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Original Research Article

Effect of intrathecal dexmedetomidine on incidence and severity of catheter related bladder discomfort

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Abstract
Introduction : Catheter relater bladder discomfort (CRBD) is a common phenomenon in catheterised patients after endourological surgeries. **Aims & Objective:**The aim of our study is to study the effect of intrathecal dexmeditomidine as an adjunct to spinal anaesthesiaon incidence and severity of catheter related bladder discomfort in post-operative period. **Materials and Methods** This study included all American Society of Anesthesiologist (ASA) grade I/II patients (18–40 years) who underwent percutaneous nephrolithotomy (PCNL) for renal calculi; and had, no previous history of dysuria or other urological disorders between August 2017 and July 2018. The patients were randomized in two groups based on computer generated random number table. Group I (control group) received 3ml levobupivacaine 0.5% in 0.5ml normal saline and Group II received 3ml levobupivacaine 0.5%+ 2.5 mcg dexmedetomidine in 0.5 ml of normal saline. Bladder discomfort was assessed at 8, 10 and 12 hours after induction of anaesthesia. **Results & Conclusion:** The incidence of CRBD after 8 hours of induction was higher in control group compared to dexmedetomidine group (56% vs 18% P <0.01). Our study gives primitive conclusive evidence that intrathecal dexmedetomidine as a spinal anaesthesia adjunct may be a viable option in reducing the incidence and severity of CRBD.

Keywords: dexmeditomidine; spinal anaesthesia; catheter; CBRD

1. Introduction

Per urethral catheter(PUC) placement is an integral part of endourological surgeries like percutaneous nephrolithotomy(PCNL), often required in postoperative period for adequate bladder drainage. Many patients complain of urgency, frequency or suprapubic discomfort after PUC placement,commonly referred as catheter related bladder discomfort (CRBD).These occur due to involuntary detrusor muscle contractions as a result of constant irritation by indwelling catheter, and are mediated by muscarinic receptors (M3) located in bladder mucosa and urothelium.[1]

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Management of CRBD is recently gaining popularity in post-anaesthesia care units as this cause significant discomfort to the patients. The incidence of CRBD varies from 30% to 80% in various studies.[2,3]Use of medications like antimuscarinics, ketamine, gabapentin, paracetamol etc. have been reported in alleviating symptoms of CRBD.[4]However, each of these agents has variable success rates and their own specific side effects.
Owing to their alpha-2 adrenergic agonistic, muscarinic(M-3) antagonistic and C fibre inhibitory effect, intravenous dexmedetomidine has been explored recently in CRBD and found to have favourable results with minimal side effects.[5] Encouraged by these results, we proposed to study the effect of intrathecal dexmeditomidine on incidence and severity of CRBD in post-operative period, when used as an adjunct to spinal anaesthesia.

2. Materials and methods

The present study was conducted at Department of Urology and Anaesthesiologyof a large tertiary care centre teaching hospital between August 2017 and July 2018. The study was approved by the Institutional Ethics Committee and is registred with clinical trial registry of India. A written informed consent was taken from all patients before recruitment. The inclusion criteria comprised of newly diagnosed patients of renal calculi (18–40 years) who were managed with PCNL; and had American Society of Anesthesiologist (ASA) grade I and II, with no previous history of dysuria or other urological disorders. Patients with a clinical history suggestive of overactive bladder, bladder outflow obstruction, previous urethral surgery, recent catheterisation within 6 weeks, renal failure, heart failure or any neurological disease that can cause urinary tract dysfunction were excluded from the study. All the patients were thoroughly educated about CRBD, questionnaire used to evaluate CRBD and chances of CRBD in postoperative period.

Sample size calculation
On the basis of previous studies, the incidence of CRBD is about 55%, and assuming that it can be reduced to 25% (with $\alpha = 0.05$, $\beta = 0.8$) following the administration of intrathecal dexmedetomidine during spinal anaesthesia, we needed to study 41 patients in each group. However,we enrolled 50 patients in each group.
The patients were randomized in two groups based on computer generated random number table. Group I (control group) received 3ml levobupivacaine 0.5% in 0.5ml normal saline and Group IIreceived 3ml levobupivacaine 0.5%+ 2.5mcg dexmedetomidine in 0.5 ml of normal saline.
Hence in both groups, a total volume of 3.5 ml drug was used. All patients were catheterised with a 16 Fr Foley catheter and its balloon was inflated with 10 ml of normal saline. Catheter was fixed to thigh without any traction. All catheters were pre-lubricated with xylocaine jelly before insertion.
Bladder discomfortwas assessed at 8, 10 and 12 hours after induction of anaesthesia. Bladder discomfort was graded as mild (CRBD reported only after questioning patient), moderate (patient report CRBD by himself, no behavioural response), or severe (patient reported CRBD along with behavioural responses).[6,7]Behavioural responses were described as restlessness, vocal responses to discomfort or strong urge to remove catheter. This is the same severity score that has been used previously in other studies.[6,7]
Any significant side effect related to spinal anaesthesia was recorded.
The incidence of CRBD between groups was analysed by Chi-square test or Fisher's exact, whereas the severity (mild, moderate, and severe) was analysed using Mann–Whitney U test.

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Statistical Package for the Social Sciences, version 23.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. $P < 0.05$ was considered as significant.

3. Results

A total of 100patients were evaluated in the study.The baseline patient characteristics were comparable in both the groups [**Table 1**].

Table 1- Baseline patient characteristics

Groups	**Control(n=50)**	**Dexmeditomidine(n=50)**	**P value**
Age(years)	32.2±7.4	31.9±7.9	0.84
Male	26	27	1.00
Female	24	23	1.00
Weight(Kg)	63.28±13.9	65.28±12.2	0.44
Height(cm)	166.88±6.6	165.32±8.4	0.30
BMI(Kg/m^2)	22.57±4.69	23.69±3.53	0.18

The incidence of CRBD after 8 hours of induction was 56%in control group and 18% in dexmedetomidinegroup (P <0.01).

Table 2- Incidence and severity of CRBD in both the groups at 8,10 and 12 hours

Postoperative period	**CRBD(all grades)**			**Mild CRBD**			**Moderate CRBD**			**Severe CRBD**		
	Group I	**Group II**	**P value**	**Group I**	**Group II**	**P value**	**Group I**	**Group II**	**P value**	**Group I**	**Group II**	**P value**
8 hours	28	9	**0.00**	11	3	**0.04**	13	4	**0.03**	4	2	**0.67**
10 hours	17	9	0.10	5	3	0.71	9	4	0.23	3	2	1.00
12 hours	12	3	**0.02**	3	1	0.61	7	1	**0.05**	2	1	1.00

The incidence of CRBD in dexmedetomidine group at 10and 12 hours was also less compared to control group. However,the difference statistically significant at 8 and 12 hours only($p<0.05$). The incidence of mild and moderate CRBD was significantly less in dexmedetomidine group after 8 hours. Similarly, the incidence of moderate CRBD was significantly less in dexmedetomidine group after 12 hours.

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Our study clearly shows that the incidence and severity of CRBD is significantly less in dexmedetomidine group. No significant side effects/adverse events were observed in post-operative period in both the groups.

4. Discussion

In this novel study, we evaluated the effect of intrathecal dexmedetomidine as spinal anaesthetic adjunct on CRBD and we found that in the dexmedetomidinegroup, the incidence of catheter associated bladder discomfort was significantly lower at 8 and 12 hours. ($P< 0.05$)
In postoperative period, CRBD is one of the most common distressing complaints in patients with indwelling urinary catheters. The clinical picture of CRBD is similar to that of OAB, and urgency and frequency are the main presenting complaints.[8]So medications used in OAB have been extensively studied in this phenomenon. Antimuscarinics such as oxybutynin and tolterodine have been successfully used in management of CRBD.[6] However, undesirable side effects such as dry mouth, constipation; facial blushing and blurred vision were fairly common. Ketamine has been found to reduce the incidence and alleviate the symptoms of CRBD but is associated with sedation even at low dose.[9] Paracetamol (a prostaglandin and COX-2 inhibitor), and gabapentin (an anticonvulsant and afferent C-fibre inhibitor) have also been found to be effective in reducing the incidence and severity of CRBD with variable success rates.[10,11]
Dexmedetomidine is a highly selective α-2 adrenergic agonist which also exerts antimuscarinic(M-3) and C-fibre inhibitory effects. Streng *et al.* have found thatdexmedetomidine may reduce bladder pressure and urine flow rate as well as rhabdosphincter electromyography amplitude by α-2 agonism and M3 antagonism. It has also been found to inhibit c fibres at the level of spinal cord.[12] Previous studies have found encouraging effects with intravenous dexmedetomidine in reducing incidence and severity of CRBD in post-operative period with minimal side effects. Hence we hypothesized that intrathecaldexmedetomidine may be helpful in reducing the incidence and severity of CRBD when it will be used as an adjunct to spinal anaesthesia.
In this study, the incidence of CRBD was found to be less in CRBD group at 8, 10 and 12 hours after induction of anaesthesia. This may lead to the assumption that effect of intrathecal dexmedetomidine as an adjunct to spinal anaesthesia may have a preventive or therapeutic effect on incidence and severity of CRBD. When compared with the other spinal anaesthesia adjuncts, a prolonged duration of action and low incidence of side effects may be an added advantage of intrathecal dexmedetomidine. Our results were consistent with that of previous studies who studied the effect of intravenous dexmedetomidine on CRBD but to best of our knowledge, no previous study assessing the effect of intrathecal dexmedetomidine has been done till now.
There were some limitations of our study. The diagnosis of CRBD was based on mainly patient symptomatology. Hence, some patients may not be able to distinguish between pain and CRBD. To analyse the effect of dexmedetomidine for increased duration post-operatively, the effect of a higher dose of the drug should be studied. This study has small sample size. The effect of drug was studied only till 12 hours. The conclusion the present study should be seen in the light of these limitations. Nevertheless, our study gives primitive conclusive evidence that intrathecal dexmedetomidine as a spinal anaesthesia adjunct may be a viable option in reducing the incidence and severity of CRBD. Further research with large number of patients and different doses of dexmedetomidine is required to establish its use as a spinal anaesthesia adjunct for CRBD.

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5. Conclusion

In our study we conclude that the incidence and severity of CRBD is significantly less in dexmedetomidine group. No significant side effects/adverse events were observed in post-operative period in both the groups.

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