Zagazig University Medical Journal
www.zumj.journals.ekb.eg

https://doi.org/10.21608/zumj.2024.234154.2873 Volume 30, Issue 1.7, Oct. 2024, Supplement Issue

Manuscript id: ID ZUMJ-2312-3062 **Doi: 10.21608/zumj.2024.257108.3062**

ORIGINAL ARTICLE

Efficacy of Intravenous Ibuprofen versus Intravenous Ketorolac for Postoperative Pain Following Septorhinoplasty

Sadik Abdel Maseeh Sadik, Safaa Mohamed Helal, Mohammed Abdel Rahman Salem,Mohamed Ali Aboelela, and Amany Said Abd El-Haleem

Department of Anesthesiology, Intensive Care and Pain Management, Faculty of Medicine, Menoufia University, Egypt

Corresponding author*
Mohamed Ali Aboelela

E-mail:

mohammed.aly1993@gmail.com

Submit date: 26-12-2023
Revise date: 04-01-2024
Accept date: 08-01-2024

ABSTRACT

Background: Septorhinoplasty is a common surgery that patients seek for functional or aesthetic purposes. Pain control after septorhinoplasty is a big deal for patient satisfaction, especially for aesthetic benefits. This study aimed to compare the effects of intravenously administered ibuprofen and intravenously administered ketorolac on postoperative pain relief following septorhinoplasty. **Methods**: This study is a double-blind randomized trial. Two equal groups of twenty patients each were randomly selected from a total of forty adult patients of both sexes, ASA I and ASA II, ranging in age from 18 to 60, who were scheduled for elective septorhinoplasty under general anesthesia between June 2022 and October 2023 at Menoufia University Hospital. Group I was given 800 mg of intravenous ibuprofen every 6 hours starting from induction of anesthesia. Group K was given 30 mg of intravenous ketorolac every 6 hours starting from induction of anesthesia. Both groups received pethidine as rescue analgesia (administered intravenously, 25 mg/dose). VAS evaluations and data on opioid use were documented up to 24 hours postoperatively. Both groups were also compared with respect to intraoperative analgesia and medication-related adverse effects.**Results:**The Ibuprofen group had lower VAS scores than the ketorolac group ($p < 0.05$).While the first call for rescue analgesia was comparable in both groups ($p = 0.779$), the total dosages and frequency of rescue analgesia consumption were significantly reduced in the ibuprofen group ($p = 0.036$ and 0.048, respectively). Both groups had no difference regarding heartburn ($p = 0.235$). However, there was more nausea& vomiting, and intraoperative blood loss in the ketorolac group ($p = 0.038$ and 0.007, respectively).

Conclusions: Intravenous ibuprofen, compared to ketorolac, is associated with lower postoperative VAS scores and less opioid consumption when used to alleviate postoperative pain following septorhinoplasty.**Keywords**: Ibuprofen; Ketorolac; Postoperative pain; Septorhinoplasty; Visual analog scale

INTRODUCTION

Septorhinoplasty is a common surgery that patients seek for functional or aesthetic purposes.[1]Pain control after septorhinoplasty is a big deal for patient satisfaction, especially for aesthetic benefits.[2]Appropriate management of postoperative pain continues to be problematic even with the development of novel pain management strategies and medications. Research is still needed to properly treat pain following septorhinoplasty.[3]

Opioids can control pain appropriately after septorhinoplasty but are associated with adverse effects including nausea, vomiting, constipation, excessive sedation, and depression of breathing.[4]Non-steroidal anti-inflammatory drugs (NSAIDs) are integrated into many regimens as part of multimodal analgesia.[5] Before 2009, intravenous (IV) ketorolac was the onlyIVfood and Drug Administration (FDA)-approved NSAID for the treatment of postoperative pain.[6]Despite the effective analgesia provided by intravenous ketorolac, it is associated with many adverse effects,such as heartburn, dyspepsia, and increased blood loss during and after surgeries.[7] In 2009, the FDA approved intravenous ibuprofen as a monotherapy or opioid adjuvant to alleviate pain.[8] Although there is insufficient research on IV ibuprofen, it has been shown that it is effective, safe, and has fewer side effects in the management of postoperative pain.[9]

The purpose of the current study was to evaluate the effectiveness of IV ketorolac and ibuprofen for treating postoperative pain in individuals undergoing septorhinoplasty.The secondary aims were to assess intraoperative analgesia and hemodynamic parameters, the requirement for postoperative rescue analgesia, and the incidence of adverse effects.

METHODS

This prospective, double-blind, randomized trialwas carried out after obtaining ethical approval from Menoufia University Research Committee under IRB number (6/2022 ANET 42). The World Medical Association's (Declaration of Helsinki) Code of Ethics for human research was adhered to in this study. A written informed consentwas obtained from eachparticipant. The study included forty adult patients of either sex, with ASA grades I–II, ranging in age from 18 to 60, who underwent elective septorhinoplasty under general anesthesia at Menoufia University Hospital in Menoufia, Egypt, between June 2022 and October 2023.

We excluded patients who have a history of bleeding disorders,taking antiplatelet or anticoagulant medications, renal impairment, diabetes mellitus (DM), peptic ulcer,psychiatric illness, drug addiction,or allergy to ibuprofen or ketorolac.

Septorhinoplasty was performed in all patients using the same technique by the same surgical team of ear, nose and throat (ENT) department. Eligible participants were randomly assigned in two equal groups using SAS software version 9.1 (SAS Institute Inc., Cary, NC, USA).Group,I wasadministered 800 mgof ibuprofen (ibuprofen-arabcomed® 800 mg, Arabcomed, Egypt), diluted with 250 ml of saline, after intubation through IV infusion over 30 minutes, followed by three total scheduled doses of IV ibuprofen infusion every six hours for 24 hours. Group Kwas administered 30 mg of ketorolac (ketolac® 30 mg, Amriya, Egypt), diluted with 250 ml of saline, after intubation through IV infusion over 30 minutes, followed by three total scheduled doses of IV ketorolac infusion every six hours for 24 hours. Neither the patients nor the investigator know the medication used. Rescue analgesia(pethidine 25 mg/dose, IV) was administered at the request of the patients when the visual analog scale (VAS) is ≥4 in both groups.Preoperative assessments in all patients included medical history, physical examination, a thorough assessment of the airway, and regular laboratory tests including hemoglobin, platelets count, bleeding time, and serum creatinine that used to calculate the estimated glomerular filtration rate (eGFR). The VAS was explained to all patients for pain assessment ranging from 0 (not in pain) to 10 (worst pain ever).All patients were receivedIV midazolam (0.02 mg/kg) as a premedication 30 minutes before coming to the operation room.On arrival at the operating room, mean arterial blood pressure (MAP) and heart rate were obtained at baseline, and they were subsequently documented every 15 minutes during the procedure.All patients were monitored with an electrocardiogram, end-tidal CO2,pulse oximetry, and invasive blood pressure to maintain MAP to the desired values. Thereafter, a standardized anesthetic technique was used in all patients, which includedlidocaine (1.5 mg/kg), propofol (2 mg/kg), fentanyl (2µg/kg), and atracurium (0.5mg/kg). Following intubation, isoflurane (1.2%) in an air: oxygen mixture (1:1) had been administered to maintain anesthesia. Meanwhile, the patients were mechanically ventilated targeting $ETCO_2$ of 35–40 mmHg. After intubation and before surgery, the patient was administeredan IV infusion of ibuprofen or ketorolac over 30 minutes according to group allocation. The patient's position was supine with the head raised and inclined slightly in the direction of the surgeon. Local anesthetic infiltrationwas done by the surgeon in both sides under mucosa, using 1% lidocaine with epinephrine (1:100,000) until the mucosa had becomesubstantiallydecongested.A mean arterial blood pressure (MAP)20% below patient's baseline MAP was adopted for deliberate hypotension during the surgery. Incremental doses of fentanyl (50 µg/dose) and beta-blockers (propranolol 0.5 mg/dose) were used to maintain the desired MAP and heart rate. After finishing the surgery, neostigmine 0.04 mg/kg and atropine 0.01 mg/kg were used to antagonize the residual neuromuscular blockage. The patient was extubated once they met the recognized respiratory and global extubation criteria. The patient is ready to be discharged from PACU when the modified Aldrete score is > 9.

Patients' pain score was assessed using VAS which is a score from 0-10, with two

endpoints representing 0 (not in pain) to 10 (Maximum pain conceivable). During the postoperative period, VAS scores were assessed at 30, 1, 2, 4, 8, 12, and 24 hours. Time to initial analgesic request, frequency of patient demand, and total doses of rescue analgesia over the first 24 hours following surgery were all documented.

The total doses of additional intraoperative fentanyl and propranolol used were documented.Both of the surgery's duration and the time needed to recover from anesthesia were documented.The amount of bleeding during surgery was measured, based on the volume of blood present in the suction line minus the washing fluid, and the blood gauze estimation using gauze visual analogue. [10]

Regarding the other side effects of drugs, we documented the incidence of its occurrence for 24 hours post-surgery.The following numerical score was used to categorize postoperative nausea and vomiting: 0 indicates no nausea or vomiting, 1 indicates nausea alone, 2 indicates vomiting once per 30 minutes, and 3 indicates vomiting twice or more in 30 minutes.[11]Patients who scored three on the nausea and vomiting scale or who had nausea that persisted for more than two hours were classified as having severe nausea and vomiting, and they received an intravenous dose of 150 µg/kg metoclopramide. Patients who had gastrointestinal side effects (e.g. heartburn) were documented.Serum hemoglobin, platelets count, bleeding time, and serum creatinine were measured 24 hours after surgery. The difference between preoperative and 24-hour postoperative hemoglobin, platelet count, bleeding time, and estimated glomerular filtration rate (eGFR)were compared.The Modification of Diet in Renal Disease (MDRD) Study equation to calculate the estimated glomerular filtration rate (eGFR).[12]Hemoglobin and platelet count were measured using Sysmex XE-2100® (Sysmex Corp., Kobe, Japan) while serum creatinine was measured by AU480 chemistry analyzer (Beckman Coulter,Brea, California, USA). Bleeding time was measured using capillary tube method.

Based on a study of previous studies, the sample size was estimated.[13] The least sample size is 40 subjects divided into two equal groups calculated using PASS software version 11. (NCSS, LLC, Kaysville, Utah, USA). The power of the study is 80% and the confidence level is 95%.

STATISTICAL ANALYSIS

The statistical package for the social science (IBM-SPSS), software version 26. (IBM Corp., Armonk, New York, USA), was used to tabulate and analyze the obtained data. The independent Student's t-test was used to compare differences between groups for numerical data that were normally distributed, and the Chi-square or Fisher exact test was used to analyze categorical variables, which are presented as numbers (%). The Mann-Whitney U test was used to compare data that were not normally distributed, and the results were presented as the median (IQR). The results were deemed significant at the 5% significance level.

RESULTS

In this study, a total of 52 patients were assessedfor eligibility, 12were excluded (4 refused to participate and 8 didn't meet inclusion criteria)، and 40 patients underwent randomization to20 patients in each group

(Figure 1). In the context ofmean age, sex, and body mass index (BMI), the two groups were statistically comparable (P > 0.05) **(Table1)**.

When comparing group I to group K, there were reduced VAS scores in group I at 30 minutes, 1 hour, 4 hours, 2 hours, 8 hours, 12 hours, and 24 hours after surgery (P <0.05) **(Table 2)**.Group I exhibited a significant decrease in both the overall dosages and frequency of rescue analgesia use (P = 0.036 and 0.048, respectively). Regarding the initial request for rescue analgesia, there was no statistically significant difference between the two groups (P = 0.779) **(Table 3)**.This study demonstrates that, in terms of intraoperative hemodynamic parameters, there was no statistically significant difference between groups I and K with respect to heart rate and mean arterial pressure at different intervals during septorhinoplasty (P > 0.05)**(Table 4)**.There was no statistically significant difference in the intraoperative propranolol and fentanyl use between the two groups (P> 0.05) **(Table 1)**.The duration of surgery and recovery time were comparable in both groups **(Table 1)**.

There was no statistically significant difference between group I and group K in terms of heartburn (P=0.235). However, there was a statistically significant difference between Group I and Group K regarding nausea& vomiting and intraoperative blood loss (P<0.05) **(Table 5)**. When compared to group I, group K experienced a higher incidence of nausea and vomiting as well as significant intraoperative blood loss.

Preoperative hemoglobin, platelet count, eGFR, bleeding time, postoperative platelets, and eGFR did not differ significantly between Group I and Group K (P >0.05); however, postoperative hemoglobin and bleeding time differed significantly (P <0.05) **(Table 5)**. Group K had much increase in postoperative bleeding time and much decrease of postoperative hemoglobin when compared to group I.

Table (1): Sociodemographic & operative characteristics in the studied groups.

Variable	Group I (N=20)		Group K (N=20)		Test of significance	p-value
	N	%	N	%		
Sex						
➢ **Male**	10	50.0	11	55.0	$\chi 2$=0.100	0.752
➢ **Female**	10	50.0	9	45.0		
ASA						
➢ **I**	16	80.0	17	85.0	FE= 0.173	1.000
➢ **II**	4	20.0	3	15.0		
Age (Years)						
➢ **Mean ±SD**	29.80 ±9.75		29.45 ±10.16		U =0.850	0.862
➢ **Range**	18-51		18-52			
BMI (kg/m2)						
➢ **Mean ±SD**	28.60 ±3.20		29.90 ±4.18		t =1.104	0.277

Variable	Group I (N=20)		Group K (N=20)		Test of significance	p-value
	N	%	N	%		
➢ Range	25-36		25-36			
Intraoperative propranolol consumption (mg) ➢ Median (IQR)	0.75 (0.125-1)		0.75 (0.5-1)		U =0.070	0.944
Intraoperative fentanyl consumption (µg) ➢ Median (IQR)	50 (0-100)		50 (12.5-100)		U =0.099	0.921
Duration of surgery (min) Mean ±SD	106.80 ±26.81		106.05 ±17.95		t=0.104	0.918
Recovery time (min) Median (IQR)	8.5 (5.5-11)		6 (4-10)		U =1.702	0.089

Group I: patients who received IV ibuprofen, Group K: patients who received IV ketorolac, N: number of patients, SD: Standard deviation, ASA: American Society of Anesthesiologist, BMI: Body Mass Index, $\chi 2$: Chi-squared test, FE: Fisher exact test, U: Mann-Whitney U test, t: Student t test, IQR: Interquartile range.

Table (2): Comparison between the two studied groups regarding VAS score.

VAS score	Group I Median (IQR)	Group K Median (IQR)	Mann-Whitney U test	p-value
30 min postoperative	2 (1-3)	3 (2-4)	2.324	0.020*
1 hour postoperative	2 (1.25-3)	4 (3-4)	3.569	<0.001*
2 hours postoperative	3 (2-3.75)	5 (4-5.75)	3.324	0.001*
4 hours postoperative	3 (2-3.75)	5 (4-6)	4.660	<0.001*
8 hours postoperative	2.5 (2-3)	4 (4-6)	3.808	<0.001*
12 hours postoperative	2 (2-3)	4 (3-5)	4.423	<0.001*
24 hours postoperative	2 (2-2.75)	2.5 (2-4)	2.090	0.037*

Group I: patients who received IV ibuprofen, Group K: patients who received IV ketorolac, *: Statistically significant, IQR: Interquartile range, VAS: visual analog scale.

Table (3): Comparison between the two studied groups postoperative rescue analgesia consumption.

Rescue analgesia (IV pethidine)	Group I Median (IQR)	Group K Median (IQR)	Mann-Whitney U test	p-value
Total consumption of IV pethidine (mg)	25 (0-43.75)	50 (25-75)	2.097	0.036*
Frequency	1 (0-1.75)	1.5 (1-3)	1.975	0.048*
First call (hours)	1.5 (0-3.75)	2 (1-3)	0.760	0.779

Group I: patients who received IV ibuprofen, Group K: patients who received IV ketorolac, *: Statistically significant, SD: Standard deviation, IQR: Interquartile range, IV: intravenous.

Table (4): comparison between the two studied groups regarding intraoperative heart rate & MAP.

Variable	Group I Mean ±SD	Group K Mean ±SD	Student t test	p-value
Heart rate Baseline	74.22 ±8.58	77.95 ±7.62	1.380	0.176
15 min after induction	71.22 ±6.16	68.50 ±6.03	1.355	0.183
30 min intraoperative	68.83 ±5.08	69.95 ±6.37	0.758	0.453
45 min intraoperative	65.60 ±3.44	68.80 ±6.37	0.506	0.055
1 hour intraoperative	67.30 ±4.52	69.50 ±6.29	0.574	0.213
75 min intraoperative	68.39 ±4.69	68.55 ±6.64	0.085	0.932
MAP Baseline	90.17 ±3.68	89.75 ±3.28	0.556	0.581
15 min after induction	67.94 ±2.62	67.10 ±2.81	1.125	0.268
30 min intraoperative	68.00 ±3.34	66.70 ±2.43	1.455	0.155
45 min intraoperative	66.94 ±2.56	68.05 ±2.95	1.097	0.280
1 hour intraoperative	67.83 ±3.22	67.60 ±3.09	0.000	1.000
75 min intraoperative	69.33 ±3.09	68.15 ±2.54	1.282	0.209

Group I: patients who received IV ibuprofen, Group K: patients who received IV ketorolac, SD: Standard deviation, MAP: mean arterial blood pressure.

Table (5): Comparison between the two studied groups regarding perioperative complications and pre and post-operative data**.**

Complication	Group I (N=20)		Group K (N=20)		Test of significance	p-value
	N	%	N	%		
Nausea and vomiting						
➢ **Present**	3	15.0	9	45.0	$\chi 2$=4.286	0.038*
➢ **Absent**	17	85.0	11	55.0		
Heart burn						
➢ **Present**	2	10.0	6	30.0	FE= 2.500	0.235
➢ **Absent**	18	90.0	14	70.0		
Intraoperative blood loss (ml) (Mean ±SD)	209.75 ±93.49		313.50 ±130.02		U= 2.639	0.007*
Preoperative hemoglobin (g/dl) (Mean ±SD)	14.11 ±1.47		13.80 ±1.39		t= 0.685	0.497
Preoperative platelets count (10^3 /mm3) (Mean ±SD)	313.10 ±61.64		308.90 ±59.46		t= 0.219	0.828
Preoperative eGFR (ml/min) (Mean ±SD)	106.65 ±4.83		104.70 ±6.92		t= 1.034	0.308
Preoperative bleeding time (seconds) (Mean ±SD)	164.50 ±52.41		139.25 ±36.08		t= 1.775	0.085
Postoperative hemoglobin (g/dl) (Mean ±SD)	13.87 ±1.55		12.93 ±1.34		t= 2.055	0.047*

Complication	Group I (N=20)		Group K (N=20)		Test of significance	p-value
	N	%	N	%		
Postoperative platelets count (10^3 /mm3) (Mean ±SD)	317.05 ±45.62		311.95 ±56.91		t= 0.313	0.756
Postoperative eGFR (ml/min) (Mean ±SD)	106.15 ±6.43		103.00 ±6.29		t= 1.565	0.126
Postoperative bleeding time (seconds) (Mean ±SD)	231.10 ±54.19		274.45 ±40.04		t= 2.877	0.007*

Group I: patients who received IV ibuprofen, Group K: patients who received IV ketorolac, N: number of patients, *: Statistically significant, SD: Standard deviation, IQR: Interquartile range, $\chi 2$: Chi-squared test, FE: Fisher exact test, U: Mann-Whitney U test, t: Student t test, eGFR: estimated glomerular filtration rate.

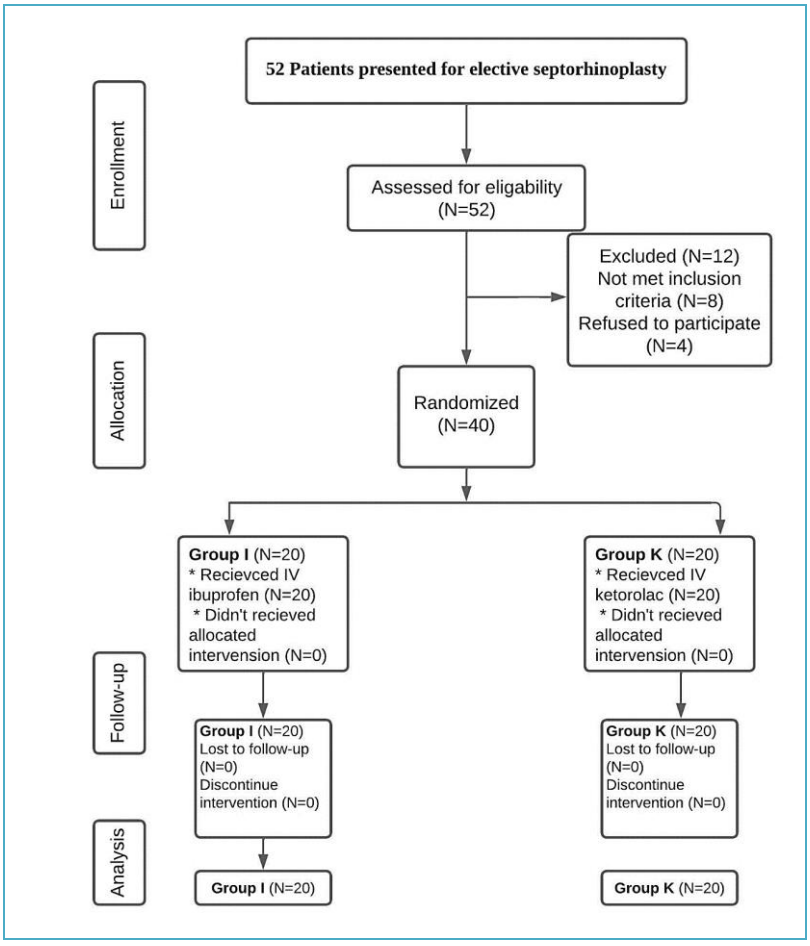

Figure (1): Consolidated standards of reporting trials flow diagram showing patient progress through the study phases.

DISCUSSION

Septorhinoplasty is a common surgery that is widely employed by plastic and ENT surgeons. Septorhinoplasty causes much more pain than classic septoplasty.[14] There are limited studies that involve pain management following septorhinoplasty.

The current study was a randomized

trialconducted to evaluate the effectiveness of intravenous ibuprofen against intravenous ketorolac in the management of postoperative pain after septorhinoplasty. We found that ibuprofen considerably reduced pain scores during the first 24 hours after surgery when compared to ketorolac.Additionally, we observed a significant decrease in the amount of opioids utilized as rescue analgesics in the ibuprofen group. Both groups had comparable intraoperative hemodynamic parameters and anesthetic requirements.

NSAIDs are widely used as a part of multimodal analgesia. Some NSAIDs are known to have opioid-sparing effects, such as ibuprofen and ketorolac. Ibuprofen is a well-known drug, but the IV form wasFDA-approved lately in 2009. Several studies compared NSAID drugs, but there are relatively few studies compared IV ibuprofen and ketorolac. Çelik et al.[15] compared the use of a single dosage of IV paracetamol and ibuprofen before septorhinoplasty for postoperative pain relief. The results showed a greater reduction in opioid consumption and VAS in the first 12 hours after septorhinoplasty in the ibuprofen group.[15] Kashif et al.[16]compared the effects of a single IV dosage of ketorolac and paracetamol for postoperative pain following septoplasty. They reported that IV paracetamol was better than IV ketorolac in controlling postoperative pain.To the best of our knowledge, there was no study comparing IV ibuprofen and IV ketorolac for the management of postoperative pain following septorhinoplasty.

Our results are supported by Yafizham [17],who found that IV ibuprofen showed lower postoperative VAS and a decrease in total consumption of rescue analgesiacompared to IV ketorolac in patients operated for abdominal gynecological surgeries under general anesthesia.

Moreover, it was shown by Uribe et al. [6]that postoperative morphine consumption and pain scores (during rest and movement) were considerably reduced in patients having arthroscopic knee procedures when IV ibuprofen was used instead of IV ketorolac.

Since postoperative pain is considered a type of acute pain, Yazdani and Pinzon et al. studies' results can be compared. Patients with acute renal colic were randomly assigned to one of three groups in Yazdani's study [18], a double-blind clinical trial, and given an intravenous infusion of ketorolac, IV ibuprofen, or morphine.They reported that Ibuprofen had a better analgesic profile relative to ketorolac and morphine. IV ibuprofen and IV ketorolac were compared by Pinzon et al.[19]for the treatment of acute non-specific musculoskeletal pain and the enhancement of sleep quality.For individuals with acute non-specific musculoskeletal pain, intravenous Ibuprofen was more successful than intravenous ketorolac in enhancing the quality of their sleep.Compared to the group using ketorolac, the Ibuprofen group experienced a much higher decrease in VAS scores.

Zubair et al.[20]in a randomized controlled trial declared that there was no significant difference in mean postoperative VAS after paraumbilical hernia repair between Ibuprofen and Ketorolac treated patients. They reported that ibuprofen use associated with lower amount of rescue analgesia consumption.

On the other side, Dwarica et al.[21]compared ketorolac with ibuprofen for alleviating pain after urogynecology surgeries.Patients who experienced different types of urogynecologic operations did not show any statistically

significant difference in pain scores between IV ketorolac and IV ibuprofen, according to Dwarica et al.[21]The difference in results from our study can be attributed to all patients receiving patient-controlled analgesia (PCA) with hydromorphone for the first day of surgery and continued on oral hydrocodone after that.

Regarding gastrointestinal complications, wehere report comparable postoperative heartburn incidence in IV ibuprofen and ketorolac treated patients. None of the participants in either group reported GI bleeding. However,we reported a higher incidence of postoperative nausea and vomiting in ketorolac treated patients. This could be attributed to higher opioid consumption in ketorolac group. Pinzon et al.[19] reported gastrointestinal complications only in ketorolac group in comparison to zero percent incidence in ibuprofen group. A systematic review study by McNicol et al.[22], which included the results of eight studies comparing the rate of nausea and vomiting with ketorolac versus placebo found no evidence of a difference. Gozeler et al.[13]observed thatan intravenous dose of ibuprofen prior to septorhinoplasty reduced the incidence of postoperative nausea and vomiting by 75% when compared to a placebo group. They stated that this finding may be attributed reduced opioid consumption by 44% in ibuprofen treated patients.

Septorhinoplasty is associated with a risk of significant bleeding.Different anesthetic techniques may be adopted to reduce bleeding. They includeregional anesthetic techniques, preventing hypothermia, and proper patient position. [23]In some cases, deliberate hypotension may be advantageous.[23]

In the current study, IV ketorolac was associated with significantly more intraoperative blood loss, postoperative hemoglobin drop, and more prolonged bleeding time compared to ibuprofen. However, none of the participants needed a blood transfusion. Both ibuprofen and ketorolac significantly prolong bleeding time relative to the preoperative baseline, however both mean values of prolonged bleeding time remain within the normal range. According to Singer et al.[24], four hours following a single intramuscular injection of 60 mg ketorolac, the mean prolongation of bleeding time in healthy participants was one minute and 46 seconds. Shetty et al.[25] found prolongation of bleeding time occurred in both ibuprofen anddiclofenacsodiumgroups. In a systematic review of the risk of bleeding after plastic surgery, Forsyth et al.[26]evaluated the use of perioperative NSAIDs. Twelve papers were analyzed in the study; 6581 patients, 1785 NSAID-using patients, and 4796 controls were included. Forsyth et al. concluded that there is a higher risk of postoperative bleeding issues when perioperative NSAIDs are used during plastic surgery operations. However, the likelihood of bleeding problems is still rather minimal. When comparing ketorolac to ibuprofen and celecoxib, Nicholas et al.'s meta-analysis [27]in the field of cosmetic surgery likewise revealed a higher risk of bleeding or hematoma. It is unclear how using ketorolac differs from using other NSAIDs in terms of blood loss risk.[28]

In our study, we compared the estimated glomerular filtration rate (eGFR) in both groups preoperatively and postoperatively using the MDRD study equation. Compared to the Chronic Kidney Disease-Epidemiology Collaboration (CKD-EPI) and Cockcroft-Gault equations, the MDRD study equation

provides a more precise estimate of the glomerular filtration rate. [12] Neither ibuprofen nor ketorolac affectseGFR after 4 doses of each drug. Maslin et al.[7]in a review of recent articles confirmed that ketorolac was safe for individuals with previously normal kidney function; nevertheless, safety precautions against use in comorbid kidney. Increased incidence of acute kidney injury in association with ibuprofen use in dehydrated participantswas found in Lipman et al. and Balestracci et al. studies. [29][30] Lee et al.[31] in a systematic review of many studies assured that patients whose preoperative renal function was normal, NSAIDs temporarily lower renal function in the early postoperative phase; however, this effect is not clinically significant. Therefore, persons whose renal function was normal before to surgery should not discontinue taking NSAIDs due to fear of postoperative renal impairment.

One of the limitations of our study is that it is a single-center study, and may not be representative of the general population. A lot of research should be considered before warning that ketorolac may increase bleeding during septorhinoplasty.

CONCLUSIONS

In patients undergoing septorhinoplasty, using IV ibuprofen is associated with lower postoperative VAS scores and less opioid consumption compared to IV ketorolac. On the other hand, Ketorolac was associated with more intraoperative bleeding and postoperative nausea and vomiting. Under the conditions of this study, IV Ibuprofen seems to be a better choice than IV Ketorolac as a component of a multimodal analgesia regimen in patients undergoing septorhinoplasty considering its efficacy and safety profile.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURES: None

REFERENCES

[1] **Sena Esteves S, Gonçalves Ferreira M, Carvalho Almeida J, Abrunhosa J, Almeida Sousa C, Esteves SS, et al.** Evaluation of aesthetic and functional outcomes in rhinoplasty surgery: a prospective study. Braz J Otorhinolaryngol. 2017;83(5):552–7.

[2] **Gadkaree SK, Shaye DA, Occhiogrosso J, Lee LN. A**ssociation between Pain and Patient Satisfaction after Rhinoplasty. JAMA Facial Plast Surg. 2019;21(6):475–9.

[3] **Nguyen BK, Yuhan BT, Folbe E, Eloy JA, Zuliani GF, Hsueh WD, et al.** Perioperative Analgesia for Patients Undergoing Septoplasty and Rhinoplasty: An Evidence-Based Review. Laryngoscope. 2019;129(6):E200–12.

[4] **Anne S, Mims JW, Tunkel DE, Rosenfeld RM, Boisoneau DS, Brenner MJ, et al.** Clinical Practice Guideline: Opioid Prescribing for Analgesia After Common Otolaryngology Operations Executive Summary. otolaryngol Head Neck Surg. 2021;164(4):687-703.

[5] **Saini AT, Jiang ZY, Starr NC, Talmadge J, Schmale I, Radabaugh P, et al**. Are nonsteroidal anti-inflammatory drugs effective enough for postoperative pain control after functional endoscopic sinus surgery and septoplasty? A randomized, controlled study. Int Forum Allergy Rhinol. 2022;12(7):910-6.

[6] **Uribe AA, Arbona FL, Flanigan DC, Kaeding CC, Palettas M, Bergese SD.** Comparing the Efficacy of IV Ibuprofen and Ketorolac in the Management of Postoperative Pain Following Arthroscopic Knee Surgery. A Randomized Double-Blind Active Comparator Pilot Study. Front Surg. 2018;5(October):1–10.

[7] **Maslin B, Lipana L, Roth B, Kodumudi G, Vadivelu N.** Safety Considerations in the Use of Ketorolac for Postoperative Pain. Curr Drug Saf. 2016;12 (1):67–73.

[8] **Smith HS, Voss B**. Pharmacokinetics of intravenous ibuprofen: Implications of time of

infusion in the treatment of pain and fever. Drugs. 2012;72 (3):327–37.

[9] **Kim SY, Lee S, Lee Y, Kim H, Kim KM.** Effect of single dose preoperative intravenous ibuprofen on postoperative pain and opioid consumption: A systematic review and meta-analysis. Korean Journal of Anesthesiology. 2021;74:409–21.

[10] A**lgadiem EA, Aleisa AA, Alsubaie HI, Buhlaiqah NR, Algadeeb JB, Alsneini HA. Blood Loss Estimation Using Gauze Visual Analogue. Trauma Mon. 2016; 21(2):e34131.**

[11] S**adhasivam S, Shende D, Madan R.** Prophylactic ondansetron in prevention of postoperative nausea and vomiting following pediatric strabismus surgery: A dose-response study. Anesthesiology. 2000;92:1035–1042.

[12] **Schwandt A, Denkinger M, Fasching P, Pfeifer M, Wagner C, Weiland J, et al**. Comparison of MDRD, CKD-EPI, and Cockcroft-Gault equation in relation to measured glomerular filtration rate among a large cohort with diabetes. J Diabetes Complications. 2017;31(9):1376–83.

[13] **Gozeler MS, Sakat MS, Kilic K, Ozmen O, Can A, Ince I.** Does a single-dose preemptive intravenous ibuprofen have an effect on postoperative pain relief after septorhinoplasty? Am J Otolaryngol - Head Neck Med Surg. 2018;39(6):726–30.

[14] **Aydil U, Yilmaz M, Akyildiz I, Bayazit Y, Keseroglu K CA.** Pain and safety in otorhinolaryngologic procedures under local anesthesia. J Otolaryngol Head Neck Surg. 2008;Dec;37(6):851–5.

[15] **Çelik EC, Kara D, Koc E, Yayik AM.** The comparison of single-dose preemptive intravenous ibuprofen and paracetamol on postoperative pain scores and opioid consumption after open septorhinoplasty: a randomized controlled study. Eur Arch Oto-Rhino-Laryngology. 2018;275(9):2259–63.

[16] **Kashif S, Kundi MN, Khan TA.** Pre-emptive effect of intravenous paracetamol versus intravenous ketorolac on post-operative pain and shivering after septoplasty under general anesthesia: a comparative study. Pakistan Armed Forces Med J. 2021;71(4):1179–82.

[17] **Yafizham MI.** Comparison of the VAS Values for the Administration of Preemptive Analgesia with Intravenous Ibuprofen 800 Mg and Intravenous Ketorolac 30 Mg for Postoperative Patients after Gynecological Abdominal Surgery under General Anesthesia. Int J Innov Sci Res Technol. 2019;4(6):333–40.

[18] **Parivahs Yazdani.** Comparative Study of Individual Pain relief Effect of Intravenous Ibuprofen Intravenous Morphine, Intravenous ketorolac Separately in renal colic Patient ED. J Crit Rev. 2021;8(2):278–84.

[19] **Pinzon RT, Susanto FE.** Effectiveness of intravenous ibuprofen compared to intravenous ketorolac for improving the sleep quality patients of acute non-specific musculoskeletal pains. Romanian Journal of Neurology. 2020;19(3):186–192.

[20] **Zubair R, Mirza MR, Channa MA, Yaqoob U.** Comparing the effects of Ketorolac and Ibuprofen on post-operative pain relief after para umbilical hernia repair . A randomized clinical trial. Pak J Surg. 2022; 38(1):13-17.

[21] **Dwarica DS, Pickett SD, Zhao YD, Nihira MA, Quiroz LH.** Comparing ketorolac to ibuprofen for postoperative pain: a randomized clinical trial. Female Pelvic Med Reconstr Surg. 2020;26(4):233 –8.

[22] **McNicol ED, Ferguson MC, Schumann R**. Single-dose intravenous ketorolac for acute postoperative pain in adults. Cochrane Database Syst Rev. 2021;5(5):CD013263.

[23] S**hah A, Palmer AJR, Klein AA**. Strategies to minimize intraoperative blood loss during major surgery. Br J Surg. 2020;107(2):e26–38.

[24] **Singer AJ, Mynster CJ, McMahon BJ.** The

effect of IM ketorolac tromethamine on bleeding time: A prospective, interventional, controlled study. Am J Emerg Med. 2003;21(5):441–3.

[25] **Shetty S, Sharath K, Thomas B, Shetty N, Shetty A, Shetty D.** NSAIDs and Bleeding in Periodontal Surgery. J Clin Diagn Res. 2014;8(5):ZC17–ZC20.

[26] **Forsyth MG, Clarkson DJ, O'Boyle C**P. A systematic review of the risk of postoperative bleeding with perioperative non-steroidal anti-inflammatory drugs (NSAIDs) in plastic surgery. Eur J Plast Surg. 2018;41(5):505–10.

[27] **Marshall R V., Rivers NJ, Manickavel S, Grayson JW, Cox AJ**. Postoperative Opioid Use in Rhinoplasty Procedures: A Standardized Regimen. Facial Plast Surg. 2021;37(1):110–6.

[28] **Cramer JD, Barnett ML, Anne S, Bateman BT, Rosenfeld RM, Tunkel DE, et al.** Nonopioid, Multimodal Analgesia as First-line Therapy After Otolaryngology Operations: Primer on Nonsteroidal Anti-inflammatory Drugs (NSAIDs). Otolaryngol Head Neck Surg. 2021 Apr;164(4):712-9.

[29] **Lipman GS, Shea K, Christensen M, Phillips C, Burns P, Higbee R, et al.** Ibuprofen versus placebo effect on acute kidney injury in ultramarathons: a randomised controlled trial. Emerg Med J. 2017;34(10):637–42.

[30] **Balestracci A, Ezquer M, Elmo ME, Molini A, Thorel C, Torrents M, et al.** Ibuprofen-associated acute kidney injury in dehydrated children with acute gastroenteritis. Pediatr Nephrol. 2015;30(10):1873–8.

[31] **Lee A, Cooper MG, Craig JC, Knight JF, Keneally JP.** Effects of nonsteroidal anti-inflammatory drugs on postoperative renal function in adults with normal renal function. Cochrane Database Syst Rev. 2007; 2007(2):CD002765

Citation:

Sadik, S., Helal, S., Salem, M., Aboelela, M., Abd El-Haleem, A. Efficacy of Intravenous Ibuprofen versus Intravenous Ketorolac for Postoperative Pain Following Septorhinoplasty. *Zagazig University Medical Journal*, 2024; (3847-3859): -. doi: 10.21608/zumj.2024.257108.3062