

Post-operative urinary retention in elective total hip and knee replacement surgery

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Abstract

Background: Urinary retention post-operatively is alarming complications that happen following joint replacement. It is managed with catheterization and catheterization can lead to urinary tract infections and can affect the efficacy of the prosthesis in future.

Objective: The objective present paper is to explore the factors related to POUR (post-operative urinary tract infection) and its management.

Methodology: Literature was searched on internet, data extracted and interpreted according to guidelines.

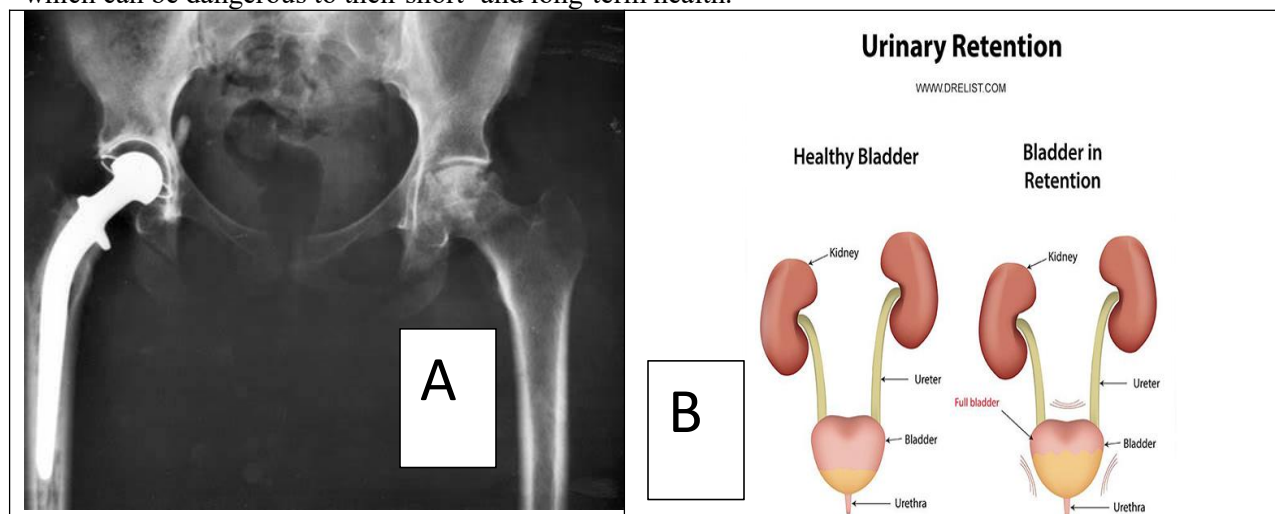
Results: In our research 4.1% and 46.3% of people had POUR. In all, there were 11 studies, and ultrasound was utilized to find POUR in each one. POUR was predisposed by elderly age, gender being male and prostrate hypertrophy, prior history of retention-urine, spinal (Sp)/epidural (Ep) anesthesia, over intravenous administration, analgesia (controlled through self-medication), opiate use, accompanying comorbid, and low ASA grade. Indwelling catheterization during surgery was not used in the majority of the trials. Patients with POUR were treated by sporadic catheterization. 400 ml was typical fluid requirement for bladder catheterization. An indwelling-catheter can be withdrawn during 2 days if it must be used. **Conclusions:** This study offered a current guide for the identification and treatment of POUR.

Keywords: knee replacement, Hip replacement, post-operative urinary retention (POUR)

Introduction

An inability to evacuate the urine even when the bladder is full is known as urinary retention. A frequent side effect of hip and knee Arthroplasty is postoperative urine retention (POUR) ¹. Atonic bladder and persistent detrusor function impairment result from a delayed diagnosis of POUR². Urinary catheterization is used to treat urine retention; however there is a risk of having a UTI-urinary tract

infection³. Additionally, following total joint arthroplasty⁴, UTI can result in hematogenous bacteremia⁵ and peri-prosthetic joint infection (PJI) in beginning of postoperative period through grasp of POUR and its treatment is necessary for arthroplasty surgeons to reduce threat of UTI and PJI. We are aware of only one review that was published in a 2010 issue of an anesthesiology journal on the impact of anaesthetic and analgesic treatments on POUR¹.After that, there was not a single thorough analysis of POUR in the literature. Since the advent of clinical pathways and the TJA fast-track protocol, the POUR has become increasingly crucial to orthopaedic surgeons' daily work. The purpose of bladder catheterization and its methodology in POUR patients are still debatable as of this writing. (TJA). The clinical uses of ultrasonography have increased over the previous ten years thanks to the efforts of medical professionals. This is particularly true in the realm of anaesthesia, where ultra sound equipment is now widely accessible in most facilities. This calls into question whether it is necessary to continue relying on particular expensive devices. POUR is not only painful and uncomfortable, but patients who experience it run the risk of acute renal injury, delirium, cardiac arrhythmias, and long-term detrusor dysfunction, all of which can be dangerous to their short- and long-term health.



A: Total hip joint replaced with prosthesis, B: Urinary retention and its effect on bladder

When compared to the general surgical population, studies have shown that patients undergoing lower limb orthopaedic procedures, particularly those undergoing hip or knee arthroplasty, have a significantly higher risk of developing POUR. POUR incidence rates have been reported at around 5% in the general surgical population compared to 77.8% seen after hip arthroplasty procedures. The UK national joint registry reports an increase of almost 20,000 replacements each year in the number of lower limb joint replacement surgeries, therefore POUR is inevitably becoming a substantial complication affecting

orthopaedic practise. By catheterizing patients during surgery, POUR can be prevented from developing. POUR is treated by inserting a urinary catheter to facilitate bladder drainage while the detrusor function recovers. Infection, bladder damage, urethral trauma, and the formation of strictures are concerns linked with catheterization. In patients whose risk of developing POUR outweighs the hazards associated with urinary catheterization, routine intra surgical catheterization should be avoided.

Despite the increased frequency of POUR in lower limb orthopaedic procedures and the existence of a successful strategy to prevent this complication, there is currently no clear guidance available to effectively determine which patients should be offered routine intra-operative catheterization while undergoing lower limb arthroplasty operations. A trustworthy estimate of bladder volume might be given via real-time ultrasonography. With the application of proportionality constant and the measuring of 3 diameters in 2 separate planes (transverse and sagittal), the operation is technically challenging. To aid in the diagnosis of POUR, certain automated bladder ultrasonography equipment that measure bladder volumes have been created. Several investigations have in fact demonstrated that they are highly accurate when compared to actual urine volumes recovered following bladder emptying. 8 Nonetheless, these tools are still expensive and frequently hard to find.

Methodology

This systematic review was done on the data available in the literature.

Inclusion Criteria: (1) Papers that included study of complete knee joint surgery or complete hip joint surgery (2) English literature (3) Papers that defined the post-operative urinary retention (POUR) (4) Papers that mentioned the risk of POUR

Exclusion Criteria: (1) Publications that did not meet the above criteria (2) Studies in language other than English (3) Studies on animals (4) Clinical drug trials (5) Papers that mentioned surgeries other than knee and hip surgery.

Literature Search: We searched on PubMed, PubMed Central, BMC, EMBASE and Google scholar using keywords “knee replacement”, “Hip replacement” and “post-operative urinary retention (POUR)”. "Urinary Retention/complications, "Urinary Retention/diagnosis, "Urinary Retention/etiology", "Urinary Retention/pathology" , "Urinary "Urinary Retention/prevention and control", "Urinary Retention/surgery", Arthroplasty, Replacement, Knee/adverse effects", "Arthroplasty, Replacement, Knee/rehabilitation" , "Postoperative Complications/diagnosis" , "Postoperative Complications/epidemiology " "Postoperative Complications/mortality" , "Postoperative Complications/pathology" , "Postoperative Complications/prevention and control", "Postoperative Complications/rehabilitation", "Postoperative Complications/surgery" "Postoperative Complications/urine"

Results

Search Results: Initial results from online database generated 1076 results in total. Then filters were applied for relevance, years of research limited to 2015 to 2023 and applying the exclusion criteria. After

going through topics 15 were selected from PubMed and 492 from other data sources. A total of 507 studies were found on data base, 467 were excluded after evaluating the titles of studies. After reading through abstracts only 31 studies were kept. After extraction of Data, systematic review was done on only 11 studies because only these fulfilled the eligibility criteria.

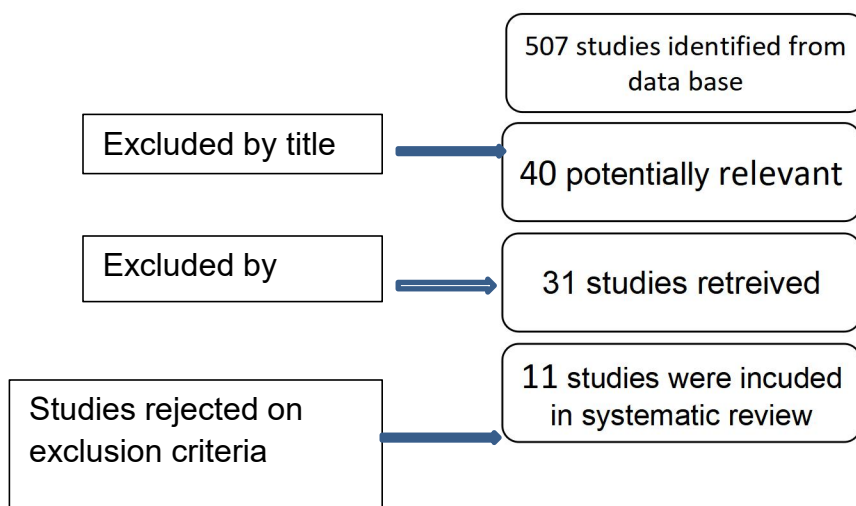


Figure 1: Extraction of Data stepwise

Data Extraction: Data was thoroughly extracted from 11 studies, the variables extracted were age, mean age, gender of the participants, number of the patients who contracted the problem and had complication. Also the papers contained information about the type of the bladder ultrasound used for the identification of the urinary retention and type of the procedure performed. The list of risk causing factors and the type of the anesthesia used for particular study were done through the information obtained from the articles. Type of surgery (total hip or total knee joint) was also specified in the literature Ultrasound was used in each of the 11 investigations to determine the POUR diagnosis. Each study used a different volume with threshold range from 350 - 700 ml to diagnose POUR. The 400 ml, 500 ml, and 600 ml volume criteria were used the most frequently (five studies each), respectively (two studies). From 4.1% to 46.3%, the frequency of POUR was extremely variable.

Aauthor and Year	Size	Study type	Cath	POUR	Mean age	F/M		
Bjerregaard et. al. 2015	1054	Prospective	x	422	67.68	633/421	474/580	118/936

David et. al. 2015	80	Prospective	x	29	65	47/33	0/80	0/0/8
Hollman et. al. 2015	376	Retrospective	O/x	150	68	0/374	0/376	234/140/0
Haung et. al.	314	Prospective	O/x	19	67.2	243/71	314/0	314/0/0
Tischler et. al. 2016	842	Prospective	x	79	66.8	555/287	401/441	0/842/0
Lawrie et. al. 2017	174	Prospective	x	76	66	106/68	106/68	0/174/0
Kort et. al. 2018	638	Retrospective	x	82	69.3	418/229	315/323	181/457/0
Scholten et. al. 2018	306	Prospective	x	142	N/D	N/D	N/D	Sp./GA
Halawi et. al. 2018	358	Prospective	O/x	145	61.7	187/171	191/187	24/0/328
Markopoulos et. al. 2019	218	Prospective	x	9	69.3	113/105	106/111	0/218/0
R.J. Magaldi et al. 2022	447	Retrospective	x	118	62.5	239/208	288/159	Sp.

Table 1: Study findings in Systematic review

Risk Factors of POUR: In eight of the 11 studies included in the systematic review, males, prostate hypertrophy, or histories of urinary issues prior to surgery were risk factors^{10, 12, 14, 16-18, 22, 23}. Age was listed as a significant factor for POUR in five studies^{2, 16, 17, 21, 22}. The cause of this causation seems to be age-related degenerative neuropathy. In comparison to general anaesthesia, the use of spinal(Sp)/epidural(Epi) anaesthesia showed up as a significant factor in three investigations^{10, 13, 15}. Three investigations identified excessive fluid administration as a risk factor^{16, 18, 21}. Self-medication, comorbid, and a low ASA-grade were additional risk factors¹⁶.

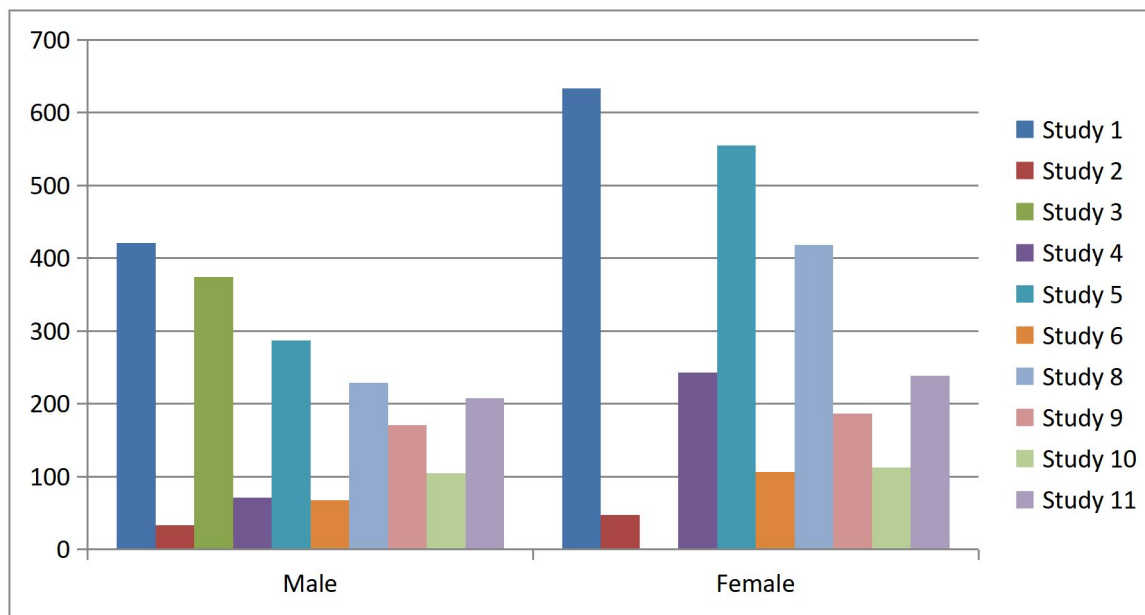


Figure 2: Gender distribution across studies

Indication of Catheterization: Just 1% of POUR patients received indwelling catheter treatment, according to Miller et al. The majority of POUR patients received catheterization once with no additional urology issues. All POUR patients in clinical trial recovered, and none of them were sent home with an indwelling-catheter.²² In another trial only 0.9% of patients required an indwelling-catheter despite having POUR in 40% of cases and 8.2% needing catheterization again and again¹³. However, the rate of indwelling-catheter placement varied from 16.8% to 36.2% in other investigations^{2,15}.

In all 11 trials, it was agreed that indwelling catheterization should not be utilized or should be used sparingly. Each study used a different set of bladder catheterization, ranging from 350 - 700 ml. 400 mL was the volume threshold employed in five studies.

Detection and Management of Pour: Individuals who are at risk for POUR should be examined before TJA and thoroughly watched both during and after the procedure. For the diagnosis of POUR, ultrasound should be employed.

Once POUR has happened, the patient needs to receive intermittent catheterization therapy. Only when persistent POURs occur despite repeated intermittent catheterization are indwelling catheters and/or pharmaceutical therapies used^{2,12,15,16,18,20}. In the event that an indwelling catheter must be used, it must be removed within 48 hours²⁴.

Discussion

Compared to other surgical procedures, TJA patients had a higher incidence of POUR. Balderi and Carli studied POUR in 2010 following TJAs. Between 0% and 75% of POUR cases were found during their review. At the time, preoperative indwelling-catheter insertion was the clinical practice used to manage the bladder in TJA patients. At the time, POUR was diagnosed using both catheterization and ultrasound. The frequency of POUR in our review is from 4.1% to 46.3%. For the diagnosis and treatment of POUR, ultrasound took the place of bladder catheterization, and routine indwelling catheter use was discontinued. Intermittent catheterization was used to treat the patients after POUR had taken place.

The vast variation in POUR incidence was caused by author-specific diagnostic criteria, various TJA patient characteristics, the type of anaesthesia, the postoperative analgesic strategy, and the use of invasive procedures like urinary catheterization have risks such as urethral injury, infection, and patient discomfort. A noninvasive diagnosis and monitoring method for POUR called an ultrasound bladder scan has been introduced²⁵. Ultrasound was utilized in place of catheterization in all 11 trials that have been published since 2016. A typical adult bladder has a volume between 400 and 600 mL, and anything more than 600 mL has been deemed abnormal²⁶. Urologic adverse effects might result from the bladder being over-distended²⁷. As a result, the proper catheterization threshold volume needs to be established. There is currently no agreement on the threshold volume, which varied in the 11 investigations from 350 mL to 700 mL. The use of an indwelling urine catheter during surgery. Many different causes have been linked in the literature to the emergence of POUR following TJAs. Old age, being male, prior renal issue, the volume of IV liquid administered, the kind of anaesthesia, anaesthetic drugs, and the use of opiates in the postoperative period are well-known risk factors.

According to recent ultrasound studies, measuring the bladder volume before and after surgery can help predict the onset of POUR. According to Scholten et al., POUR risk factors included the preoperative residual volume. When the remaining urine was greater than 150 mL, 15% of cases of POUR occurred.²⁰ Bladder volume >200 mL, according to research by Kort et al. Keita et al. recognized >270 mL at the post-anaesthesia is a threat for POUR. POUR after TJAs has been suggested to be predicted by (IPSS).²⁹ IPSS was not effective at predicting POUR in other studies, although being less expensive than an ultrasound scan^{30,31}. Individuals who are at risk for POUR should be examined before TJA and thoroughly watched both during and after the procedure. Recent research found that using an ultrasound scan for monitoring reduces the likelihood of POUR and advised doing it 6 to 8 hours after the beginning of anaesthesia^{15,19,25}. POUR patients received intermittent catheterization in all studies. The removal of an indwelling-catheter must be done in 2 days if it is unavoidable, as the length of catheterization is highly associated to the development of UTI

Conclusion: This study offered a current guide for the identification and treatment of POUR.

The condition can be avoided either by taking precautions and early detection through bladder ultrasonography. The review includes a current manual for the detection and treatment of POUR and can be used as guidelines in future.

Limitations: This review does have certain constraints. Secondly, disparities in patient constitution, ethnicity, and surgical protocols could not be evaluated. Second, it was unable to compare anaesthetic agents with postoperative pain relievers. Finally, we were unable to distinguish urinary retention following reoccurrence Arthroplasty. POUR may vary depending on whether it is a primary arthroplasty or a revision¹³. of the 11 studies that made up this review's sample enrolled people who were getting primary arthroplasty. The final two studies^{2,22} appeared to cover both revision and initial arthroplasties. The number of revision patients, however, was not recorded by the authors.

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