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Comparison of two methods of administering a short-acting sedative drug during hip and knee replacement surgery under spinal anesthesia

Submission date
18/03/2026

Recruitment status
No longer recruiting

Registration date
19/03/2026

Overall study status
Completed

Last Edited
19/03/2026

Condition category
Surgery

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol
Not provided at time of registration

Contact information

Type(s)
Public, Scientific, Principal investigator

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Additional identifiers

Study information

Scientific Title

A randomized controlled trial comparing intermittent bolus administration versus target-controlled infusion of remimazolam for moderate sedation in adult patients undergoing hip or knee arthroplasty under spinal anesthesia

Study objectives

Ethics approval required
Ethics approval required

Ethics approval(s)
1. Approved 02/08/2023, Ethics Committee of the Hospital of Traumatology and Orthopaedics (Duntes iela 22, Riga, LV - 1005, Latvia; +371 (0)67 399 266; izg@tos.lv), ref: 41/2023/1

2. Approved 26/04/2024, Ethics Committee of the Hospital of Traumatology and Orthopaedics (Duntes iela 22, Riga, LV - 1005, Latvia; +371 (0)67 399 266; izg@tos.lv), ref: 29/2024/1

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Open (masking not used)

Control
Active

Assignment
Parallel

Purpose
Treatment

Study type(s)

Health condition(s) or problem(s) studied
Sedation management in adult patients undergoing hip or knee arthroplasty under spinal anesthesia

Interventions
Participants are randomly assigned in a 1:1:1 ratio using computer-generated block randomisation to one of three intervention arms: intermittent bolus administration of remimazolam, target-controlled infusion using the Masui pharmacokinetic model, or target-controlled infusion using the Zhou pharmacokinetic model.

All participants receive standard intraoperative monitoring, including electrocardiography, non-invasive blood pressure, and pulse oximetry. Supplemental oxygen is administered via nasal cannula. Moderate sedation is targeted, defined as a Modified Observer's Assessment of Alertness/Sedation score of 2 to 3, with sedation level assessed at 5-minute intervals.

In the bolus group, remimazolam is administered as an initial intravenous bolus of 0.04 mg per kilogram over 2 minutes. Additional boluses of 0.04 mg per kilogram are administered as needed to maintain the target sedation level.

In the target-controlled infusion groups, remimazolam is administered using an infusion pump guided by pharmacokinetic models implemented in a clinical decision-support application. Initial effect-site concentration targets are set between 0.2 and 0.4 micrograms per millilitre, with adjustments made in increments of 0.05 to 0.10 micrograms per millilitre based on the sedation level. If oversedation occurs, the infusion is reduced or temporarily discontinued.

All interventions are continued throughout the surgical procedure under spinal anesthesia.

Intervention Type
Drug

Phase
Not Applicable

Drug/device/biological/vaccine name(s)
Remimazolam

Primary outcome(s)
1. Sedation quality (time in target sedation range) measured using Modified Observer's Assessment of Alertness/Sedation (MOAA/S) scale assessed at 5-minute intervals; proportion of measurements with score 2–3 expressed as percentage at initiation of sedation to end of the surgical procedure

2. Sedation variability (time outside target range) measured using MOAA/S scale assessed at 5-minute intervals; proportion of measurements with score <2 (oversedation) and >3 (undersedation), expressed as percentages at initiation of sedation to end of the surgical procedure

Key secondary outcome(s)
1. Sedative drug utilisation measured using total remimazolam dose normalised to body weight and duration (milligrams per kilogram per hour) at initiation of sedation to end of the surgical procedure

2. Haemodynamic stability – hypotension measured using incidence of systolic blood pressure <90 mmHg or mean arterial pressure <60 mmHg (binary per patient) at during intraoperative period

3. Haemodynamic stability – bradycardia measured using Incidence of heart rate < 50 beats per minute (binary per patient) at During intraoperative period

4. Respiratory safety – hypoxia measured using incidence of peripheral oxygen saturation < 94% (binary per patient) at during intraoperative period

5. Pharmacodynamic response (effect-site concentration–response relationship) measured using logistic regression modelling of probability of achieving MOAA/S 2–3 as a function of effect-site concentration (micrograms per millilitre) at during intraoperative period

Completion date
05/12/2024

Eligibility

Key inclusion criteria
1. Adult patients aged 18 years or older
2. Scheduled for elective hip or knee arthroplasty
3. Planned to undergo surgery under spinal anesthesia
4. American Society of Anesthesiologists physical status class I–III
5. Able to provide written informed consent

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 Years

Upper age limit
90 Years

Sex
All

Total final enrolment
42

Key exclusion criteria
1. Hepatic impairment (alanine aminotransferase or aspartate aminotransferase >100 IU L^{1} or aspartate aminotransferase to alanine aminotransferase ratio ≥2:1)
2. Known hypersensitivity or allergy to benzodiazepines
3. Chronic or daily use of benzodiazepines
4. Cognitive impairment precluding reliable assessment of sedation level or informed consent
5. Contraindications to spinal anesthesia
6. Contraindications to procedural sedation

Date of first enrolment
01/09/2023

Date of final enrolment
05/12/2024

Locations

Countries of recruitment
Latvia

Sponsor information

Organisation
Riga Stradiņš University

ROR
https://ror.org/03nadks56

Funder(s)

Funder type

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available