

POST-OPERATIVE URINARY RETENTION (POUR) IN LUMBAR SPINE SURGERY- A PROSPECTIVE STUDY

Jenson Isaac¹, Vijay Krishna², Sowmiya Ramanan³, Susmitha Periyasamy⁴

¹Associate Professor, Department of Orthopaedics, Tagore Medical College and Hospital, Chennai, Tamilnadu, India.

²Senior Resident, Department of Orthopaedics, Tagore Medical College and Hospital, Chennai, Tamilnadu, India.

³Professor, Department of Community Medicine, Tagore Medical College and Hospital, Chennai, Tamilnadu, India.

⁴Junior Resident, Department of Orthopaedics, Tagore Medical College and Hospital, Chennai, Tamilnadu, India.

ABSTRACT

BACKGROUND

Post-operative urinary retention following lumbar spine surgery can lead to detrusor dysfunction, urinary tract infections, prolonged hospital stay and a higher treatment cost. The incidence of POUR varies among different studies,^(1,2,3,4,5) the risk factors for POUR in lumbar spine surgery remain unclear. Hence the aim of the study is to analyse the prevalence and incidence of postoperative urinary retention in patients undergoing posterior Lumbar spine surgeries and to evaluate the risk factors associated with development of postoperative urinary retention (POUR).

METHODS

All patients who underwent posterior lumbar spine surgery from June 2016 to May 2018 who satisfy the inclusion criteria were included in this prospective study. Patients with urinary incontinence, pre-operative catheterization, neurological deficit were excluded from the study. Risk factors were assessed, and univariate analyses was done.

RESULTS

A total of 203 patients underwent lumbar spine surgery in the study period of which based on inclusion criteria 123 patients were included in the study. On prospective analysis, 20 patients were found to have developed POUR. The incidence rate was 16.26%. Significant risk factors were analysed in which age of the patient, duration of surgery, patient with higher post-operative pain score, high blood loss were found to be associated with POUR.

CONCLUSIONS

The incidence of POUR in lumbar spine surgeries was found to be 16.26% in our study which significantly differs from various other studies.⁽⁴⁾ Older age of the patient, prolonged duration of surgery, surgery with more blood loss, patient with higher post-operative pain score were significant risk factors associated with POUR.

KEY WORDS

POUR, Posterior Lumbar Spine Surgery

HOW TO CITE THIS ARTICLE: Isaac J, Krishna V, Ramanan S, et al. Post-operative urinary retention (POUR) in lumbar spine surgery- a prospective study. J. Evolution Med. Dent. Sci. 2019;8(24):1926-1929, DOI: 10.14260/jemds/2019/423

BACKGROUND

Postoperative urinary retention (POUR) is one of the main post-operative complications which is often underestimated and often gets missed. POUR refers to patients' inability to void urine in spite of full bladder after the surgical intervention in the postoperative period.⁽¹⁾ The reported incidence varies for the wide range of 5%- 84%.^(1,2,3,6,5) Because of its multifactorial aetiologies like the type of anaesthesia, type and duration of surgery, underlying co morbidities, and drugs used in perioperative period⁽⁴⁾ it is very difficult to predict the accurate incidence of POUR in most of the hospital set up which leads to failure in prevention.

POUR can result in bladder atony and increase the risk of urinary tract infection and sepsis ⁽¹⁾ which leads to increased hospital stay and expenditure.

'Financial or Other Competing Interest': None.
Submission 13-04-2019, Peer Review 27-05-2019,
Acceptance 01-06-2019, Published 17-06-2019.

Corresponding Author:

Jenson Isaac,

Flat No. 4041, Estancia Township,

Guduvanchery, Chennai-603202, Tamilnadu, India.

E-mail: docjenson@gmail.com

DOI: 10.14260/jemds/2019/423



Although several studies have been conducted on POUR, most of them are limited to general surgery, colorectal surgery, and joint arthroplasty ^(2,7,8) only very few studies have been done in case of spine surgeries. Few studies evaluated POUR in spine surgery, and a majority of those are retrospective case study and factors reported to have an association with the development of POUR include age, diabetes, opioid administration, anaesthesia type, perioperative analgesia, intravenous (IV) fluid volume, comorbid medical and surgical conditions, and surgery duration.¹ The lack of accurate and complete data in a retrospective study makes the analysis suboptimal. The reported incidence of POUR ranges between 5% and 84%, and numerous criteria have been suggested to define POUR, adding to the complexity of this clinical condition.^(1,2,9) Studies have demonstrated that POUR with subsequent catheterization can result in urinary infection and bacteraemia, which can be a source for surgical site wound infection and morbidity.⁽⁶⁾ The identification of the risk factors for POUR may help reduce the chances of postoperative urinary infection, urinary bladder atony, and urosepsis, as well as reduce the length of hospital stay.

A Study conducted by Gandhi SD et.al⁽⁴⁾ showed the incidence of POUR following Lumbar spine surgeries was 5.6%, which is contradicting incidence rates in various other studies. So, we aimed to prospectively estimate the occurrence

of POUR in the patients who underwent lumbar spine surgeries in the last two years and analyse the risk factors for the development of POUR.

METHODS

Type of Study and Study Period

A Prospective observational study was performed on patients who underwent elective posterior lumbar spine surgery performed between June 2016 to May 2018 in Department of Orthopaedics, Tagore medical college and hospital, Chennai after getting the IEC clearance from the institute and informed consent from the patient in participating in this study.

Inclusion and Exclusion Criteria

Patients who undergoes posterior lumbar spine surgery like micro-lumbar discectomy, single and multiple level lumbar decompression, single level posterior lumbar fusion surgeries during the study period were included in the study and evaluated for the development of POUR. Various other factors which have influence in the results such as previously diagnosed neurological deficit, urinary disturbances, need of pre-operative catheterization were excluded from the study. Cases of acute spinal trauma were excluded from the study group. Patients were assessed clinically to identify any saddle anaesthesia and sphincter function to determine possible bladder bowel dysfunction indicative of a cauda equina syndrome; such patients were excluded from the study. Any patients with significant preoperative neurological motor and sensory deficit (Medical Research Council grade <3) were also excluded from the study because these patients may have a subclinical bladder deficit. Patients with features of urinary hesitancy, poor stream, nocturia, or on treatment for prostatic hypertrophy with alpha agonists were excluded from the study.

Patients who developed supra pubic pain and discomfort, difficulty or inability to void, presence of supra pubic dullness, and palpable bladder were subjected to bedside ultrasound and diagnosis of POUR were made. Patients who did not develop any retention comprised the control group.

After considering the inclusion and exclusion criteria, out of 203 patients who underwent posterior lumbar spine surgeries 80 patients were excluded from the study. The following factors were analysed on the total of 123 patients who fits into the inclusion and exclusion criteria like Age, sex, body mass index (BMI), presence of co morbidities including diabetes mellitus, postoperative pain scores, surgery duration, IV fluid volume administered and blood loss in the surgery.

All the surgeries were performed under general anaesthesia with propofol as the induction agent, rocuronium as the muscle relaxant, 60 mcg fentanyl as an opioid, and sevoflurane or isoflurane as the inhalational agent. Postoperatively, all the patients received a single dose of 1 mg butorphanol at night on the day of the surgery with no other opioid agent being used in the postoperative period. Postoperative analgesia was provided with non-steroidal anti-inflammatory drugs, paracetamol and rescue analgesia was provided with tramadol.

Characteristic	Pour (N= 20)	Control (N=103)	p-Value
Age (Year)	57.7±14.1	49.5±13.4	0.036 ^{a)}
Sex			0.544
	Male	11	52
	Female	9	51
BMI (Kg/m ²)	25.6±2.3	24.1±3.8	<0.0001 ^{a)}
Postoperative Pain Scores (Visual Analog Scale score)	4.44±0.6	3.0±1.2	<0.0001 ^{a)}
Surgery Duration (min)	97±34.4	89.4±34.8	<0.0001 ^{a)}
IV Fluid Volume Administered (ml)	1,486±450	1,268±381	0.001 ^{a)}
Presence of Comorbidities			0.64
	Diabetic	7	32
	Non-Diabetic	13	71
Blood Loss (ml)	70±12.4	56±33.3	0.002 ^{a)}
Hospital Stay (days)	5.13±1.19	5.46±1.38	0.06

Table 1. Risk Factors Evaluated in Univariate Analysis

Values are presented as mean±standard deviation or number. ^{a)} Denotes statistical significance.

Statistical Analysis

Continuous variables are expressed as mean and standard deviation and categorical variables are reported as the number of occurrences and frequency. The Student t-test and Pearson chi-square test were used to statistically compare continuous and categorical variables, respectively. Cox univariate analyses were performed to assess the prognostic factors of POUR in all spinal surgery patients. P-values <0.05 were considered to indicate statistical significance.

RESULTS

Total of 203 patients underwent elective posterior Lumbar spine surgery during the study period of two years. After considering the inclusion and exclusion criteria, 123 patients were included for the final analysis. Total 80 patients were excluded because of previous neurological deficit, spinal trauma, and previous history of urine voiding difficulties. 20 of the 123 patients developed POUR, resulting in a prevalence rate of 16.26%.

Univariate Analyses

The study population comprised 63 men and 60 women. There were 9 women and 11 men in the POUR group, while the control group included 51 women and 52 men; there were no significant sex-based differences (p=0.544) with respect to the development of POUR. Seven patients (5.6%) in the POUR group were diabetic compared to 32 (24.24%) in the control group; however, this difference did not reach statistical significance (p=0.64). The mean duration of stay in the POUR group (5.13±1.19 days) was not significantly different from that in the control group (5.46±1.38 days, p=0.06).

The mean Age of the patients who developed POUR was found to be 57.7 years which turns to be statistically significant (p=0.036). BMI of the 20 patients who developed POUR was 25.6 (kg/m²) and was statistically significant (p=<0.0001). Post-operative pain score (Vas Score) of the 20 patients who developed POUR was found to be 4.44 with p=<0.0001 which is also statistically significant. Of the 20 patients who developed POUR the total surgery duration was 97±34.4 mins, IV Fluid administration during surgery was 1,486±450 ml and total blood loss during surgery was 70±12.4 ml have the p values of <0.0001, 0.001, 0.002 respectively and all are found to be statistically significant.

DISCUSSION

The prevalence rates for POUR reported by various authors were ranging from 5% to 84%.^(1,2,3,6,5) These variations can be attributed to the several factors, including the variable definitions used to define POUR, type of surgery performed, type of anaesthesia, and use of opioid analgesia that affects bladder function.^(1,9,10,7,11)

Another contributing factor to the variable incidence rates is the fact that variable definitions have been used in these studies to establish POUR. The present study used a clinical definition for defining POUR, and this may be a limitation, particularly in the case of obese patients.¹⁰ In a recent study, the use of ultrasonography-based identification for bladder volumes has been suggested as being superior to clinical assessment.^(6,10) Moreover, patients with large bladder volumes and incomplete emptying may remain asymptomatic, and thus may escape detection based on a pure clinical definition.⁽⁷⁾ This study did not perform a formal urological consult in all patients with POUR to rule out other asymptomatic and co-existing urinary problems, including benign prostatic hypertrophy (BPH); this is another study limitation. However, all the patients in the POUR group were able to void normally after catheter removal, except one patient who needed prolonged catheterization.

In a review article, Baldini et al.⁽¹⁾ stated that the definition for POUR can be based on clinical, catheterization-, and ultrasonography-based evidence and documented over 18 different definitions used in previous studies.⁽¹⁾ And also higher prevalence rates for POUR have been noted in patients who received spinal anaesthesia, patient-controlled analgesia, and opioids as well as those who underwent anorectal surgery and total joint replacement surgery than in those who underwent other orthopaedic surgical procedures.^(1,2,10,7)

POUR has been studied extensively in gastrointestinal and anorectal studies, in orthopaedic surgery under spinal anaesthesia, and most notably in total joint arthroplasty-related procedures.^(1,9,10,7,12,8) In a large retrospective review on 15,681 patients who underwent major orthopaedic surgery, including joint replacement surgery, Sung et al.¹⁰ reported a prevalence rate of 2.3%. However, few studies have assessed POUR with lumbar spine surgery.^(5,11) Our study documented a rate of 16.5% occurrence of POUR in patients who underwent spinal surgery which is considerably higher than previous reports on POUR in spine surgery, such as that by Atschulet al.⁽⁵⁾ (8.8%), Gandhi et al.⁽⁴⁾ (5.6%), and Jung et al.⁽¹¹⁾ (11.1%).

In-out catheterization has been associated with an increased cumulative risk of urinary tract infection owing to frequent manipulation of the lower urinary tract.⁽⁷⁾ Therefore, we did not perform in-out catheterization, and an indwelling catheter was inserted for patients who were unable to void in the postoperative period. Lumbar discectomy and decompression and single-level fusions were included because these patients are routinely discharged by the 3rd and 5th postoperative day respectively. Urinary catheterization is not performed in these procedures routinely, and the occurrence of POUR in this subset may prolong hospital stay. Patients undergoing multiple-level fusion and presenting with preoperative neurological deficit frequently require preoperative catheterization; thus, they were excluded from the prospective analysis.

General anaesthesia, spinal anaesthesia, opioids, and patient-controlled anaesthesia are reported to cause POUR.^(1,2,8) The authors speculate that postoperative pain is a subjective assessment and can be considerably influenced by the use of narcotics and patient-controlled analgesia devices in the postoperative period. The methods for postoperative analgesia were standardized to reduce the impact of narcotic use as an independent factor for POUR. All the procedures were performed under general anaesthesia with uniform induction and maintenance protocols; further, the use of opioids in the postoperative period were restricted to a single dose to reduce the effect of these confounding factors. Postoperative analgesia was provided with non-steroidal anti-inflammatory drugs, Paracetamol and rescue analgesia was provided with Tramadol.

This study demonstrated that older age, higher BMI, and increased postoperative pain scores (VAS scores) higher blood loss during surgery, increased IV fluids usage in the surgery and surgery duration co morbidities like diabetes were associated with higher risk of POUR. POUR has been reported to prolong the duration of hospital stay.^(1,10) Our study confirms that development of POUR increases the stay in hospital compared to the control group which increases the total expenditure spent by the patient.

Gandhi et al.⁽⁴⁾ conducted a retrospective analysis of POUR among 647 patients undergoing posterior lumbar spine surgery and reported that age, male sex, diabetes mellitus, and BPH were significant factors for POUR. However, BMI, and duration of surgery did not influence the occurrence of POUR⁽⁴⁾. Incidence rate in our study was higher (16.26%) with additional risk factors such as prolonged duration of surgery, surgery with more blood loss and more intra op IV fluids usage, patient with higher post-operative pain score, and higher BMI was found to be the risk factors in our study contradicting the Gandhi et al.⁽⁴⁾ study.

A major concern following POUR and urinary catheterization is the development of urinary tract infections. Wald et al.⁽¹³⁾ analysed 35,904 in patients undergoing major surgery, including cardiovascular, gastrointestinal surgery, and joint replacement surgery and concluded that urinary catheterization for more than 2 days increases the risk of urinary tract infection by two-fold. There were 61 patients in the POUR group with a mean duration of catheterization of 3.1 days, and two patients developed urinary tract infection. Altschul et al.⁽⁵⁾ reported an infection rate of 14% in the retention group, while Hollman et al.⁽⁷⁾ reported a rate of 1.5% infection among 150 patients with retention following joint replacement.

POUR has been reported to prolong the duration of hospital stay,^(1,10) however, this study did not find a significant difference. This can be attributed to the fact that the routine discharge for patients undergoing microdiscectomy patients and decompressions in this study was scheduled on postoperative day 3. The authors speculate that POUR may have a greater impact on the duration of stay, particularly, when procedures, such as microdiscectomy and lumbar decompressions, are performed on a day care basis or when the patients have a shorter postoperative stay.⁽¹⁴⁾

Our study shows that diabetics was one of the individual risk factors for development of POUR. Numerous studies also have reported higher rates of POUR in diabetics. This is believed to be attributable to neuropathy with long-term

diabetes mellitus that can result in autonomic dysfunction and voiding difficulties.^(1,10,4,11) In contrast, Altschul et al.⁽⁵⁾ retrospectively reported on 397 elective spine surgery procedures, including cervical, thoracic, and lumbar surgical procedures to report that diabetes mellitus was not an independent risk factor. Similar findings were reported by Hollman et al. Limited studies have examined POUR in spine surgery; Jung et al.⁽¹¹⁾ reported on 325 patients undergoing anterior cervical spine surgery for cervical radiculopathy and myelopathy. The authors concluded that older age, diabetes, male sex, BPH, clinical presentation of myelopathy, and narcotic drug use were associated with a higher risk of POUR.⁽¹¹⁾ They reported a 16% risk of infection and bladder complications in the 36 patients with POUR⁽¹¹⁾ based on their study on 376 patients undergoing total hip replacement surgery; they found that diabetes mellitus was not a risk factor.

Our study also stated an increase in the hospital stay in the patients who developed POUR which increased the total expenditure spent by the patient. Similar results were obtained in the study conducted by Lee KS et al.⁽¹⁵⁾

CONCLUSIONS

The prevalence of POUR in posterior lumbar spine surgery patients was 16.26%. Older age of the patient, prolonged duration of surgery, surgery with more blood loss, patient with higher post-operative pain score were significant risk factors associated with POUR. These increased incidence rates and can be reduced in future by carefully accessing the risk factors and preventing the development of POUR.

REFERENCES

- [1] Baldini G, Bagry H, Aprikian A, et al. Postoperative urinary retention: anaesthetic and perioperative considerations. *Anesthesiology* 2009;110(5):1139-57.
- [2] Fernandez MA, Karthikeyan S, Wyse M, et al. The incidence of postoperative urinary retention in patients undergoing elective hip and knee arthroplasty. *Ann R Coll Surg Engl* 2014;96(6):462-5.
- [3] Oishi CS, Williams VJ, Hanson PB, et al. Perioperative bladder management after primary total hip arthroplasty. *J Arthroplasty* 1995;10(6):732-6.
- [4] Gandhi SD, Patel SA, Maltenfort M, et al. Patient and surgical factors associated with postoperative urinary retention after lumbar spine surgery. *Spine (Phila Pa 1976)* 2014;39(22):1905-9.
- [5] Altschul D, Kobets A, Nakhla J, et al. Postoperative urinary retention in patients undergoing elective spinal surgery. *J Neurosurg Spine* 2017;26(2):229-34.
- [6] O'Riordan JA, Hopkins PM, Ravenscroft A, et al. Patient-controlled analgesia and urinary retention following lower limb joint replacement: prospective audit and logistic regression analysis. *Eur J Anaesthesiol* 2000;17(7):431-5.
- [7] Hollman F, Wolterbeek N, Veen R. Risk factors for postoperative urinary retention in men undergoing Total hip arthroplasty. *Orthopaedics* 2015;38(6):e507-e11.
- [8] Toyonaga T, Matsushima M, Sogawa N, et al. Post-operative urinary retention after surgery for benign anorectal disease: potential risk factors and strategy for prevention. *Int J Colorectal Dis* 2006;21(7):676-82.
- [9] Lingaraj K, Ruben M, Chan YH, et al. Identification of risk factors for urinary retention following total knee arthroplasty: a Singapore hospital experience. *Singapore Med J* 2007;48(3):213-6.
- [10] Sung KH, Lee KM, Chung CY, et al. What are the risk factors associated with urinary retention after orthopaedic surgery? Article ID 613216, *Biomed Res Int* 2015;2015:1-5.
- [11] Jung HJ, Park JB, Kong CG, et al. Postoperative urinary retention following anterior cervical spine surgery for degenerative cervical disc diseases. *Clin Orthop Surg* 2013;5(2):134-7.
- [12] Boulis NM, Mian FS, Rodriguez D, et al. Urinary retention following routine neurosurgical spine procedures. *Surg Neurol* 2001;55(1):23-8.
- [13] Wald HL, Ma A, Bratzler DW, et al. Indwelling urinary catheter use in the postoperative period: analysis of the national surgical infection prevention project data. *Arch Surg* 2008;143(6):551-7.
- [14] Aiyer SN, Kumar A, Shetty AP, et al. factors influencing postoperative urinary retention following elective posterior lumbar spine surgery: a prospective study. *Asian Spine Journal* 2018;12(6):1100-5.
- [15] Lee KS, Koo KC, Chung BH. Risk and management of postoperative urinary retention following spinal surgery. *Int Neurourol J* 2017;21(4):320-8.