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The effect of intravenous anesthesia on postoperative cognitive function in patients undergoing painless gastroscopy: a meta-analysis

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ADMINISTRATIVE INFORMATION

Support - This study did not receive any funding in any form.

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 23 September 2025 and was last updated on 23 September 2025.

INTRODUCTION

Review question / Objective To evaluate the effect of intravenous anesthesia on postoperative cognitive function (POCF) in patients undergoing painless gastroscopy, with a focus on identifying potential risks of postoperative cognitive dysfunction (POCD) and guiding clinical anesthesia practices.

Condition being studied Painless gastroscopy under intravenous anesthesia has become increasingly prevalent. The implications of anesthesia, particularly on postoperative cognitive function (POCF), have garnered considerable attention, given the potential risks associated with cognitive impairment after surgical procedures.

METHODS

Participant or population Patients over 60 years old undergoing elective gastrointestinal endoscopy.

Intervention Experimental groups receiving inhalational or non-intravenous forms of anesthesia.

Comparator Control group undergoing intravenous anesthesia.

Study designs to be included Randomized controlled trials (RCTs) published in English.

Eligibility criteria Inclusion and Exclusion Criteria: Study Type: Clinical research published domestically and internationally, limited to English-language publications; Design: Randomized Controlled Trials (RCTs); Participants: Patients aged over 60 years, scheduled for elective gastrointestinal endoscopy (e.g., gastroscopy and gynecological surgeries); ASA Classification: Grades I-III; Other Criteria: Surgeries expected to last more than 2 hours, patients capable of reading without severe hearing and visual impairments; Data Requirements: Studies must include the

purpose of the study, detailed statistical methods, and results that can provide weighted mean differences with 95% CI or data convertible to OR values with 95% CI, along with the years of study conduct and publication; Comparison Groups: Control group undergoing intravenous anesthesia, with experimental groups receiving inhalational or non-intravenous forms of anesthesia.
Exclusion Criteria:
Language: Non-Chinese or English publications; Health Conditions: Severe cardiovascular, respiratory, liver, kidney, or central nervous system diseases, life expectancy less than 3 months; Duplication: Repetitive reports; Cognitive Impairment: Mini-Mental State Examination scores below 23; Current Medication: Use of sedatives, antidepressants, or corticosteroids; Incomplete Data: Missing crucial information, such as group case numbers; Publication Type: Calls for papers, conference announcements, and reviews.

Information sources PubMed、Embase、Web of Science、Scopus、Cochrane, and Clinical Key.

Main outcome(s) Monitoring heart rate, non-invasive blood pressure, pulse oximetry, ECG, respiratory rate, and BIS during anesthesia; recording gastroscopy operation time, awakening time (from the end of the examination to the moment the patient can accurately respond with their name and age), dosage of intravenous anesthetics like propofol, and discharge time (from awakening to meeting discharge criteria based on "Expert Consensus on Sedation/Anesthesia for Digestive Endoscopy in China"). Mental activity tests are conducted 30 minutes before painless gastroscopy and upon meeting discharge criteria. If mental activity test results do not revert to preoperative levels upon meeting discharge criteria, a third test is conducted after resting for 30 minutes. Mental activity tests include: (1) Digit Cancellation Test, (2) Digit Symbol Test, and (3) Pegboard Test.

Quality assessment / Risk of bias analysis Two researchers independently evaluate the quality of the literature and discuss their findings. In cases of disagreement, a third researcher participates in the discussion to reach a decision. This study employs the Cochrane bias risk assessment tool for RCTs, which includes seven items rated as "low risk," "high risk," or "unclear" of bias. A grade is assigned based on the likelihood of various biases occurring: "A" for minimum possibility, "B" for moderate possibility, and "C" for a high possibility of bias.

Strategy of data synthesis Meta-analyses are performed using the analysis module in RevMan 5.3 (Cochrane Collaboration, Copenhagen, Denmark), with Relative Risks (RRs) analyzed within a 95% confidence interval. Heterogeneity among the included studies is assessed using I-square statistics and the heterogeneity Chi-square test before combining study results. Values of I2 > 50% or P < 0.10 indicate significant heterogeneity among studies. The overall RR or SMD scores are calculated using a random-effects model in the presence of heterogeneity; otherwise, a fixed-effects model is used.

Subgroup analysis The meta-analysis revealed no significant difference in the incidence rates of POCD on Day 1 and Day 3 postoperatively between patients undergoing intravenous versus inhalation anesthesia. However, on Day 7, the incidence of POCD was significantly lower in the intravenous anesthesia group, with a combined Odds Ratio (OR) of 0.96 (95% Confidence Interval (CI): 0.73-1.26, I^2 = 34%, n=7, P<0.00001). Furthermore, plasma levels of S-100β protein, a marker for neural injury, were significantly lower in the intravenous anesthesia group, with a Mean Difference (MD) of 0.34 (95% CI: 0.23-0.48, I^2 = 0%, n=5, P<0.00001).

Sensitivity analysis Meta-analyses were performed using RevMan 5.3, with heterogeneity assessed via I-square statistics.

Language restriction English.

Country(ies) involved China.

Keywords Postoperative Cognitive Dysfunction; Intravenous Anesthesia; Painless Gastroscopy; Meta-Analysis; Postoperative Cognitive Function.

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