IBUPROFEN VERSUS ACETAMINOPHEN IN CONTROLLING POSTOPERATIVE IMPACTED THIRD MOLAR TOOTH EXTRACTION PAIN

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ABSTRACT

Objectives: To compare the efficacy of ibuprofen and acetaminophen in reducing postoperative third molar extraction pain in patients reporting to Armed Forces Institute of Dentistry.

Study design: Randomized controlled trial.

Place and duration of study: The study was carried out on patients who presented for surgical removal of impacted teeth at Armed Forces Institute of Dentistry Rawalpindi (AFID) from February 2008 to March 2009 at the Department of Oral Surgery, Armed Forces Institute of Dentistry Rawalpindi.

Patients and methods: One hundred and forty patients requiring surgical removal of mandibular impacted teeth were equally divided into two groups. Surgical extraction of third molar tooth was performed under local anesthesia. Patients in group A were given ibuprofen and in group B were given acetaminophen at 6 hourly intervals. First dose was given 3 hours postoperatively. Each patient rated pain on a visual analog scale at baseline and then at 12, 24, 48 and 72 hours postoperatively.

Results: There was statistically significant difference (p=0.025) during first 12 hours with ibuprofen group showing better efficacy but afterwards there was no significant difference in the efficacy of both drugs.

Conclusions: Ibuprofen is more effective in controlling severe third molar extraction pain as compared to acetaminophen but has similar efficacy in controlling moderate pain.

Keywords: Acetaminophen, ibuprofen, postoperative pain, Visual analogue scale.

INTRODUCTION

Pain associated with dentistry contributes to excessive anxiety about dental care and treatment. Studies have been conducted which show that anxiety may exacerbate pain experience by the patient owing to attentional bias towards painful experience. Managing peroperative anxiety is still a major challenge, irrespective of technical, pharmacological and surgical advances, developing and establishing stress reducing and anxiolytic techniques is of considerable importance for both patients and surgeons[1].

Impacted teeth result from obstruction or lack of space due to tooth-jaw size discrepancy and mandibular third molars are most frequently involved teeth[2]. Impacted third molar associated with pericoronitis is the commonest complaint. It may also endanger the adjacent tooth due to its position. Those which have a high risk of infection should be removed prophylacticaly because sometimes these infections can be life threatening since they may involve adjacent facial spaces and infection may rapidly spread involving vital structures and may even spread to mediastinum[3].

Impacted third molar extraction is a common surgical procedure and is followed by moderate to severe pain. Pain is sometimes associated with limited mouth opening due to inflammation. Pain following surgical extraction is used as gold standard model to test the efficacy of analgesics in clinical trials over last two decades[4]. Pain following surgical extraction of impacted third molar tooth is frequently moderate to severe in nature and is a well documented and validated method to study pain[5].

Pain after third molar extraction increases with increased surgical difficulty due to excessive bone cutting and tissue manipulation, increase in

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duration of the intervention which results in tissue necrosis followed by prolonged duration and intensity of pain. Surgical technique used is also a modifying factor for pain following extraction[6]. The pain begins when the effects of the local anesthesia subside and reaches its maximum intensity during the first 12 hours postoperatively[7].

Different treatments are used to control postoperative pain e.g. proteolytic enzymes, long acting local anaesthetics, low power laser, acupuncture, TENS, hypnosis, cryotherapy, medications etc[8].

A large variety of analgesics are available for the management of postsurgical pain. Analgesics should be given before the effect of the local anesthesia subsides usually within 3rd hour. In this manner, the pain is usually easier to control, requires less drug, and may require a less potent analgesic[9].

Prostaglandins play a role in inflammation and play a major role in pain following surgery. Non-steroidal anti-inflammatory drugs (NSAIDs) have their therapeutic effect by means of the inhibition of cyclooxygenase (COX), which determines an inhibition of prostaglandin production. Three isoforms of COX are known: COX-1, a constitutive form expressed in almost all tissues, COX-2, predominantly induced and constitutively expressed in a limited number of tissues (renal medulla, prostate, brain and endothelium) and COX-3, a COX-1-derived protein, most abundant in the cerebral cortex and heart. It is believed that COX-2 is the main isoenzyme for pro-inflammatory prostaglandin production. Both COX-1 and COX-2 are inhibited non selectively by non-steroidal anti-inflammatory drugs (NSAIDs) like ibuprofen. This results in the inhibition of the constitutive isoforms also resulting in the side effects associated with these NSAIDs. Inhibition of COX-3 could represent a primary central mechanism by which analgesics like acetaminophen decrease pain and possibly fever. In addition to this it also inhibits production of PGE-2 which represents its action as a selective COX-2 inhibitor. This also avoids the side effects associated with other NSAIDs[10].

This study is primarily designed to test the efficacy of acetaminophen in comparison with the prototype NSAID ibuprofen in postoperative impacted third molar tooth extraction pain both of which are available over the counter. Ibuprofen is claimed to have better anti-inflammatory properties than acetaminophen. The results would help our patients choose a cheap drug with few side effects for relieving post extraction pain.

PATIENTS AND METHODS

These randomized control trials were conducted at Armed Forces Institute of Dentistry Rawalpindi from 2008 to 2009. A total of 140 patients were included in the study through non-probability convenience sampling and randomly divided into two groups of 70 each requiring surgical removal of mandibular impacted teeth. Patients of either gender aged 18 years and above requiring surgical removal of impacted mandibular third molars and patients having no previous sensitivity to ibuprofen, acetaminophen and local anesthesia were included in the study. While medically compromised patients (any acute or chronic systemic disease), pregnant and lactating mother, known intolerance to the trial drugs, patients with non odontogenic pain, surgery lasting more than 60 minutes resulting in tissue necrosis were excluded from the study. A written informed consent was taken after explaining the purpose of the study. Ethical committee of AFID for medical research approved the trial. Surgical extraction of third molar tooth was performed under local anesthesia. Patients in group A were given ibuprofen and in group B were given acetaminophen at 6 hourly intervals. First dose was given 3 hours postoperatively. Patients were studied for postoperative pain control comparing two drugs using visual analogue scale. VAS readings of 0-2 was taken as no pain, 3-5 as mild pain, 6-7 as moderate pain, 8-10 as severe pain.

Each patient rated their pain on a visual analog scale at baseline and then at 12, 24, 48 and 72 hours postoperatively. The data was analysed by SPSS (version 10). Mean and standard deviation (SD) were calculated for age. Frequencies and percentages were presented for gender and visual analogue scale categories. Chi square test was used to compare VAS categories in group A and B patients at the base line and at 12, 24, 36, 48 and 72 hrs post-operatively. *p* value of ≤ 0.05 was considered as statistically significant.

RESULTS

The study comprised of 140 patients and they were only randomly divided into two groups of 70 patients each. None of the patients were excluded or dropped out from the study. In group A 41 (52.7%) were males and 30 (49.4%) were females while in group B, males were 42 (50.6%) and 27 (47.3%) were females.

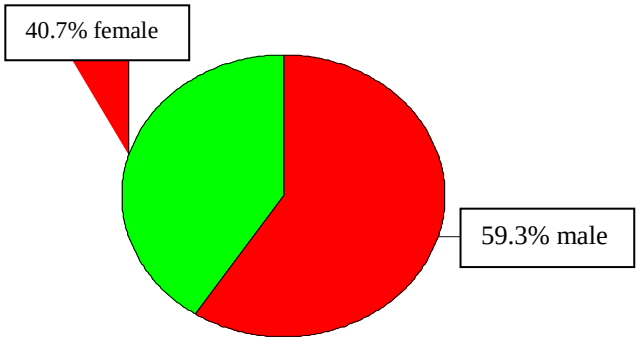

Figure-1: Gender distributions of patients.

Patients ranged in age from 21 to 37 years with a mean age of 28.57 with standard deviation of +3.79.

At baseline, in group A 57 (40.7%) patients experienced no pain and 13 (9.3%) patients experienced mild pain while in group B 21 (15%) experienced mild pain and 49 (35%) patients experienced no pain. The difference was insignificant statistically (*p*=0.115).

At 12 hours postoperatively, in group A 1 (0.7%), 36 (25.7%) and 33 (23.6%) patients experienced severe, moderate and mild pain respectively. While in group B 8 (5.7%), 39 (27.9%) and 23 (16.4%) patients experienced severe, moderate and mild pain postoperatively. The difference was statistically significant (*p*=0.025) table-1.

At 24 hours postoperatively, in group A 2 (1.4%), 10 (7.1%), 53 (37.9%) and 5 (3.6%) experienced severe, moderate, mild and no pain respectively. While in group B 1 (7%), 21 (15%), 47 (33.6%) and 1 (0.7%) patients experienced severe, moderate, mild and no pain respectively. The difference was insignificant statistically (*p*=0.06) table-2.

Pain at 48 and 72 hours postoperatively is given in tables (3 and 4).

DISCUSSION

Surgical removal of impacted mandibular third molars has been advocated frequently in oral surgery but the indications and contraindications are not absolute[11].

Table-3: Frequency of pain 36 hours after administration of drugs.

		Pain at 36hrs		Total
		No pain	Mild pain	
Study groups	Group A	49	21	70
	GroupB	52	18	70
Total		101	39	140

p-value 0.57

Table-5: Frequency of pain 72 hours after administration of drugs.

		Pain at 72hours	Total
		no pain	
Study groups	GroupA	70	70
	GroupB	70	70
Total		140	140

Pain following third molar surgery is frequently moderate to severe. It has been extensively used in studies for evaluation of efficacy of analgesics. It is excellent model for assessing efficacy of analgesics in clinical trials. The reason for using third molar as a pain model is the frequent reproduction of pain mediators[12].

The analgesic effect in this pain model has been reproducibly validated with the use of other analgesic medications. Maximum pain skill of surgeon does have influence on post operative complications[17].

Table-1: Frequency of pain 12 hours after administration of drugs.

		Pain at 12hrs			Total
		Mild pain	Moderarte pain	Severe pain	
Study groups	Group A	33	36	1	70
	GroupB	23	39	8	70
Total		56	75	9	140

p-value 0.02

Table-2: Frequency of pain 24 hours after administration of drugs.

		Pain at 24hrs				Total
		No pain	Mild pain	Moderate pain	Severe pain	
Study groups	Group A	5	53	10	2	70
	GroupB	1	47	21	1	70
Total		6	100	31	3	140

p-value 0.06

Table-4: Frequency of pain 48 hours after administration of drugs.

		Pain at 48hrs			Total
		No pain	Mild pain	Moderate pain	
Study groups	Group A	66	3	1	70
	GroupB	64	5	1	70
Total		130	8	2	140

p value 0.76

experienced by our patients was during first 12 hours. This is in accordance with the other studies which report maximum pain during first 5-8 hours postoperatively[13,14].

In our study females experienced more pain as compared to males. Other studies have also reported more perception of pain in females as compared to males[15,16].

Duration for surgery was less than 60 minutes as it could produce more tissue necrosis and the surgical procedure was almost similar in all patients. Grossi et al conducted a study and assessed the risk factors associated with post operative discomfort after third molar surgery and concluded that preoperative risk factors such as age and gender of patients, tobacco use, oral contraceptive use, antibiotic prophylaxis, flap design, extraction difficulty, operative time and

In our study we excluded these factors by standardizing them, like the surgery was performed by one surgeon, all the patients with history of smoking or use of contraceptive pills were excluded from study, same flap design was used for every patient, and by limitation of age because as stated by Grossi et al older patients are at greater risk for complications after third molar surgery[17].

In our study ibuprofen 600 mg and acetaminophen 1000 mg was given to two groups 6 hourly over 24 hours. Ibuprofen was more effective for first 12 hours postoperatively with a *p*-value of 0.02 and afterwards the efficacy of both drugs remained the same. Pain after first postoperative day was mainly moderate and hence controlled with acetaminophen. So acetaminophen can be used as an alternative to

ibuprofen in moderate pain in its therapeutic profile because it is more safe and gastric friendly[18].

Acetaminophen is involved in the suppression of COX-3 is at the level of CNS. Studies have revealed that it also suppresses COX-2 selectively. So its mechanism of action is almost similar to other selective COX-2 inhibitors. It can be safely used in moderate pain within its therapeutic range. Since the pain is in its intense severity within first 8 hours postoperatively, during this period another analgesic can be given to the patient but afterwards a safe analgesic like acetaminophen can be given to the patient. Studies revealed that ibuprofen has better efficacy compared to acetaminophen[19,20].

One of the drugs most frequently used in the third molar model is ibuprofen, now often used as the positive control after oral surgery.

Acetaminophen has often been tested after third molar surgery, sometimes combined with codeine and acetaminophen in doses of 500-1000 mg, a combination which has been demonstrated to have analgesic efficacy superior to that of placebo, but inferior or equal to most NSAIDs Winter, et al, compared the effectiveness of 400 mg and 800 mg of ibuprofen to 650 mg of aspirin, 65 mg of propoxyphene HCl, and a placebo in 510 patients experiencing pain subsequent to oral surgery procedures. Ibuprofen, at both doses, was shown to be more effective for both degree and duration of relief from pain[21].

Few studies have tested the use of opioids after third molar surgery, probably because these drugs are not commonly used for analgesia in dentistry. Many patients obtained total relief of pain with a mean duration of analgesia for 2:30 h with 10 mg morphine and 8:10 h with 20 mg morphine[21,22].

Ibuprofen and other NSAIDs have been compared with steroids but studies have proved that ibuprofen and NSAIDs are better in controlling postoperative pain as compared to steroids. The use of preoperative analgesics has also been evaluated in the surgical pain models. In 1978, Dionne and Cooper evaluated the analgesic effects of 400 mg of ibuprofen in postoperative pain after the surgical removal of impacted third molars on 100 patients. They concluded that pretreatment with ibuprofen delayed the mean time of onset of postoperative pain more than 100 minutes, as compared to pretreatment with a placebo. The pain severity was less in group treated preemptively with ibuprofen[22].

Dionne et al, continued to study preoperative administration of ibuprofen for removal of impacted third molars in 1983. Subjects were given 800 mg ibuprofen prior to the procedure and 400 mg ibuprofen 4 and 8 hours later. Comparison was made to groups receiving either placebo at all three doses, 600 mg acetaminophen administered on the same schedule, or preoperatively administered placebo followed by two doses of postoperatively administered 600 mg acetaminophen plus 60 mg codeine. Ibuprofen pretreatment resulted in significantly less pain than placebo or acetaminophen pretreatment as the effect of local anesthetic wore off. Ibuprofen also resulted in less postoperative pain than acetaminophen plus codeine following the second dose. The results of these studies suggest that it is possible to delay the onset and lessen the severity of postoperative pain by preoperative administration of a nonsteroidal anti-inflammatory drug, such as ibuprofen[23].

The combination of corticosteroids and NSAIDs has also been shown to be well suited to the treatment of postoperative pain, trismus and swelling after dental surgical procedures. Non-medication methods used to minimize facial swelling and pain after third molar surgery include cryotherapy and soft-laser application[23,24]. There were a few limitations in the study. A major drawback in the study was the absence of a control group. But studies are conducted in which NSAIDS are compared with placebos so there was no need for inclusion of the control group.

Pain perception also varies greatly between individuals. In addition, the reaction to and the perception of pain will vary between individual patients and is influenced by the individual's emotional status and the coping strategies used to manage the pain.

Fear plays a role in the perception of pain. The fear of dentists and/or dental procedures, anxiety, apprehension, and other psychological factors influence the patient's pain perception and reaction threshold[24].

CONCLUSION

This clinical study revealed that Ibuprofen was more effective in controlling third molar extraction pain as compared to acetaminophen. On first postoperative day ibuprofen was more effective but later on there was statistically no significant difference in the efficacy of ibuprofen and acetaminophen. So acetaminophen can be used as an alternative to ibuprofen in moderate pain so as to avoid the unwanted side effects of ibuprofen.

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