

Efficacy of Single-dose Ketorolac in Reducing Pain in Patients Undergoing Double J-stent Removal under Local Anesthesia

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ABSTRACT

Background

Double J (DJ) stents are regularly used after different urological procedures. They are mostly removed under local anesthesia using lignocaine gel. Patients often experience significant pain during and after stent removal.

Objective

To determine the effect of preemptive oral ketorolac on pain relief during and after DJ stent removal by rigid cystoscopy under local anesthesia.

Method

In this prospective comparative study, patients undergoing Double J stent removal under local anesthesia were randomly assigned to two groups: group A received tab ketorolac 10mg one hour before the procedure and group B received no medications. Stent was removed by rigid cystoscope using 2% lignocaine gel. The pain during the procedure, at first void and at 24 hours were assessed by visual analogue scale (VAS) pain score (0 to 10). The patient's characteristics, pain score and any adverse events were recorded.

Result

Total of 276 patients (137 in group A and 139 in group B) underwent stent removal. The visual analogue scale pain score during the procedure and at first void was significantly lower in group A as compared to group B (3.0 ± 1.3 vs 3.68 ± 1.5 , $p < 0.001$ and 1.98 ± 1.3 vs 2.55 ± 1.4 , $p = 0.001$). However, the pain at 24 hours was similar between two groups ($p=0.626$). The demographic profiles, stent laterality, duration of stent and occurrence of side effects were comparable between two groups.

Conclusion

The use of single oral dose of ketorolac before Double J stent removal under local anesthesia using rigid cystoscope decreases pain significantly during the procedure and at first void with minimal side effects.

KEY WORDS

Double J stent removal, Ketorolac, Local anesthesia, Pain

INTRODUCTION

Ureteral stents are now commonly used by urologists following endourological procedures for keeping the ureter patent and for adequate drainage. They are also used to relieve obstruction in ureteral and kidney pathologies. Many patients often experience complications such as pain, hematuria, fever and lower urinary tract symptoms following usage of ureteral stents.¹ Double J (DJ) stents are mostly removed under local anesthesia using lignocaine gel and using a rigid cystoscope. Though the procedure is short, many experience significant pain during stent removal and discomfort during voiding can last for few days in some patients.²

Pain management in patients undergoing transurethral procedures under local anesthesia is an issue of concern. Regional and general anesthesia will be painless, but these are associated with more cost, longer hospital stays and higher anesthetic risk to the patients for such a short procedure.³ Lignocaine gel used locally during this procedure has not been found to be very effective. Oral analgesics such as non-steroidal anti-inflammatory drugs (NSAIDs) and opioids has been used before and after the procedure. Some also used alfa blockers like Tamsulosin and Silodosin along with NSAIDs.^{4,5} The pain relief by the non-steroidal anti-inflammatory drugs (NSAIDs) is attributed to their analgesic, anti-inflammatory and the smooth muscle relaxing properties.⁶

Limited studies have been done in Nepal on preemptive analgesic use during DJ stent removal. This study aims to determine the effect of preemptive oral ketorolac on pain relief during and after DJ stent removal by rigid cystoscopy under local anesthesia.

METHODS

This hospital-based, prospective, comparative study was performed in Gandaki Medical College Teaching Hospital, Pokhara Nepal from January 2024 to December 2024. This study was reviewed and approved by the Institutional Review committee (approval number: 22/080/081). Written informed consent was obtained from each patient before they were enrolled in the study.

All the patients aged 18 years and above undergoing DJ stent removal under local anesthesia were included in the study. Patients with history of peptic ulcer, upper gastrointestinal (upper GI) bleeding, chronic kidney disease, bleeding diathesis, significant lower urinary tract symptoms or prostatitis were excluded from the study. Similarly, patients with bilateral DJ stents, urethral stricture, deranged renal function, concomitant use of nephrotoxic drugs, and inability to understand the visual analogue scale (VAS) were also not included in the study. A total of 340 patients who fulfilled the criteria were enrolled in the study. These patients were randomly divided into two

groups by using a computer-generated random number table. Patients in Group A received oral Ketorolac 10 mg 60 minutes before the procedure while those in group B were not prescribed any medication. DJ stent was removed using the standard technique by rigid cystoscopy of size 19.5Fr and 2% xylocaine jelly was used as local anesthetic agent. The pain experienced was assessed by visual analogue scale (VAS) score ranging from 0 to 10 (where 0 refers to no pain and 10 denotes the maximum pain a patient has ever experienced). VAS score was measured during the procedure, at the first micturition and at 24 hours after the procedure. Pain score at 24 hours were recorded by contacting the patients through telephone.

The patient's demography, duration of DJ stent, laterality of stent, pain score, any complications of the procedure (like hematuria, urinary retention) and any drug side effects (like nausea, epigastric pain, vomiting) were recorded in the preformed proforma sheets. The primary outcome was VAS pain score perceived at various time intervals, and the secondary outcome variables were side effects of the drug and complications of the procedure. The data were analyzed using SPSS, version 23.0 (SPSS Inc., Chicago, IL, USA). Discrete variables were evaluated by chi-square test and continuous variables by unpaired Student t-test. All statistical tests were based on two-tailed probability, and a p-value <0.05 was considered statistically significant.

RESULTS

In this study out of 370 patients who were assessed for eligibility, 30 patients were initially excluded while 64 patients were later excluded due to inability to understand VAS scale and lost to follow up. At last, 276 patients completed the study and hence analyzed (Figure 1). The mean age of the patients was 40.41 ± 14.6 years. There was slight male preponderance with male: female ratio of 1.07:1. Most of the patients were young and 58% were under 40 years (Figure 2). The demographic parameters, the side of the stent and duration of DJ stent were comparable between the two groups (Table 1).

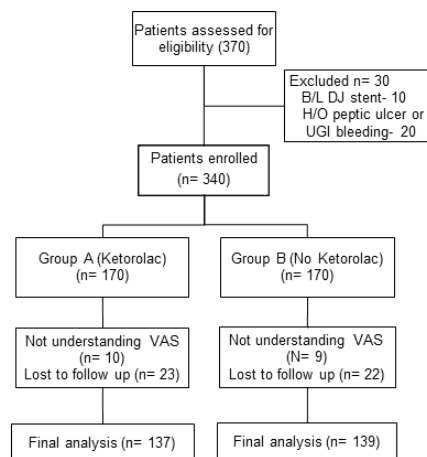


Figure 1. The flow diagram of the study

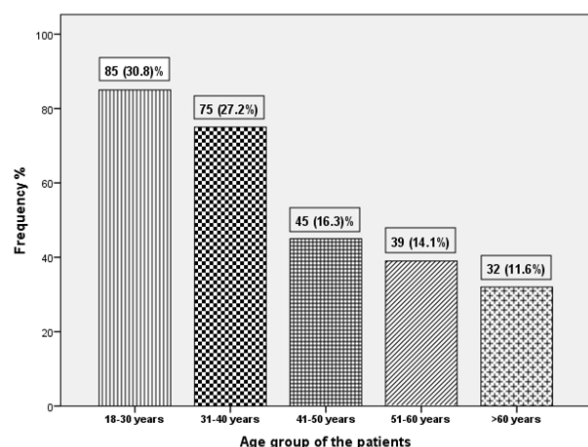


Figure 2. Age distribution of the patients

Table 1. Patients' baseline characteristics

Parameters	Total (n=276)	Group A (n=137)	Group B (n=139)	P value
Age in years	40.41±14.6	39.99±15.3	40.82±14.0	0.640*
Male/Female(n)	143/133	69/68	74/65	0.633**
Stent laterality, (n)				
Right/Left	148/128	74/63	74/65	0.897**
Duration of stent (days)	22.26±8.4	22.67±8.2	21.86±8.6	0.423*

Values are presented as mean ± standard deviation or number.

*: Statistical significance was analyzed by Student t-test.

**: Statistical significance was analyzed by chi-square test.

Group A, Ketorolac; group B, No Ketorolac; n, number.

The average VAS pain score during the DJ removal was 3.34 ± 1.5 and it was lower in group A, who received pre-procedural ketorolac, and this difference was statistically significant (3.0 ± 1.3 vs 3.68 ± 1.5 , $p < 0.001$). Furthermore, the pain experienced at first void was also significantly lower in group A as compared to group B (1.98 ± 1.3 vs 2.55 ± 1.4 , $p = 0.001$). However, the pain score at 24 hours post procedure was comparable and not different statistically between two groups (Table 2).

Table 2. VAS pain score

Timing	Total (n=276)	Group A (n=137)	Group B (n=139)	P value
Pain during procedure	3.34 ± 1.5	3.0 ± 1.3	3.68 ± 1.5	0.000
Pain during first micturition	2.27 ± 1.4	1.98 ± 1.3	2.55 ± 1.4	0.001
Pain at 24 hours	0.54 ± 0.7	0.56 ± 0.6	0.52 ± 0.8	0.626

Values are presented as mean ± standard deviation.

Statistical significance was analyzed by Student t-test.

Group A, Ketorolac; group B, No Ketorolac.

The overall incidence of side effects was similar in both groups (6.6% vs 7.9%, $p = 0.667$). Few patients experienced epigastric pain, nausea or vomiting (Table 3). None of the patients developed urinary retention or significant hematuria after the procedure.

Table 3. Adverse effects / complications experienced by the patients in each group

Parameters	Group A (n=137)	Group B (n=139)	P value
Overall incidence of side effects, n (%)	9 (6.6%)	11 (7.9%)	0.667
Epigastric pain	5 (3.6%)	8 (5.8%)	0.409
Nausea & vomiting	6 (4.4%)	6 (4.3%)	0.980
Urinary retention	None	None	-
Significant hematuria	None	None	-

Values are presented as number (%).

Statistical significance was analyzed by chi-square test

Group A, Ketorolac; Group B, No Ketorolac

DISCUSSIONS

The presence of ureteral stent in-situ is associated with the pain and discomfort in as many as 80% of patients, and the pain is more significant during the act of micturition.⁷ While most of the literature focuses on the morbidity of the in-situ ureteral stent, patients experience pain and other lower urinary tract (LUTS) symptoms during and after removal of DJ stents. In one study, 64% of patients who underwent ureteral stent removal reported one or more symptoms including pain, frequency, urgency, hematuria, urinary retention or fever.⁸ Use of flexible cystoscope may reduce the degree of pain, but its use is less in practice largely due to its higher cost and lack of availability.⁹ Intra-urethral lignocaine gel is traditionally used as a local anesthesia for any urethral instrumentations. However, its use is only limited to as lubricant and there is no significant pain relief when compared to plain gel.¹⁰ Komiya et al. used preemptive oral non-steroidal anti-inflammatory drug zaltoprofen during cystoscopy and found that the cystoscopy-associated pain and discomfort during urination was significantly lower.¹¹ There are many studies that used several medications, such as alpha blockers, non-steroidal anti-inflammatory drugs, anticholinergics, as well as new stent designs, stent materials, and stent dimensions to reduce stent-related pain and discomfort.^{1,12-14} However, fewer studies are there which address pain control during cystoscopic DJ stent removal.^{4,6,15,16}

Pain during stent removal most likely occurs due to activation of nociceptors, the friction between stent and mucosa leading to irritations of ureteral smooth muscle, irritation of trigon, and pressure induced changes in pelvicalyceal system.¹⁵ NSAIDs are the gold standard drugs for control of renal and ureteral colic.¹⁷⁻¹⁹ Chaignat et al. have shown the presence of cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) receptors in human ureters, and that NSAIDs decrease ureteral contraction and renal blood flow.²⁰ Tadros et al. studied the efficacy of Rofecoxib to relieve pain after stent removal and found that no patients in Rofecoxib group experienced severe pain. However, a significant number of patients complained of severe pain after stent removal in the placebo group.⁶

Surgical trauma causes induction of COX-2 enzyme and release of prostaglandins. Prostaglandins sensitize the

peripheral nociceptors producing localized primary hyperalgesia. The resultant central sensitization produces pain hypersensitivity in the surrounding uninjured tissue. Preemptive analgesia has been defined as analgesic intervention provided before surgery to prevent or reduce subsequent pain.²¹ It has an antinociceptive action that decreases postoperative pain.²² Preemptive NSAIDs inhibit the early production of prostanoids before surgical trauma and thus prevents the development of both peripheral and central sensitization, suppress local inflammation, and decrease hyperalgesia.²¹⁻²³ Ketorolac is a nonspecific COX inhibitor. Thus, the pain relief observed with ketorolac was probably due to its inhibitory actions on ureteral contractility and renal blood flow as well as its analgesic and anti-inflammatory properties. However, the inflammation and edema may take days to subside. So, this action probably plays a less significant role in the described setting.

In present study, the age, sex, duration of ureteral stent and side of the stent were comparable between two groups. The pain and discomfort experienced by the patients during the stent removal and during the first void was significantly lower in patients who took preemptive ketorolac ($p < 0.001$ and $p = 0.001$ respectively). However, this analgesic effect didn't last till 24 hours as there was no significant difference in VAS pain score at 24 hours post-procedure (0.56 ± 0.6 vs 0.52 ± 0.8 ; $p=0.626$). Several other studies also supported the preemptive use of NSAIDs as an analgesic for pain relief during DJ stent removal. In a study by Karthikeyan et al. 121 patients undergoing ureteral stent removal under local anesthesia were randomized into two groups: the first group received diclofenac 75 mg and placebo was given to another group.¹⁶ There was significantly lower pain perception during the procedure, at first void and at 24 hours post-procedure in the analgesic group as compared to the placebo group ($p < 0.001$).¹⁶

Gangkak et al. used diclofenac, silodosin and combination of both for pain control during ureteral stent removal and compared it with placebo.¹⁵ They found that the pain score was significantly reduced in all three groups when compared to the placebo group ($p < 0.001$).¹⁵ Similar results were published by Hadibrata et al. and Godse et al., where they used placebo, diclofenac, tamsulosin and their combination for pain control during DJ removal.^{4,24} They found that both diclofenac and tamsulosin were effective in relieving pain, but the combination of diclofenac and tamsulosin resulted in more significant pain reduction ($p < 0.001$).^{4,24} Cyclooxygenase-2 inhibitor Celecoxib has been used by Rulianov et al. in patients undergoing DJ stent removal under local anesthesia and found that the intraoperative pain ($p=0.04$) and pain during first void ($p < 0.001$) was significantly higher in patients not taking celecoxib.²⁵ However, there was no difference in pain experienced 24 hours after the procedure ($p=0.53$), and similar results were found in our study.²⁵

In our study, the incidence of adverse events (drug side effects and complications of the procedure) was minimal and comparable between two groups, and these results

are in accordance with the other studies as well.^{4,15,16,24,25} None of the patients developed acute urinary retention or significant hematuria. The low incidence of drug side effects in the ketorolac group could be due to single dose of medicine and exclusion of the patients with peptic ulcer and upper GI bleeding.

Subgroup analysis was performed between male and female patients undergoing ureteral stent removal cystoscopically under local anesthesia (Table 4). The demographic parameters, stent laterality and duration of DJ stent were similar in both sexes. However, the VAS pain score during the procedure, at first void and at 24-hour post-procedure was significantly lower in females as compared to male ($p < 0.001$). This could be attributed to the shorter urethra in females. However, most literatures have not studied the pain between males and females during ureteral stent removal. Many researchers had included only the male patients in their study, while others did not compare the pain between male and female patients during DJ stent removal.^{4,15,16,24,25}

Table 4. Comparison of pain score and other parameters between male and female patients

Parameters	Total (n=276)	Male (n=143)	Female (n=133)	P value
Age in years	40.41±14.6	41.48±14.3	39.26±15.0	0.208*
Stent laterality (n)				
Right / Left	148/128	71/72	77/56	0.170**
Duration of stent (days)	22.26±8.4	22.29 ± 8.7	22.23±8.1	0.958*
Pain during procedure	3.34±1.5	3.94±1.3	2.70±1.4	0.000*
Pain during first micturition	2.27±1.4	2.79±1.4	1.71±1.2	0.000*
Pain at 24 hours	0.54±0.7	0.70±0.8	0.37±0.6	0.000*

Values are presented as mean ± standard deviation or number (n).

*:Statistical significance was analyzed by Student t-test.

**:Statistical significance was analyzed by chi-square test.

This study has some limitations. This is a single-center study, which may have an unavoidable inherent bias. The DJ stents were not removed by a single surgeon as it is a teaching institute. There was no placebo used in patients in the control group, thus depriving the psychological benefit of drug intake.

CONCLUSION

The use of single dose of preprocedural ketorolac in the patients undergoing ureteral stent removal by rigid cystoscope under local anesthesia using lignocaine gel decreases the pain and discomfort significantly during the procedure and at first void. However, its use does not reduce the pain at 24 hours post-procedure. It has minimal side effects and can be used safely. Thus, preemptive oral ketorolac is effective in reducing pain during cystoscopic DJ stent removal.

REFERENCES

- Lingeman JE, Preminger GM, Goldfischer ER, Krambeck AE; Comfort Study Team. Assessing the impact of ureteral stent design on patient comfort. *J Urol*. 2009;181(6):2581-7.
- McFarlane N, Denstedt J, Ganapathy S, Razvi H. Randomized trial of 10 mL and 20 mL of 2% intraurethral lidocaine gel and placebo in men undergoing flexible cystoscopy. *J Endourol*. 2001;15:541-4.
- Tyritzis SI, Stravodimos KG, Vasileiou I, Fotopoulou G, Koritsiadis G, Migdalis V, et al. Spinal versus general anesthesia in postoperative pain management during transurethral procedures. *ISRN Urol*. 2011;2011: 895874. doi: 10.5402/2011/895874. Epub 2011 Jul 12.
- Hadibrata E, Farishal A, Ali Z, Danarto R. Tamsulosin and sodium diclofenac as an effective therapy to reduce pain after ureteral stent removal: A prospective, double blinded randomized placebo controlled trial. *Urol J*. 2020 Jan 4;18(1):111-6. doi: 10.22037/uj.v0i0.5190.
- Yuri P, Ali Z, Rasyid N, Birowo P. Effect of ppeidic acid, phenazopyridine HCL, and sodium diclofenac on pain perception following endoscopic urological surgery: Double-blind randomized controlled trial. *Acta medica Indones*. 2016; 48:184-92.
- Tadros NN, Bland L, Legg E, Olyaei A, Conlin MJ. A single dose of a non-steroidal anti-inflammatory drug (NSAID) prevents severe pain after ureteric stent removal: A prospective, randomized, double-blind, placebo-controlled trial. *BJU Int*. 2013 Jan;111(1):101-5.
- Joshi HB, Stainthorpe A, MacDonagh RP, Keeley FX, Timoney AG, Barry MJ. Indwelling ureteral stents: evaluation of symptoms, quality of life and utility. *J Urol*. 2003;169:1065-9.
- Theckumparampil N, Elsamra SE, Carons A, Salami SS, Leavitt D, Kavoussi A, et al. Symptoms after removal of ureteral stents. *J Endourol*. 2015;29:246-52.
- Kobayashi T, Nishizawa K, Mitsumori K, Ogura K. Instillation of anesthetic gel is no longer necessary in the era of flexible cystoscopy: A crossover study. *J Endourol*. 2004;18:483-6.
- Chen YT, Hsiao PJ, Wong WY, Wang CC, Yang SS, Hsieh CH. Randomized double-blind comparison of lidocaine gel and plain lubricating gel in relieving pain during flexible cystoscopy. *J Endourol*. 2005;19:163-6.
- Komiya A, Endo T, Kobayashi M, Kim W, Araki K, Naya Y, et al. Oral analgesia by non-steroidal anti-inflammatory drug zaltoprofen to manage cystoscopy-related pain: A prospective study. *Int J Urol*. 2009;16:874-80.
- Dellis A, Joshi HB, Timoney AG, Keeley FX Jr. Relief of stent related symptoms: Review of engineering and pharmacological solutions. *J Urol*. 2010;184(4):1267-72. doi: 10.1016/j.juro.2010.06.043.
- Gupta M, Patel T, Xavier K, Maruffo F, Lehman D, Walsh R, et al. Prospective randomized evaluation of periureteral botulinum toxin type A injection for ureteral stent pain reduction. *J Urol*. 2010 Feb;183(2):598-602.
- Damiano R, Autorino R, De Sio M, Giacobbe A, Palumbo IM, D'Armiento M. Effect of tamsulosin in preventing ureteral stent related morbidity: A prospective study. *J Endourol*. 2008;22(4):651-6. doi: 10.1089/end.2007.0257.
- Gangkak G, Teli RD, Yadav SS, Tomar V, Priyadarshi S, Aggarwal SP. A single oral dose of silodosin and diclofenac sodium is effective in reducing pain after ureteric stent removal: a prospective, randomized, double blind placebo-controlled study. *Springer Plus*. 2016 Jan 7;5:23. doi: 10.1186/s40064-015-1662-7.
- Karthikeyan VS, Keshavamurthy R, Mallya A, Chikka Moga Siddaiah M, Kumar S, Chandrashekar CR. Efficacy of preprocedural diclofenac in men undergoing double J stent removal under local anesthesia: A double-blind, randomized control trial. *Indian J Urol*. 2017 Jan-Mar;33(1):53-7. doi: 10.4103/0970-1591.194783.
- Hurault LB, Ryckelynck JP. The role of nonsteroidal anti-inflammatory agents in the treatment of renal colic. *Nephrologie*. 1989;10(1):1-3.
- Tankó A, Tamás G. The use of Voltaren (diclofenac sodium, Ciba) in acute renal colic. *Acta Chir Hung*. 1995-1996;35(3-4):285-90.
- Davies NM, Anderson KE. Clinical pharmacokinetics of diclofenac. Therapeutic insights and pitfalls. *Clin Pharmacokinet*. 1997 Sep;33(3):184-213. doi: 10.2165/00003088-199733030-00003.
- Chaignat V, Danuser H, Stoffel MH, Z'brun S, Studer UE, Mevissen M. Effects of a non-selective COX inhibitor and selective COX-2 inhibitors on contractility of human and porcine ureters in vitro and in vivo. *Br J Pharmacol*. 2008 Jul;154(6):1297-1307. doi: 10.1038/bjp.2008.193. Epub 2008 May 26.
- Aida S, Baba H, Yamakura T, Taga K, Fukuda S, Shimoji K. The effectiveness of preemptive analgesia varies according to the type of surgery: A randomized, double-blind study. *Anesth Analg*. 1999;89:711-6.
- Ong CK, Lirk P, Seymour RA, Jenkins BJ. The efficacy of preemptive analgesia for acute postoperative pain management: A meta-analysis. *Anesth Analg*. 2005;100:757-73.
- Reuben SS, Bhopatkar S, Maciolek H, Joshi W, Sklar J. The preemptive analgesic effect of rofecoxib after ambulatory arthroscopic knee surgery. *Anesth Analg*. 2002;94:55-9.
- Godse S, Kumar A, Singh H, Chhabra MK. Single dose diclofenac and tamsulosin effectiveness in patients undergoing double J-stent removal under local anesthesia. *Urol Androl Open J*. 2022;6(1):4-7. doi: 10.17140/UAOJ-6-141.
- Rulianov R, Santoso J, Abriansyah AT, Siregar S. Effect of Cyclooxygenase-2 Inhibitors in Double J Stent Removal under Local Anesthesia. *Ann Afr Surg*. 2021;18(4):220-4. doi: http://dx.doi.org/10.4314/aas.v18i4.6.