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Original Article

Comparison of Analgesic Effect of Intravenous Paracetamol with Intravenous Ketorolac in Patients Presenting With Renal Colic in the Emergency Department

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ABSTRACT

Objective: To compare the effects of intravenous (IV) Paracetamol and intravenous (IV) Ketorolac in pain management of patients with renal colic presenting to the emergency department (ED).

Study Design: Quasi-experimental study.

Place and Duration of Study: Emergency Department, Combined Military Hospital, Rawalpindi Pakistan, from Jan to Jul 2021.

Methodology: Eighty patients were included in the study who were selected and divided into two groups, one receiving Paracetamol 1 g intravenous (PC-Group) and the other receiving Ketorolac 30 mg IV (KET-Group). Their effect was compared using differences in visual analogue scale (VAS) before and after giving analgesia. Record of vital signs pre and post-drug administration, adverse effects and need for rescue analgesia was maintained (Nalbuphine). If further analgesia was required, 100 mg intravenous was used as the rescue drug.

Results: Ketorolac (KET) Group had a mean age of 37.60±14.56 years, while the Paracetamol (PC) Group had a mean age of 43.2 ± 16.05 years. There was no statistically significant difference in the reduction of pain intensity after giving the drug in the respective study Groups (p=0.09). Adverse effects (p=0.17) and the need for rescue analgesia (p=0.34) were also comparable between the two Groups.

Conclusion: The use of either intravenous-PC or intravenous-KET in patients with renal colic had similar analgesic effects with no significant difference in side effects and need for rescue analgesia.

Keywords: Acetaminophen, Ketorolac, Renal colic.

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INTRODUCTION

Renal colic is one of the most typical reasons for emergency department (ED) visits.[1] Around 1% of all hospital admissions are attributable to this condition, with a 2-3% prevalence in the general population.[2,3] The debilitating pain of acute renal colic, often described as the worst pain ever experienced, warrants rapid pain relief. Pain associated with kidney stones is due to obstruction of a hollow viscus (ureter) and subsequent hydronephrosis, creating pressure against Gerota's fascia and causing flank pain. The pain is visceral without peritoneal irritation.[4]

Good pain relief is associated with patient satisfaction and quality of care in ED. Paracetamol (Acetaminophen) is one of the most used drugs for pain relief in ED.[5,6] Then compared to NSAIDs and opioids, Paracetamol has a better safety profile.[7] Intravenous-Paracetamol is a centrally-acting analgesic rapidly crossing the blood-brain barrier, providing quick pain relief. It was assumed that intravenous Paracetamol could be more effective in acute renal colic due to these two properties.[8] Due to its better safety profile and central analgesic action, intravenous Paracetamol can be a good choice for pain relief in renal colic.[9] Although a recent study by Zadeh *et al.* advocated using Paracetamol in renal colic due to its efficacy similar to Ketorolac and fewer adverse effects[3], its effect has yet to be studied in the Sub-continent population.

The paucity of data regarding the use of Paracetamol in renal colic among the Pakistani population was the rationale behind our study. Therefore, the objective of our study was to compare the effects of Paracetamol and Ketorolac in acute pain management of patients with renal colic presenting to the ED of a tertiary care hospital in Pakistan. The primary outcome of this study was to compare the change in pain intensity 30 minutes after administration in respective study Groups.

METHODOLOGY

The quasi-experimental study was conducted at the Emergency Department of Combined Military

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Hospital, Rawalpindi, from January to July 2021. Ethical Committee approval was obtained (vide certificate number 214).The sample size was calculated using a WHO calculator with a prevalence of 3 per cent in the general population.[10]

Inclusion Criteria: All patients presenting with flank pain radiating to the groin or abdomen aged 16 to 60 years and a confirmed diagnosis of renal stone on CT or ultrasound were included in the study.

Exclusion Criteria: Patients with known allergies to Paracetamol or Ketorolac, pregnancy and history of renal impairment or gastro-intestinal bleeding were excluded from the study.

A total of 80 patients was selected via non-probability (consecutive) sampling technique and divided into two groups, one receiving Paracetamol 1g intravenous and the other receiving Ketorolac 30 mg intravenous. The Emergency Medicine or Surgical resident completed the proforma and collected all data. The assessment was conducted using a visual analogue scale (VAS) upon presentation and at 15 and 30 minutes after drug administration. The information collected at the same time intervals was vital signs of the patient and any adverse effects, including nausea, vomiting and dizziness. The change in VAS was also documented. Patients who did not respond to initial treatment were given Nalbuphine 100 mg intravenous as the rescue drug.

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 26.00. Categorical variables were recorded as frequency and percentages, while continuous data was recorded as mean and standard deviation. The chi-Square test was used for categorical variables, while the independent sample t-test was used for continuous data. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

The Ketorolac Group had a mean age of 37.60± 14.56 years, while the Paracetamol Group had a mean age of 43.2±16.05 years (Table-I). Mean VAS was evaluated among the study groups (Table-II). The significant difference was noted in the VAS between the two groups at presentation (*p*= 0.06). However, the VAS score at 15 minutes (*p*= 0.02) and 30 minutes (*p*= 0.03) was lower in the PC Group and statistically significant; the change in VAS score (primary outcome) was statistically insignificant between the two Groups. The means systolic pressure in KET and PC Group were 142.63±19.28 mmHg and 131.23±18 mmHg, respectively, with a *p*-value of 0.08. However, the systolic blood pressure at 30 minutes in KET and PC Group was 128.23±18.73 and 119.85±11.80, respectively, with a *p*-value of 0.02 which was statistically significant.

Table-I: Comparison of Demographic Characteristics Between Study Groups (n=80)

Characteristic	Intravenous Ketorolac n (%)	Intravenous Paracetamol n (%)	*p*- value
Age (Mean±SD) years	37.60± 14.56	43.2±16.05	0.106
Gender			
Male Female	26(65%) 14(35%)	30(75%) 10(25%)	0.329
Comorbidities	17(42.5%)	14(35%)	0.491
History of Renal Colic	20(50%)	18(45%)	0.654
Flank Tenderness	32(80%)	27(67.5%)	0.204
Hematuria	7(17.5%)	9(22.5%)	0.576
Mode of Diagnosis			
CT KUB	21(52.5%) 19(47.5%)	25(62.5%) 15(37.5%)	0.366
Size of Stone			
<4mm >4mm	20(50%) 19(47.5%)	29(72.5%) 11(27.5%)	0.09
Location of Stone			
Kidney Ureter Bladder	15(37.5%) 22(55%) 3(7.5%)	11(27.5%) 27(67.5%) 2(5%)	0.50

Table-II: Comparison of Visual Analogue Scale and Vital Signs between Study Groups at different Time Intervals (n=80)

Characteristics	Time	Intravenous Ketorolac (Mean±SD)	Intravenous Paracetamol (Mean±SD)	*p*-value
Visual Analogue Score	At Presentation	8.6±1.75	8.75±1.27	0.66
	After 15min	6.88±1.62	5.88±2.3	0.02*
	After 30min	4.07±2.39	2.95±2.309	0.03*
	Change in Visual Analogue Score	4.93±2.33	5.8±2.24	0.09
Systolic Blood Pressure	At Presentation	142.63±19.28	131.23±18.15	0.008
	After 30min	128.23±18.73	119.85±11.80	0.02*
Diastolic Blood Pressure	At Presentation	87.05±10.35	86.03±7.30	0.64
	After 30min	79.48±7.53	79.68±6.70	0.9
Pulse	At Presentation	90.88±14.83	87.93±13.49	0.355
	After 30min	80.37±10.21	79.9±10.11	0.835
Respiratory Rate	At Presentation	18.65±2.43	17.8±1.65	0.07
	After 30min	16.3±2.88	16.10±1.58	0.235
Rescue Drug Needed	n(%)	15(37.5%)	11(27.5%)	0.34
Adverse Effects	n(%)	19 (47.5%)	13 (32.5%)	0.171

* *Statistically significant p-value*

DISCUSSION

Pain is the most common symptom presenting to the Emergency Department. Timely administration of appropriate and effective analgesia is crucial to pain management and directly corresponds to patient care and satisfaction.[12] Similarly, swift potent analgesia is the mainstay of treatment in acute renal colic. The oral route is usually avoided due to low bioavailability and slower onset of action. Forced IV hydration results in no difference in pain control or stone passage rates compared to minimal intravenous hydration. Fluids should only be given to correct any fluid deficit due to vomiting or limited oral intake.[13]

Several Studies have been performed to compare Paracetamol and Ketorolac with morphine. However, the comparative data between Paracetamol and Ketorolac is scarce in our population.[14,15] The present study compared the analgesic effect of intravenous Paracetamol with intravenous Ketorolac in patients with renal colic. The study showed that both study Groups were similar in demographic variables such as age, gender, history of hematuria, flank tenderness, location of calculus or co-morbidities. Moreover, the difference between the change in VAS score after drug administration was similar, signifying similar analgesic effects of both drugs. These results are as per the study carried out by Zadeh *et al*., in which no significant differences were observed between the severity of pain and vital signs in patients with renal colic who were given Paracetamol and Ketorolac, respectively. Ans *et al*. compared Paracetamol with Ketorolac for postoperative pain in patients who underwent abdominal surgery.[16] The analgesic effect of both drugs were comparable, as is the case with our study.

Interestingly, Grissa *et al*. carried out a study which concluded that intravenous Paracetamol was superior to intramuscular Piroxicam in patients with renal colic.[17] The study revealed that the pain relieved in 90% of the patients who were given Paracetamol as compared to only 48% patients of piroxicam Group. As previously mentioned, various studies have proven the similar efficacy of Paracetamol with morphine. In contrast to our study, patients who were given NSAIDs required less rescue analgesia than those who were given Paracetamol. A randomized controlled trial by Barnaby *et al.* also demonstrated the weaker analgesic effect of intravenous Paracetamol compared to intravenous Ketorolac.[18] However, the safety profile of Paracetamol was superior to the other Group. Another double-blinded, randomized controlled trial by Montazer *et al.* showed similar analgesic effects between morphine and Paracetamol, with fewer side effects in the Paracetamol Group.[19]

The results of our study are in line with our hypothesis, Paracetamol and Ketorolac have comparable analgesic effects in renal colic, but Paracetamol is safer than the two with fewer side effects.

LIMITATIONS OF STUDY

Pain severity was subjective and self-reported. Despite using an objective pain assessment tool, i.e., VAS, there may be some variation due to differences in individual pain threshold.

CONCLUSION

Intravenous-PC and intravenous-KET in patients with renal colic had similar analgesic effects with no significant difference in side effects and need for rescue analgesia. Increasing the strength and amount of pain relievers will only be detrimental to the cost-effectiveness. Hence adding Paracetamol can be resourceful in low-resource countries like ours.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MHR & MNA: Data acquisition, data analysis, drafting the manuscript, approval of the final version to be published.

HS & KB: Data acquisition, concept, critical review, approval of the final version to be published.

SFZ & TP: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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