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Efficacy and Safety of Anesthetic Agents for Preventing and Managing Intraoperative Penile Erection: A Systematic Review with Quantitative Synthesis

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ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 September 2025 and was last updated on 14 September 2025.

INTRODUCTION

Review question / Objective To assess the efficacy and safety of various anesthetic agents for preventing or treating intraoperative penile erection through a systematic meta-analysis.

Condition being studied Our meta-analysis demonstrates that therapeutic administration of anesthetic agents during surgery significantly shortens the duration of intraoperative penile erection and lowers the incidence of erection at catheterization. Importantly, these agents do not

increase postoperative cognitive dysfunction or nausea and vomiting, nor do they affect emergence time, 30-minute postoperative hemodynamics, or postoperative erectile function. Moreover, they markedly reduce the incidence of severe postoperative bladder irritative symptoms—an effect further enhanced by prophylactic administration.

METHODS

Participant or population Administration of an anesthetic agent in the intervention group versus

saline or standard care (no active treatment) in the control group.

Intervention NO ADAPT.

Comparator Administration of an anesthetic agent in the intervention group versus saline or standard care (no active treatment) in the control group.

Study designs to be included RCT design.

Eligibility criteria Studies were included if they met the following criteria:

1. RCT design;
2. Enrollment of male patients with intraoperative penile erection explicitly documented;
3. Administration of an anesthetic agent in the intervention group versus saline or standard care (no active treatment) in the control group;
4. Published in English or Chinese;
5. Human subjects only.

Information sources Searches were conducted in Embase, the Cochrane Library, PubMed, Web of Science, CNKI, VIP, and Wanfang Data for randomized controlled trials (RCTs) evaluating anesthetic agents for intraoperative penile erection.

Main outcome(s) Ten RCTs (n = 2,313 participants; 1,481 treatment, 832 control) were included.

Efficacy: Anesthetic agents significantly shortened the time to detumescence (mean difference [MD], -3.64 min; 95% CI, -4.68 to -2.59; $P < 0.001$) and reduced the incidence of erection at catheterization (risk ratio [RR], 0.73; 95% CI, 0.54 to 0.98; $P < 0.05$).

Safety: No significant between-group differences were observed for postoperative emergence delirium (RR, 1.35; 95% CI, 0.55 to 3.33; $P > 0.05$), nausea and vomiting (RR, 1.22; 95% CI, 0.58 to 2.54; $P > 0.05$), recovery time (MD, 8.71 min; 95% CI, -5.38 to 22.81; $P > 0.05$), systolic blood pressure at 30 min post-op (MD, 1.93 mmHg; 95% CI, -3.26 to 7.12; $P > 0.05$), diastolic blood pressure at 30 min post-op (MD, 1.93 mmHg; 95% CI, -1.37 to 5.24; $P > 0.05$), heart rate (MD, -3.96 bpm; 95% CI, -15.16 to 7.23; $P > 0.05$), or postoperative erectile-function scores (MD, 4.04; 95% CI, -2.19 to 10.26; $P > 0.05$). However, anesthetic administration significantly lowered the risk of severe postoperative bladder irritation (RR, 0.57; 95% CI, 0.36 to 0.90; $P < 0.05$).

Subgroup analysis indicated that prophylactic dosing was superior to therapeutic dosing in preventing postoperative bladder irritation (RR, 0.33; 95% CI, 0.19 to 0.57; $P < 0.05$).

Quality assessment / Risk of bias analysis Key characteristics of the included studies are summarized in Table 1. Study quality was assessed using the Cochrane Risk of Bias tool; risk-of-bias judgments are presented in Supplementary Figure 1.

Publication bias was evaluated by inspecting funnel plots (Supplementary Figure 3). All funnel plots exhibited asymmetry, suggesting a potential risk of publication bias in this meta-analysis.

Strategy of data synthesis Trial quality was appraised using the Cochrane Risk of Bias tool. Data synthesis and sensitivity analyses were performed using RevMan 5.4 and Stata 16.0. A random-effects model was employed when significant heterogeneity was detected; otherwise, a fixed-effects model was applied.

Subgroup analysis Subgroup analyses were performed to explore sources of substantial heterogeneity ($I^2 \geq 75\%$) identified in prior meta-analyses.

Sensitivity analysis Sensitivity analyses were conducted using a leave-one-out approach. In other words, each study was sequentially omitted from the pooled analysis, and the meta-analysis was re-run on the remaining studies; the resulting forest plots and effect estimates before and after exclusion were then compared. The results demonstrated that omitting any single study did not materially alter the overall findings (neither the statistical significance nor the direction of the effect changed), indicating that the meta-analytic results are robust.

Country(ies) involved China.

Keywords Anesthetic agents; Intraoperative penile erection; Efficacy; Safety; Meta-analysis.

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