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Prophylactic use of alpha-1 adrenergic blocking agents for prevention of postoperative urinary retention: A review & meta-analysis of randomized clinical trials

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A R T I C L E I N F O

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ABSTRACT

Background: Alpha-1 adrenergic blockers used to treat postoperative urinary retention (POUR) may also have a preventative role. Here we assess the evidence behind their prophylactic use on POUR prevention. *Study design:* PRISMA guidelines were followed. All studies reviewed for eligibility, data extraction, and risk of bias assessment. Pooled risk ratios with 95% confidence intervals calculated using a random effects model. Heterogeneity assessed using Forest plots, l^2 statistic and Chi-squared Cochran's Q-statistic. *Results:* Fifteen RCTs (1732 patients) included. Prophylactic alpha-1 adrenergic blockers significantly reduced risk of POUR, 13.16% vs 30.24%, RR = 0.48 (95%CI: 0.33; 0.70, p-value = .001), without a statistically significant increase in adverse events. Substantial heterogeneity found between included studies ($l^2 = 65.49\%$ [95%CI:48.49; 95.01] & Q-statistic 43.46 (p-value<.001)). Subgroup analysis revealed strong risk reduction and little heterogeneity in males (RR:0.33, 95%CI:0.23; 0.47, p-value<.001, l^2 :10.58) and patients receiving spinal anesthesia (RR:0.26, 95%CI:0.14; 0.46, p-value<.0001, $l^2 = 0\%$). *Conclusion:* Prophylactic alpha-1 adrenergic blockers reduce risk of POUR in males and after spinal anesthesia.

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1. Introduction

Postoperative urinary retention (POUR) refers to impaired voiding with bladder distention after surgery.¹ The incidence of POUR appears to vary between surgical populations and prevalence

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² The work was completed when authors Amandeep Ghuman, S·W de Jonge, Simon D. Dryden, Timothy Feeney, Daniel H. Buitrago were completing their MPH at Harvard.

https://doi.org/10.1016/j.amjsurg.2018.01.015 0002-9610/© 2018 Elsevier Inc. All rights reserved. estimates are affected by varying diagnostic standards.^{2–6} This wide range of POUR rates reflect the complex and often multifactorial etiology, including drugs administered during anesthesia and surgery, high volumes of intravenous fluids, type of surgical procedure and patient risk factors.

Historically, the practice of inserting a urinary catheter at the time of surgery was routinely performed during many surgical procedures, especially those intended to last more than two hours. This allows for monitoring of urine output, guides volume resuscitation, and serves as a surrogate marker of hemodynamic stability. With an increase in outpatient and fast-track surgical procedures, urethral catheterization is used less commonly increasing the likelihood of POUR.^{7,8} Further, urethral catheterization, a mainstay of initial management for patients with POUR, can be associated with prolonged length of hospital stay and

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complications, such as urinary tract infections that may increase cost of care. Therefore, pharmacological therapy has gained a favorable and interesting approach to prevent patients of developing urinary retention following surgery.^{9–11}

Alpha-1 adrenergic blocking agents, such as tamsulosin, have demonstrated an effect in preventing POUR following surgical procedures in different randomized clinical trials (RCTs).¹² However, others have not found the prophylactic effect and thus its true value remains controversial.¹³ Here, we review the evidence behind the prophylactic effect of alpha-1a adrenergic blocking agent on the development of POUR.

2. Methods

2.1. study design

This review and meta-analysis is reported according to the validated methods of the PRISMA statement.¹⁴ As this concerns a literature study, no ethical approval was required.

2.2. Study identification

A clinical librarian was consulted on the search strategy. A systematic literature search was conducted using PubMed (MEDLINE), Embase and Cochrane Library databases (from inception of the databases to March 2017). Language was restricted to English, French, Spanish and German. A comprehensive list of search terms was used, including Medical Subject Headings (MeSH) and combined with Cochranes highly sensitive search strategy to identify RCTs.¹⁵ The full search strategy is available in appendix (1).

2.3. Study selection

Two independent reviewers (TF and SW) screened titles and abstracts of retrieved references for potentially relevant studies. Any disagreements were solved through discussion or, when necessary, after consultation with a third author (SD). The full text of all potentially eligible articles was obtained and reviewed for eligibility based on predefined inclusion criteria. All RCTs investigating the effect of Alpha-1 adrenergic blockers on the incidence of POUR among patients undergoing surgery were considered for eligibility. Conference abstracts, in vitro and animal studies were excluded from the analysis. When title and abstract indicated potential eligibility based on these criteria, or insufficient information was supplied for assessment, the full-text article was obtained and assessed by both authors independently for final decision. Any disagreements were resolved through discussion or, when necessary, after consultation with a third author (SD). When full text was not available or presented results were incomplete the corresponding author was contacted. When all relevant full text papers were gathered each reference list was reviewed for any omitted studies.

2.4. Data abstraction

Two independent reviewers (AG and DB) reviewed each eligible paper independently. Data abstraction was done using a predefined evidence table, and data were then compared. The outcome of interest was postoperative urine retention, defined as the need for intermittent catheterization or reinsertion of an indwelling catheter after the original urinary catheter (placed at the time of surgery) has been removed. Data collection for each paper included age, sex, year and type of publication, country, design, participants, surgical procedure, alpha-1 adrenergic blocker used, time of alpha-1 adrenergic blocker initiation, presence of urinary catheter, type of anesthesia, and adverse events.

2.5. Risk of bias

Two authors appraised each study critically using the Cochrane Collaboration's tool for assessing risk of bias and displayed summary figures generated by Review Manager version 5.3 (The Cochrane Collaboration; 2014).¹⁵

2.6. Statistical analyses

All statistical analyses were performed in R version 3.3.2¹⁶ using the metafor package.¹⁷ Pooled risk ratios with 95% confidence intervals were calculated using a random effects model with DerSimion and Laird weighting. Heterogeneity was assessed visually using Forest plots and formally through the I² statistic and the Chisquared Cochran's Q-statistic (with I^2 > 50%, and p-value<.05 indicative of substantial heterogeneity respectively). Forrest plots and risk of bias table and graph where constructed using Review Manager version 5.3 (The Cochrane Collaboration; 2014). Possible sources of heterogeneity were investigated using subgroup analysis and meta-regression with a priori postulated factors (including publication year, mean age, gender, abdominal vs. non-abdominal, rectal vs. non-rectal, alpha-1 blocker and pre-operative initiation of alpha-1 blocker, foley catheter at time of surgery, and anesthetic type). Sensitivity of results was assessed through leave-one-out analyses. Publication bias was visually assessed using funnel plots and formally through Egger's test (p-value <.10 indicating significant publication bias).

3. Results

3.1. Eligible studies

A total of 2096 articles were retrieved, of which 1832 were screened after duplicates were removed. 1771 articles were found to be duplicates, as such 33 underwent full review and 18 were excluded due to failure to meet inclusion criteria in study design or patient population. Fifteen studies, including 1732 patients, were included in the final analysis (Fig. 1 and Table 1). Livne et al. was considered as two separate studies to facilitate heterogeneity assessment of vaginal vs. abdominal hysterectomies. The studies were published between 1983 and 2016. Eight studies included only male participants, 3 included female participants only and 2 included both sexes. Phenoxybenzamine was the alpha-1 blocker used in 4 studies, prazosin in 4 studies, alfusozine alone in one study, tamsulosin alone in 5 studies and either tamsulosin or alfusozine in one study.

3.2. Primary outcome: urinary retention

There were 370 episodes of urinary retention among the 1732 patients. There were 119 episodes of urinary retention amongst 904 patients who received alpha-1 adrenergic blockers. There were 251 episodes of urinary retention amongst the 830 control patients. Prophylactic alpha-1 adrenergic blocker use significantly reduced the risk of post-operative urinary retention, RR = 0.48 (95%CI: 0.33; 0.70, P-Value = .001) (Fig. 2). These results were robust to leave-one-out analyses. The proportion of pooled patients who developed POUR in the alpha-1 adrenergic blocker group were 13.16%, compared to 30.24% amongst the pooled controls, thus an absolute risk reduction of 17.08% and a number needed to treat of 6.

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