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EFFICACY OF SUBLINGUAL VERSUS ORAL PIROXICAM IN MANAGEMENT OF POST-SURGICAL PAIN, SWELLING AND TRISMUS AFTER LOWER 3RD MOLAR SURGERY- A RANDOMIZED CONTROL CLINICAL TRIAL

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ABSTRACT

Background of the study: Third molar surgical removal is a common procedure in oral and maxillofacial surgery, causing moderate to severe pain, swelling, and trismus. Postoperative pain control improves patient recovery and oral function, with commonly used analgesics including Ibuprofen, Aceclofenac, Ketorolac, Tramadol, Paracetamol, Nalbuphine, Nimusulide, and Buprenorphine. **Aim and Objective:** The study compares oral and sub-lingual Piroxicam for managing post-surgical pain after extraction of impacted third molars, focusing on analgesia onset, pain intensity, swelling, and trismus degree. **Materials and method:** A randomized control trial was conducted on 30 patients who underwent surgical removal of mandibular impacted third molars. The patients were divided into two groups: Group I (Study) and Group II (Control). All patients underwent the procedure by a single surgeon. Post-operative medications were prescribed according to the study design, with Piroxicam 20mg administered sub-lingually (Group I) and 20mg orally (Group II). The parameters were assessed and measured for both groups, and the results and statistical analysis were compared. **Result:** The results revealed that the inter-group difference for the post-operative symptoms evaluated using a t-test for Equality of means by comparing the pre-op, POD 2, POD 7 values was statistically significant. Mean onset time taken and pain perception by Group I (Sub-lingual) in the first dose was 32.3 minutes

and for Group II was 51.21 minutes which was established to be significantly (P<0.05) low for the sub-lingual group by statistical analysis. **Conclusion:** The study found that the sublingual route of administering Piroxicam had a faster onset of action and better analgesia postoperatively compared to the oral route. This is crucial for patients and surgeons to improve compliance and comfort post-operatively after impaction surgery, as potent analgesics are essential for effective pain management.

KEY WORDS: Pain, 3rd Molar surgery, Piroxicam, Sublingual route, Post-Surgical Complications, Analgesic

INTRODUCTION

Surgical extraction of impacted third molars is the most frequently performed outpatient procedure in the clinical practice of oral and maxillofacial surgery. Somesthesia or pain that occurs after the extraction of the mandibular third molar has been observed, studied as well as documented extensively. This led to comparing and evaluating the efficacy of many pharmacological medicaments. The intensity of pain sensation reaches its upper limit in 2–4 hours after the procedure, and, in most cases, patients require analgesic care immediately. The pain experienced by the patient was moderate to severe which lasts for 24 hours post-operatively, more specifically maximum intensity reaches briefly after the removal. Apart from pain, other undesirable consequences for a patient who underwent surgical removal of teeth were swelling, trismus - limited mouth opening which reached its maximum in 48 - 72 hours after surgery [1,2].

Most commonly used drugs to manage post-operative pain, swelling, trismus are non-steroidal anti-inflammatory drugs (NSAIDs), Opioids, and Corticosteroids. Diclofenac, ibuprofen, ketorolac, tramadol, paracetamol, nalbuphine, and buprenorphine. Analgesic agents are the choice, most commonly used to ameliorate these postoperative symptoms [3].

Piroxicam is a long-acting, non-selective, potent, NSAID derivative of oxicam. Piroxicam reversibly inhibits cyclo-oxygenase (COX) with keen antipyretic- analgesic action. Additionally, it also inhibits thromboxane synthesis in platelets, thus inhibiting the secondary phase of platelet aggregation. Piroxicam when administered orally, the drug takes 30 minutes and more to produce its appreciable pharmacological action [4]. According to literature any preparation or combination that could increase the drug absorption and decreases the duration of onset of analgesia results in better post-surgical pain management. The drug absorption in the oral cavity occurs mainly in four distinct regions - buccal, gingival, sublingual, and palatal regions. Immediately after absorption through the mucous membrane in the sub-lingual area, the drug straightaway diffuses into venous blood. The venous blood from the sub-lingual region of the oral fissure drains into a common trunk, which then flows via the IJV (internal jugular vein), the subclavian vein, and the brachiocephalic vein instantly into the superior vena cava. Thus, venous return from all these areas gets into the systemic circulation, bypassing the pre-systemic drug elimination, unlike in oral administration. Direct drainage into systemic circulation results in immediate systemic availability of the drug and faster onset of action. The sublingual route of administration negates the gastrointestinal tract and also the first passage of the drug in the liver where some of the drugs would be metabolized [5,6].

AIM & OBJECTIVES:

This study aimed to evaluate and compare the efficaciousness of Piroxicam administered orally Versus sub-lingual route in the management of post-surgical pain, swelling, and trismus following removal of mandibular impacted third molars. The objectives of the study were

1. To assess the pain perception & onset of analgesia in both routes of administration.
2. To evaluate the pain intensity using the Visual Analogue Scale (VAS).
3. To analyze the post-operative swelling using 3-line facial measurements. (Tape measuring method)
4. To assess the degree of trismus post-operatively. (Inter- incisal distance)
5. To compare the above parameters between Group I (Study) and control Group II (Control).

MATERIALS AND METHODS:

This prospective, clinical, randomized control study was performed on patients who reported to the Department of Oral and Maxillofacial Surgery from June 2015 to September 2016 for surgical removal of mandibular impacted third molars. The study sample enclosed 30 patients (17 males, 13 females) of age ranging from 18 to 60 years. The patients fulfilling the inclusion criteria of ASA I with mesioangular impaction with Pederson difficulty index *(Table 1)* between 3 to 6 score and mouth opening of 40 mm and above were included for the study. The exclusion criteria were ASA II to V, patients with any systemic illness, local pathology, and known allergic to NSAIDs. The study design was informed verbally and informed consent was obtained from the patient preceding the procedure.

S. No	Classification	Value
1.	**Spatial Relationship**	
	Mesioangular	1
	Horizontal/transverse	2
	Vertical	3
	Distoangular	4
2.	**Depth**	
	Level A: high occlusal level	1
	Level B: medium occlusal level	2
	Level c: low occlusal level	3
3.	**Ramus relationship/ space available**	
	Class 1: sufficient space	1
	Class 2: reduced space	2
	Class 3: no space	3
Interpretation	**Difficulty Index**	
	Very difficult	7-10
	Moderately difficult	5-6
	Slightly difficult	3-4

Table 1: *(Pederson Difficulty Index)*

The following outcome parameters were assessed:

1. Pain perception and Onset of analgesia: All patients were provided with a handout form to record the time of occurrence of pain, administration of the drug, and time taken for complete pain relief. (Table 2) Readings were measured and compared for 1st and 2nd dose postoperatively.
2. Facial swelling was evaluated by recording facial size post-operatively on the 2nd and 7th days and compared with pre-operative measurements. The swelling was ascertained by using a tape measuring method- modification of Gabka and Matsumara which was used by Schultze Mosgau et al (1995) (7,8). Three measurements points were *(Figure 1):*

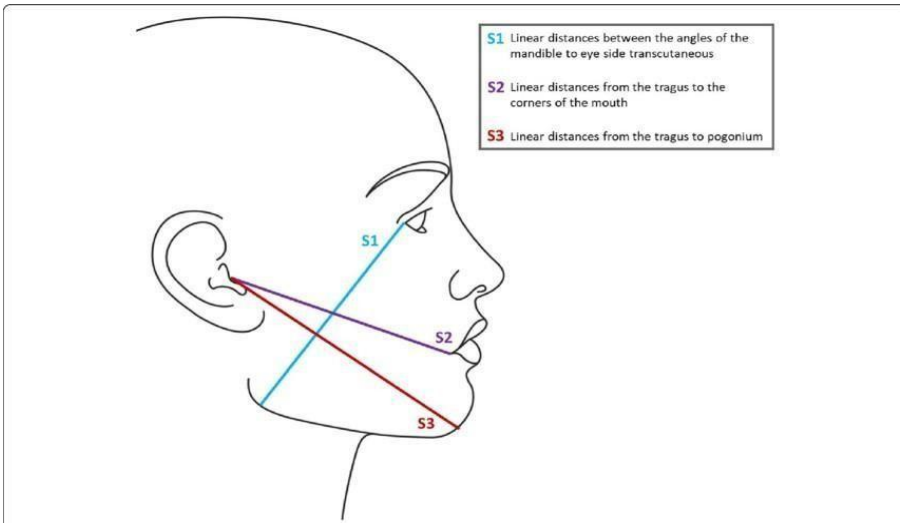

Figure 1 (Swelling was ascertained by using a Tape Measuring

S1 – Measured from the lateral canthus of the eye to the angle of the mandible. S2 – Measured from the tragus to the outer corner of the mouth. S3 – Measured from the tragus to pogonion.

3. Pain intensity was recorded using VAS (visual analog scale) (7,9). Subjectively pain intensity was measured by asking the patients to rate the pain perception on a Numerical visual analog scale (VAS) of 0 to 10, on the 1st, 2nd, and 7th post-operative days before and after every dose of medication.

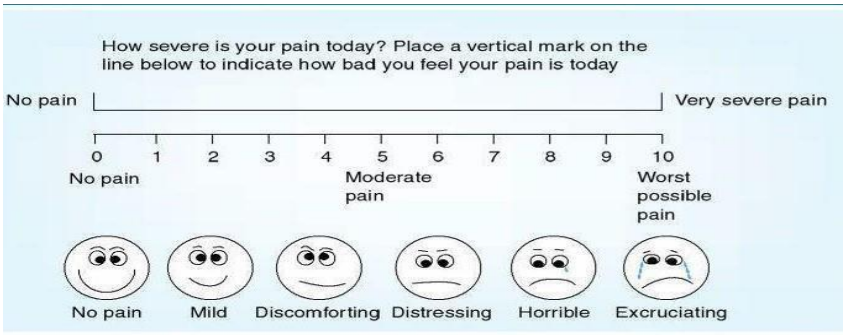

Figure 2 (Visual Analogue Scale (VAS))

4. Mouth opening was recorded in millimeters by using Vernier calipers to measure the interincisal distance at maximum mouth opening ability. Reference points were the mesio-incisal angle of mandibular central incisor and mesio-incisal angle of maxillary central incisor. Measurements were recorded immediately pre-operative and on the 1st, 2nd & 7th postoperative days [7]. *(Figure 3)*

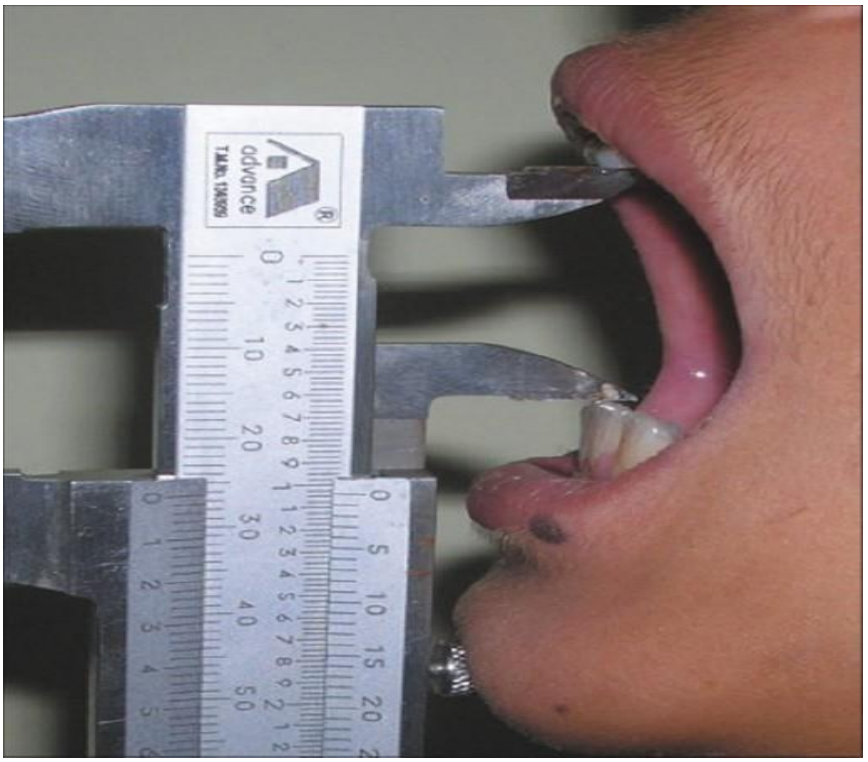

Figure 3 *(Mouth opening was recorded in millimetres.)*

	1ST DOSE	2ND DOSE
TIME OF ONSET OF PAIN		
TIME AT WHICH DRUG IS TAKEN		
PAIN RELIEF TIME		

Table 2 *(Pain Perception & Onset of Analgesia Handout Form)*

RESULTS

The study consisted of 30 patients, who had undergone surgical extraction of impacted mesioangular mandibular third molar. The study group was divided into two groups, Group I and Group II, with the patients in Group I (n=15) were administered Tab Piroxicam by sub-lingual route post-operatively whereas in Group II (n=15) were administered Tab Piroxicam by oral route post-operatively.

The Pre-operative and postoperative scores for pain, time taken for pain relief, swelling, and maximum mouth opening were recorded and tabulated. The significance of inter-group difference for the post-operative symptoms was evaluated using a t-test for Equality of means by comparing the Pre-op, POD 2nd day, POD 7th day values. The significance of inter-group relation for the recorded data was evaluated using the chi-square test.

TIME TAKEN FOR PAIN RELIEF:

Meantime taken by Group I (Sub-lingual) in the first dose was 32.3 minutes and for Group II was 51.21 minutes which was established to be significantly ($P<0.05$) low for the sub-lingual group by statistical analysis. Time taken for pain relief for the second dose was 31.73 minutes for the control group and 46.71 minutes for the study Group. The result was statistically significant ($P<0.05$) The time taken for pain relief for the third and fourth dose was also significantly lower for the Sub-lingual group than the Oral group. *(Table 3)*

GROUP		MEAN	STANDARD DEVIATION	P VALUE
DOSE 1	SUBLINGUAL	32.30	9.58	**0.009**
	ORAL	51.21	22.28	
DOSE 2	SUBLINGUAL	31.73	7.99	**0.021**
	ORAL	46.71	22.26	
DOSE 3	SUBLINGUAL	26.07	4.82	**0.000**
	ORAL	42.21	7.22	
DOSE 4	SUBLINGUAL	20.14	5.21	**0.010**
	ORAL	38.30	15.62	

Table 3 *(Time Taken for Pain Relief (in minutes) & Statistical Analysis)*

PAIN PERCEPTION: The results yielded were statistically significant for Group I (Sub-lingual) for the 3rd and 4th dose of the medication (P<0.05) and not significant statistically for the Oral route of administration (P>0.05). *(Table 4)*

GROUP	DOSE 1		DOSE 2		DOSE 3		DOSE 4	
SUBLINGUAL	7.1	4.4	5.8	3.47	4	1.78	3	1.14
ORAL	7.47	5.53	6.6	4.53	5	3.07	4.7	2.2
P VALUE	0.459	0.111	0.133	0.098	**0.021**	**0.005**	**0.002**	**0.001**

Table 4 *(Pain Perception Value)*

SWELLING:

Post-surgical facial swelling was measured and recorded during the second and seventh postoperative days. This produced a single-digit value for each patient, which is the sum of the S1, S2 & S3.

The average of the three measurements was considered to indicate post-operative swelling. The mean baseline value for Group I (Sub-lingual) was 11.92mm and 12.07mm for Group II (Oral) which increased to 13.29 mm on a postoperative day 2 for the control Group and 12.12mm for the study Group. This difference was not clinically and statistically significant (P>0.05). The values then decreased to 12.43mm for the Control Group and 12.33mm for the Study Group on the 7th post-operative day. *(Table 5)*

GROUP		**MEAN**	**STANDARD DEVIATION**	**P VALUE**
PREOP	SUBLINGUAL	11.92	.589	0.509
	ORAL	12.07	.638	
POD 2	SUBLINGUAL	13.29	.922	0.253
	ORAL	12.12	.844	
POD 7	SUBLINGUAL	12.43	.678	0.707
	ORAL	12.33	.659	

Table 5 (*Statistical Analysis for Facial Swelling***)**

MOUTH OPENING:

The mouth opening was evaluated by measuring the inter-incisal distance at maximum mouth opening ability for both the groups at baseline, POD 2 and POD 7. On statistical analysis, on the postoperative 2nd day the mean mouth opening in the group, I (control) was 25.27mm as compared to group II (Study) which was 28.73. Similarly, on postoperative day 7, the mean mouth opening for group I- 37.20mm was slightly higher than group II 40.20mm. On the 2nd and 7th postoperative day mouth opening was found not statistically significant (P>0.05). *(Table 6)*

GROUP		MEAN	STANDARD DEVIATION	P VALUE
PREOP	SUBLINGUAL	44.2	2.73	0.766
	ORAL	44.53	3.31	
POD 2	SUBLINGUAL	25.27	5.92	0.104
	ORAL	28.73	5.37	
POD 7	SUBLINGUAL	37.20	4.79	0.076
	ORAL	40.20	4.09	

Table 6 *(Statistical Analysis for Mouth Opening)*

DISCUSSION

A tooth was diagnosed to be impacted when it is unable to erupt or evolve into the correct anatomic and functional position in the oral cavity. The definition of impaction is “a tooth that can't, or won't, erupt into its normal functioning positions, and is, therefore, pathologic and requires treatment. The foremost common tooth to be impacted was the mandibular third molar. Specifically, wisdom teeth have been found to develop between the age group of 17 to 21 years. So, the surgical extraction of impacted mandibular third molars is the most frequent OP (Out Patient) procedure performed [(10)]. Pain, edema, bruising, trismus, surgical site infection, and alveolar osteitis were the most common characteristic complications encountered following surgical removal of 3rd molar. The pain pursued after surgical extraction of the 3rd molar has been shown to reach moderate to a severe degree within the initial 5 hours after surgical removal which causes unpleasantness and extremum agony to the patient [(11)].

The surgical extraction of the impacted 3rd molar results in the consequent cellular and tissue destruction which leads to the liberation of many biochemical pro-inflammatory mediators and by-

products which participate in the somesthesia or pain activity, particularly, bradykinin, histamine, and prostaglandins. Histamine and bradykinin both sensitize the free nerve endings and entangle in edema formation. Nevertheless, histamine and bradykinin have shortened half-lives, hence the prime role of these components takes place in the primordial stages immediately after the surgery [12].

Currently, there is a broad range of analgesic medications administered by operating surgeons to decrease pain perception, pain intensity, swelling, and trismus. These analgesics can be centrally acting drugs or peripherally acting drugs. Non-steroidal anti-inflammatory drugs (NSAIDs) are the most popular group of drugs widely used in this field, which act by reducing prostaglandin synthesis and thereby preventing peripheral sensitization at the site of surgery [13-15].

Different routes exist for the administration of various analgesics such as Oral, Topical, Sub-lingual, Intramuscular, Intravenous, and Intranasal. The oral route of administration is by farthermost common route for the administration of the drug. Generally, drug bypass from the Gastrointestinal tract into the bloodstream was accelerated by biological, physical, and chemical factors, and by the dosage form. For most drugs, two to five-fold differences within the rate or extent of gastrointestinal absorption can occur, counting on the dosage form. These two characteristics, rate, and completeness of absorption represent drug bio-availability. In General, the bio-availability of oral route of drugs follows the order: Coated tablet < tablet < capsule< suspension< solution [12,16].

Drugs after ingested enter the circulation if they're to exert a systemic effect. Unless administered through the intravenous route, most drugs are absorbed incompletely. Together, these processes explain why the bio-availability of an orally administered drug is usually but 100% [16].

Comparing the oral administration (i.e. the drug to be swallowed) of drugs, the sublingual route of administration has a distinct advantage with pronounced pre-systemic metabolism, providing direct and rapid access to the systemic circulation, bypassing the liver and intestine. The mouth has four distinct regions which will absorb drugs—the sublingual, buccal, gingival, and palatal regions. These regions differ from each other in biochemical composition and histological structure of the mucosal membrane, and their bioavailability to retain the dosage form long enough to permit complete absorption of drugs [17]. The absorption potential of oral mucosa is influenced by the lipid solubility and thus the permeability of the solution (osmosis); the ionization (pH). Absorption of some drugs via oral mucosa is shown to increase when carrier PH is lowering (more acidic) and decrease with a lowering of pH (more alkaline) [18].

Following the sublingual route of administration, the drugs are absorbed across the mucous membrane by one of the following mechanisms: i) Passive diffusion, ii) Active or carrier-mediated transport, iii) Endocytosis. The buccal membrane lining the cheeks and the sublingual membrane on the ground of the mouth under the tongue are commonly used for systemic drug delivery. The oral submucosa is additionally richly provided with blood vessels. Following absorption through the mucous membrane in the sub-lingual region, the drug readily diffuses into the venous blood, unlike the oral route which gets absorbed by the gastrointestinal system before entering the hepatic circulation. The blood from the sublingual region of the mouth drains into a common trunk, which then drains via the interior vena jugularis, the vena subclavia, and the brachiocephalic vein directly into the superior vena cava. Thus, venous return from these regions enters the systemic circulation, bypassing the pre-systemic drug elimination, unlike in oral administration of drugs [19].

Direct drainage into systemic circulation results in immediate systemic availability of the drug and leads to the rapid onset of action. Oral mucosal drug absorption is governed by (a) the oral mucous membrane permeability and the anatomy of the underlying tissues, (b) the physicochemical properties of the drugs, (c) the formulation design, (d) rapid disintegration and dissolution are crucial for drug absorption of the sublingual formulation.

Piroxicam is a long-acting, non-selective, potent, NSAID derivative of oxicam. Piroxicam reversibly inhibits cyclo-oxygenase (COX) with keen antipyretic- analgesic action and anti-inflammatory properties. Its half-life is 38 hours, and hepatic metabolism to inactive metabolites is the primary route of elimination. Drugs excreted via urine and less than 10% of a dose appear unchanged during excretion [20].

In our study Sublingual route of administration versus the oral route of administration of Piroxicam was evaluated and compared to assess the onset of analgesia, the intensity of pain, swelling, and trismus. This study is a Randomised control clinical trial on 30 patients (17 males, 13 females) who underwent surgical extraction of the mandibular impacted third molar. Group I consisted of 15 patients who received 20 mg Sublingual Piroxicam administered twice daily on 1st, 2nd, and 3rd postoperative days. Group II also consisted of 15 patients who received 20mg Orally administered Piroxicam twice daily on 1st, 2nd, and 3rd postoperative days. The amount and time of rescue medication (750mg Paracetamol) were also noted and recorded.

The time taken for the analgesic action was significantly less ($P<0.05$) for the sublingual group resulting in a faster onset of action which is attributable to drainage directly into the systemic circulation resulting in immediate systemic availability of the drug when given via the sublingual route compared to the oral group with a difference of 18 minutes between both the groups for the 1st dose, 14 minutes for the 2nd dose, 16 minutes for the 3rd dose and 18 minutes for the 4th dose. 2 patients in the sublingual group discontinued the medication with the 2nd dose due to complete relief of pain and 13 patients stopped the medication with the 3rd dose due to complete relief of pain using sublingual piroxicam.

Pain intensity scores were evaluated using the Visual analog scale for all the patients before and after administration of the medication for all the doses of medication in both groups. The pain scores were also significantly lower ($P<0.05$) after administration of the sublingual piroxicam indication better relief of pain for the patients.

The swelling was measured postoperatively on the second, seventh day and it was compared with the baseline measurement taken on the day of the surgery. The swelling was measured using the 3-line measurements taken on the face with S1- Lateral Canthus to Angle of the mandible; S2- Tragus to the corner of the mouth; S3- Tragus to Pogonion. The mean baseline value for Group I (Sublingual) was 11.92 mm and 12.07mm for Group II (Oral) which increased to 13.29 mm on a postoperative day 2 for the Control Group and 12.12mm for Study Group. The values then decreased to 12.43mm for the Control Group and 12.33mm for the Study Group on the 7th post-operative day.

These results however showed that orally administered piroxicam had a better anti-inflammatory action though not statistically significant than the Sublingual route of administration. The anti-inflammatory action of piroxicam is thus not as potent as the analgesic action which might necessitate the need of an effective anti-inflammatory drug to be added in the prescription in addition, in cases of

surgeries which might result in large swellings as in the case of deep impactions with extensive bone removal or long-duration surgeries.

Trismus was measured using the Inter-incisal distance on maximal mouth opening as the indicator [21]. This was measured before the procedure and on the second, seventh days postoperatively. On statistical analysis, on the second postoperative day, the mean mouth opening for the sublingual group was 25.27mm as compared to 28.73mm for the oral group. Similarly, on postoperative day 7 the mean mouth opening for group I was slightly higher than group II indicating a lower degree of trismus associated with the sublingual route than oral though not statistically significant. However, several other factors are causing postoperative trismus such as oral surgical interventions performed in the region of the ramus and the mandibular angle. Also, the severity of the intervention and the massiveness of tissue and bone destruction is directly proportional to the amount of trismus. It is also partially related to the degree of post-surgical pain and swelling. Also, 3 patients on Oral piroxicam took the Rescue medication due to severe pain uncontrolled with the medication. No patients in both groups reported any adverse reactions or gastric discomforts.

P. A.K. Trinade, F.P. M. Giglio et al (5) conducted a similar study with 53 patients who received piroxicam orally or sublingually after extraction of the symmetrically positioned lower third molars. The patients were randomly given piroxicam either orally or sublingually for postoperative pain relief. Postoperative pain subjectively was recorded with the help of a 100mm VAS. The dosage and the time when the additional analgesia was taken were also noted. Before surgery mouth opening was measured on the 2nd and 7th postoperative days and expressed as a percentage of the preoperative value. The swelling was measured on the 2nd and 7th postoperative days. The study concluded that no significant variations were found in the management of pain, trismus, and swelling concerning the routes of drug delivery.

Our study measured an additional parameter of time taken for the occurrence of pain relief upon administration of the medication, this parameter yielded statistically significant results indicating Sublingual route has a faster onset of action as compared to the Oral route. The VAS scores of pains were also significantly lower for the sublingual group for the 3rd and 4th dose of drug administration. Also, none of the patients in our study experienced any discomfort with the consumption of the medication.

A study conducted by Alpaslan et al (22), compared single doses of sublingually administered aspirin and piroxicam for the post-surgical pain management following removal of the lower third molars. They compared the effectiveness of the two-drug formulations and also a placebo. A total of 100 patients were included in this study. Patients received piroxicam fast-dissolving dosage formulations (FDDF) 40 mg either pre-operatively or post-surgery, sublingually or aspirin (500 mg) or a placebo. Six hours post-surgically, the pain was recorded for every hour. A significant difference ($p<0.05$) was found concerning piroxicam as compared to aspirin or placebo. Also, the amount of rescue analgesia was recorded and was found to be considerably less for piroxicam FDDF which was similar to our study where only 3 patients who consumed Oral piroxicam required rescue medication and no patient administered with sublingual piroxicam took the rescue medication. This study was reported no adverse reactions with piroxicam usage. Thus, they concluded that piroxicam FDDF, administration of piroxicam either preoperatively or postoperatively, can be efficaciously used after a third molar surgery.

Orally disintegrating mucoadhesive sublingual tablets have the following potential advantages over conventional dosage forms as shown by our study as follows:

1. Comparatively faster onset of action as compared to the oral route and the drug formulation can be easily removed if therapy is required to be discontinued.
2. Liver is bypassed and also drug is protected from degradation due to pH and digestive enzymes of the middle gastrointestinal tract.
3. Improved patient compliance due to the elimination of associated pain with injections.
4. Low dosage gives high efficacy as hepatic first-pass metabolism is avoided and also reduces the risk of side effects.
5. The large contact surface of the oral cavity contributes to rapid and extensive drug absorption.
6. This route of administration can be used in emergency conditions.
7. Rapid absorption and higher blood levels due to high vascularization of the region.
8. They also present the advantage of providing fast dissolution or disintegration within the mouth, without the necessity for water.
9. Dissolution stability when placed below the tongue,
10. Increased bioavailability,
11. Lower rate of adverse reactions.

Some of the demerits of sublingual piroxicam are (a). Poor anti-inflammatory action of piroxicam (b). No significant improvement on mouth opening in the immediate postoperative period. Accidental ingestion can cause mild systemic effects. (c). Sublingual administration of drugs hinders normal activities like talking, eating, and drinking, this route of administration is generally considered undesirable for prolonged administration. (d). Not well suited to sustained-delivery systems. (e). Sublingual medication cannot be used for uncooperative or unconscious patients.

CONCLUSION

The need for a potent analgesic and anti-inflammatory drug with a fast onset of action has always been the primary requisite for the patient and the surgeon to improve the patient compliance and comfort post-operatively after an impaction surgery. Our study has shown that the sublingual route of administration had a significantly faster onset of action and better degree of analgesia postoperatively on comparison to the oral route of administration of the same drug Piroxicam. Though the degree of edema and trismus were minimal in the piroxicam group when compared with the oral group and not statistically significant, it is believed these findings are important concerning clinical practice. Thus, we conclude that the sublingual administration of piroxicam was the desirable option of the two when surgically extracting an impacted third molar.

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REFERENCES

1. Blondeau F, Daniel NG. Extraction of impacted mandibular third molars: postoperative complications and their risk factors. J Can Dent Assoc. 2007.
2. LJ Balihallimath, Shruti SP. Sublingual piroxicam for management of postoperative pain, trismus and swelling after extraction of lower third molars: an overview. *IOSR Journal of Dental and Medical Sciences. Volume 14, Issue 10 Ver. VIII (Oct. 2015)*.
3. Lee Y, Rodiguez C, Dionne RA. The role of cox-2 in acute pain and the use of selective cox-2 inhibiors for acute pain relief. Curr Pharm Des 2005.
4. R. N. Brogden, R. C. Heel, T. M. Speight, G. S. Avery. Piroxicam A Reappraisal of its Pharmacology and Therapeutic Efficacy. Drugs.October 1984.
5. 5.P. A. K. Trindade, F. P. M. Giglio et Al . Comparison of oral versus sublingual piroxicam during postoperative pain management after lower third molar extraction. Int. J. Oral Maxillofac. Surg. 2011.
6. Saha P, Verma SU, Das PS. Sublingual drug delivery: an indication of a potential alternative route. International Journal of Current Pharmaceutical Research. 2017.
7. Kaur N, Misurya R, Narula R, Kumar M. Comparison of the clinical efficacy of methylprednisolone with ibuprofen and ibuprofen alone on the postoperative sequelae of surgical removal of the impacted third molar. Indian Journal of Pain. 2014.
8. Schultze-Mosgau S, Schmelzeisen R, Frölich JC, Schmele H. Use of ibuprofen and methylprednisolone for the prevention of pain and swelling after removal of impacted third molars. Journal of oral and maxillofacial surgery.1995.
9. Delgado DA, Lambert BS, Boutris N, McCulloch PC, Robbins AB, Moreno MR, Harris JD. Validation of digital visual analog scale pain scoring with a traditional paper-based visual analog scale in adults. Journal of the American Academy of Orthopaedic Surgeons. Global research & reviews. 2018.
10. Gintaras Juodzbalys , Povilas Daugela; Mandibular Third Molar Impaction: Review of Literature and a Proposal of a Classification**;** J Oral Maxillofac Res. 2013.
11. Singh AK. Complications Associated with Surgical Removal of Mandibular Third Molar: A Prospective Study. J Nep Dental Association. 2019.
12. Nazar MN, Puthiriraj V. Analgesics following mandibular third molar surgery. Int J Pharm Clin Res. 2014.
13. Barden J, Edwards JE, McQuay HJ, Moore RA. Pain and analgesic response after third molar extraction and other postsurgical pain. Pain. 2004.
14. Levrini L, Carraro M, Rizzo S, Salgarello S, Bertelli E, Pelliccioni GA, Garau V, Bandettini M, Caputi S, L철rincz A, Sz청cs A. Prescriptions of NSAIDs to patients undergoing third molar surgery. Clinical drug investigation. 2008.
15. Lustenberger FD, Grätz KW, Mutzbauer TS. Efficacy of ibuprofen versus lornoxicam after third molar surgery: a randomized, double-blind, crossover pilot study. Oral and maxillofacial surgery. 2011.

16. Pawar PP, Ghorpade HS, Kokane BA. Sublingual route for systemic drug delivery. Journal of Drug Delivery and Therapeutics. 2018.
17. Elsey MJ, Rock WP. Influence of orthodontic treatment on the development of third molars. Br J Oral Maxillofac Surg. 2000.
18. Richman MD, Fox D, Shangraw RF. Preparation and stability of glyceryl trinitrate sublingual tablets prepared by direct compression. J Pharm Sci 1965.
19. Neha Narang, Jyoti Sharma; Sublingual Mucosa as A Route for Systemic Drug Delivery, Int J Pharm Pharm Sci, Vol 3, Suppl 2, 2011.
20. Zhang H, Zhang J, Streisand JB. Oral mucosal drug delivery: clinical pharmacokinetics and therapeutic applications. Clinical pharmacokinetics. 2002 Aug; 41:661-80.
21. Agarwal P, Kumar HS, Rai KK. Trismus in oral cancer patients undergoing surgery and radiotherapy. Journal of oral biology and craniofacial research. 2016 Nov 1;6: S9-13.
22. Alpaslan C, Alpaslan G et Al. Postoperative pain control by single doses of piroxicam administered sublingually and aspirin. J Marmara Univ Dent Fac. 1997.