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Original Article

# Preemptive Effect of Intraurethral Instillation of Ketamine–lidocaine Gel on Postoperative Catheter-related Bladder Discomfort after Lumbar Spine Surgery

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## Abstract

**Background:** Catheter-related bladder discomfort (CRBD) is one of the main reasons of agitation after surgery, leading to urgency and frequency during recovery. Ketamine has been used as an effective drug for reducing the signs and severity of this problem. We hypothesized that intraurethral instillation of ketamine–lidocaine gel before urinary catheterization can reduce the incidence of CRBD in the postoperative period. **Materials and Methods:** A total of 136 male patients, who underwent two-level laminectomy/discectomy were enrolled in this randomized clinical trial. Patients were randomized into the two groups before urinary catheterization. The ketamine group received urethral lubrication with 5 mL xylocaine jelly (2%) in conjunction with 2 mL (100 mg) ketamine. Patients in control group received urethral lubrication with 5 mL xylocaine jelly (2%) in conjunction with 2 mL distilled water. The primary outcome was the incidence of CRBD. CRBD was assessed using four-stage criteria when arriving in the recovery room and at 1, 2, and 6 h after surgery. Postsurgical pain and the number of sedatives given and opioid requirement were also the secondary outcomes in this study. **Results:** Intraurethral instillation of ketamine–lidocaine gel reduced the incidence of CRBD at recovery ($P < 0.001$) along with a reduction in the severity of CRBD ($P < 0.05$) during the 1st and 2nd visit compared with control group. The mean pain intensity score (visual analog scale) and opioid requirement to relieve postsurgical pain were lower in the ketamine group during all the study timepoints from recovery and after transfer to the ward ($P < 0.008$). A higher rate of sedation (72% vs. 11%) also was seen at recovery period in the ketamine group ($P < 0.008$). **Conclusion:** Intraurethral instillation of ketamine–lidocaine gel before bladder catheterization is an effective technique for reducing the incidence and severity of postoperative CRBD.

**Keywords:** *Catheter-related bladder discomfort, ketamine, postoperative pain, urinary catheterization*

## Introduction

Catheter-related bladder discomfort (CRBD) is one of the most frequent problems during the postoperative period presenting as burning sensation and irritation of the urethra with boring sense of urinary urgency and frequency in the recovery room. Its incidence has been reported to be as high as 47% in some studies.[1,2] Several methods have been suggested to reduce the symptoms of CRBD following catheter insertion.[3,4] Preoperative treatment with oxybutynin, tolterodine, gabapentin, and intraoperative administration of tramadol and ketamine have been reported to reduce the incidence and severity of CRBD.[5-7]

We examined the efficacy of intraurethral instillation of ketamine–lidocaine gel to reduce the urethral discomfort after outpatient rigid cystoscopy in male patients showing promising results.[8]

Due to the high prevalence of CRBD in the early postoperative period, in patients undergoing low back surgeries, the present study was designed to evaluate the efficacy of intraurethral instillation of ketamine–lidocaine gel before urinary catheterization to reduce the incidence and intensity of CRBD and overall postoperative pain.

## Materials and Methods

This double-blind, randomized, clinical study was performed on male patients, who were candidates for elective lumbar spine surgery under general anesthesia in the Department of Neurosurgery, Sina Hospital, Tehran University of Medical Sciences. This study has been approved



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by the institutional ethics committee as an investigational controlled trial, and written informed consent was obtained from all of the patients and the patients consented to the submission of their data for publication. Patients were excluded from this study if: (1) there was a history of drug addiction and taking gabapentin, (2) clinical evidence of previous lower urinary system diseases needing medical or surgical intervention (such as prostate diseases or urethral stricture), (3) a history of neurologic disorder, severe liver or heart disease, history of overactive bladder (urinating >3 times at night or 8 times during a 24-h period), (4) sphincter problem as a clinical symptom of disc disease, (5) History of urinary tract catheterization, and (6) patient refusing catheterization.

Before urinary catheterization, the patients were randomized into the two groups using a computer-generated table of random numbers; the ketamine group received urethral lubrication with 5 mL of 2% lidocaine hydrochloride gel (Xylogel, Sina Daru) in conjunction with 2 mL (100 mg) of ketamine (Rotex Medica, Germany).

Patients in the control group received urethral lubrication with 5 mL of 2% lidocaine hydrochloride (Xylogel, Sina Darou) in conjunction with 2 mL of distilled water. After urethral lubrication, urinary catheterization was performed with a 16 Fr Foley's catheter for all patients.

Induction of anesthesia was performed by intravenous injection of fentanyl (2–3 μg/kg), midazolam (0.05 mg/kg), thiopental sodium (3–5 mg/kg), atracurium (0.5 mg/kg), and lidocaine (1 mg/kg). Anesthesia was maintained using isoflurane in an air/oxygen mixture and a bolus injection of fentanyl (2 μg/kg) every hour.

Surgeries were standard laminectomy up to at most two lumbar levels with or without discectomy performed by the senior neurosurgeon. All of the surgeries were performed in prone position under standard ECG, noninvasive blood pressure monitoring, pulse oximetry, and end-tidal carbon dioxide measurement. At the end of surgery and reversal of neuromuscular blockade, all patients were extubated and transferred to the postanesthesia care unit (PACU).

The incidence of CRBD in the recovery room was the primary outcome. Severity of CRBD was recorded as follow: (1) feeling of urination, (2) feeling of urination and try to stand up, (3) agitation, strong vocal response, and attempts to pull out the catheter.

The severity of postsurgical pain was assessed on arrival to PACU and was repeated at 1, 2, and 6 h after surgery using visual analog scale with 0 standing for "no pain" and 10 for "the worst possible pain." Sedation score was also assessed using Ramsay Sedation Scale. Intravenous pethidine (0.5 mg/kg) as rescue analgesia was injected in recovery room if needed and then the total opioid consumption during the first 24 h after surgery was recorded.

### Statistical analysis

After data collection, all statistical analysis was done using SPSS (version 17, SPSS Inc., Chicago, IL).

Baseline data were presented as mean ± standard deviation for quantitative variables. Independent sample *t*-test and repeated measure analysis of variance were used to compare the main outcome measures between the study groups and $P < 0.05$ was considered as statistically significant.

## Results

A total of 136 consecutive male patients between 20 and 60 years age (American Society of Anesthesiologists physical status I–II) were enrolled in this study (mean age; 45.32 ± 10.6). There was no significant difference in the mean age, anesthesia, and surgery duration and type of surgery [Table 1]. The incidence of CRBD was significantly lower in the ketamine group at the PACU and at 1 and 2 h after exiting the recovery room ($P < 0.001$) but had no significant difference thereafter [Figure 1].

The mean postsurgical pain score (VAS) was lower in the ketamine group in comparison with the control group during all the study checkpoints [Figure 2].

The incidence of sedation during the recovery period was 72% in the ketamine group compared to 11% in the control group ($P < 0.008$), but at the following time in the ward, it was the same in both groups.

**Table 1: Clinical characteristics of the patients**

| Variable | Ketamine group (*n*=68) | Control group (*n*=68) |
|---|---|---|
| Age (year) | 44.13±12 | 45.3±9.7 |
| Duration of anesthesia (h) | 4.14±1.2 | 4.57±1.38 |
| Duration of operation (h) | 3.47±1.1 | 3.83±1.2 |
| Type of surgery, *n* (%) | | |
| Laminectomy and discectomy | 31 (54) | 26 (45) |
| Laminectomy and foraminotomy | 27 (58) | 19 (41) |

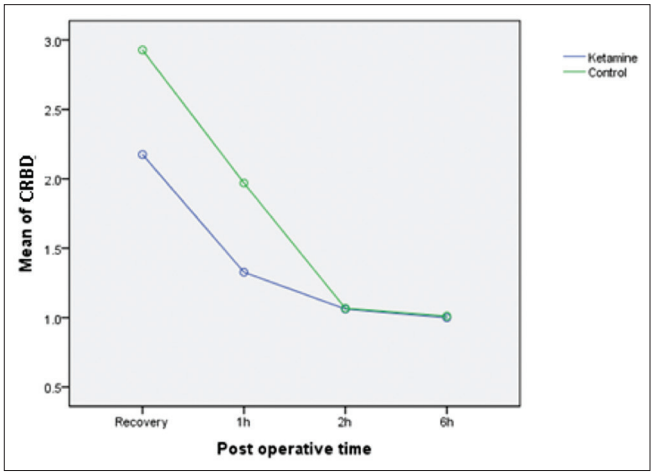


**Figure 1: Comparison of the severity of catheter-related bladder discomfort between the study groups during the postoperative period ($P < 0.001$)**

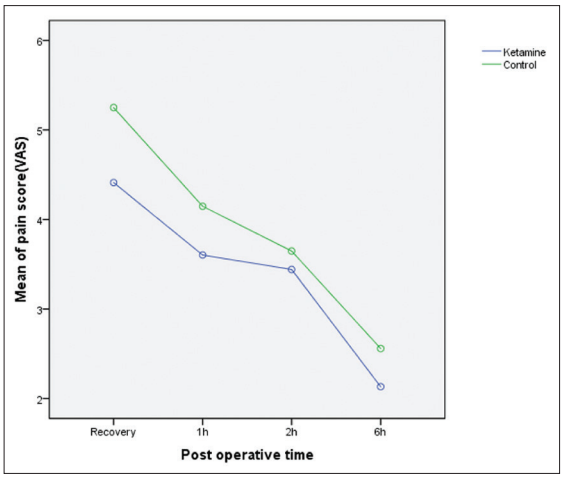


**Figure 2: Comparison of the mean pain severity stated as visual analog scale between the study groups during the postoperative period**

In the recovery room, 8 (11.7%) patients of the ketamine group needed rescue analgesia with pethidine, while 37 (54.4%) patients of the control group received pethidine ($P < 0.003$). During the next 6 h after surgery, only four patients (5.8%) in the ketamine group needed opioid injection in comparison to 14 patients (20.5%) in the control group ($p < 0.008$) [Table 2].

## Discussion

Catheterization of the urinary tract is one of the necessary procedures in numerous surgery, but many of the patients do not tolerate it and make them agitated in the recovery period. The signs of CRBD are very similar to symptoms of overactive bladder (urinary urgency and feel of urination) that may be due to involuntary contractions of bladder wall smooth muscles mediated by muscarinic receptors. Oral antimuscarinic drugs have been used successfully for the management of CRBD in the postoperative period.[9] They have limited route of administration and have systemic side effects such as dry mouth, constipation, headache, and blurred vision.[10]

Ketamine is an anesthetic drug that produces dose-related unconsciousness and analgesia. It acts at multiple receptors, including the N-methyl-D-aspartate receptors, opioid receptors, and monoaminergic and muscarinic receptors.[11] Antimuscarinic effect of ketamine both centrally and peripherally has been shown by Durieux.[12] Agarwal demonstrated that small doses of ketamine could be used in recovery room to treatment of CRBD.[13]

In addition to direct analgesic effects of ketamine, Shariat Moharari *et al*. reported that intravenous injection of ketamine just before urinary catheterization at the beginning of surgery can reduce the incidence and severity of CRBD in the early postoperative period.[14] Preemptive analgesic efficacy of subcutaneous and intraperitoneal administration of ketamine has also been reported to be effective in reduction of CRBD in several groups of patients.[15,16]

**Table 2: Opioid requirement in postoperative period**

| Variable | Ketamine group, *n* (%) | Control group, *n* (%) | *P* |
|---|---|---|---|
| PACU | 8 (11.7) | 37 (54.4) | 0.003 |
| Ward | 4 (5.8) | 14 (12.5) | 0.008 |
| Total | 12 (17.6) | 51 (75) | 0.001 |

PACU – Postanesthesia care unit

This clinical trial, designed to assess preventive effects of intraurethral instillation of ketamine–lidocaine gel at the time of urinary catheterization on postoperative CRBD. The results of our study showed that adding 100 mg ketamine to lidocaine gel is more effective than using lidocaine gel alone. Ketamine has a short half-life and is dissipated enough after operation without any harmful effect on the urethral mucous membrane. The main mechanism proposed to be effective in our patients is just preemptive analgesic effect of ketamine that is lipid soluble and has local analgesic action. Our results are in concordance with the study of Singh and *et al*.[17] They showed that ketamine instillation on the site of noxious stimulus during laparoscopic cholecystectomy led to both reduced postoperative pain and more patients' satisfaction in the recovery period.

The dose of ketamine depends on the desired therapeutic effect and on the route of administration.

We would like to suggest that the preemptive infiltration of ketamine with lidocaine gel in the urethra can suppress the local pain receptors and manage the CRBD in postoperative period. The analgesic and sedative effect of ketamine might also be due to the systematic absorption of drug that leads to better control of pain and less opioid consumption in postoperative period.

## Limitations

The limitations of our study are as follows: (a) ketamine side effects as reminded in the discussion, (b) the duration of operation and the experience of the surgeon can be a very important variable in outcome analysis. Three hours, as the median duration of operation for two-level laminectomy with and without discectomy, is somehow acceptable for a teaching hospital and not in the ordinary practice. The same would be for the duration of anesthesia, (c) the amount of blood loss, body mass index of the cases, length of the penis before and after catheterization, the amount of intake and output may be the variants to be included in uni- and bivariate regression analysis of the data, and (d) "outcome scaling" of discomfort because of urinary catheterization should be standardized and needs a uniform worldwide accepted method, otherwise, our scaling method might be under debate.

## Conclusion

Intraurethral instillation of 100 mg ketamine with 5 mL lidocaine gel before bladder catheterization is an effective

technique for reducing the incidence and severity of postoperative CRBD and overall patient-reported pain severity.

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## Conflicts of interest

There are no conflicts of interest.

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