well as provides the ease of sudden withdrawal of the drug following patch removal. Nevertheless, clinical studies for longer duration with greater sample sizes must be performed prior to defining the true scope of such transdermal delivery systems.

V. CONCLUSION:

The current research concluded that ketoprofen as well as diclofenac transdermal patches aid in the management of pain that occurs post-operatively. However, it was seen that the ketoprofen patch offered a superior analgesic effect as compared to the diclofenac transdermal patch subsequent to extraction of teeth for orthodontic reasons.

REFERENCES:


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