

Let's take you home tonight



Spinal anesthesia in ambulatory surgery

from cocaine to chlorprocaine

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The background of the slide is a vertical wooden plank wall. On the left side, there are dark, elongated shadows cast across the planks, suggesting the silhouettes of people standing or moving. The lighting is warm, highlighting the natural grain and texture of the wood.

General anesthesia in favour vs spinal anesthesia
for ambulatory surgery

'New' local anesthetics
Better outcomes

RESEARCH

Open Access

Spinal anesthesia is a grossly underutilized gold standard in primary total joint arthroplasty: propensity-matched analysis of a national surgical quality database



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Surgical Management of Osteoarthritis of the Knee

Evidence-Based Clinical Practice Guideline

ANESTHETIC TYPES

Limited evidence supports the use of neuraxial anesthesia compared to general anesthesia to reduce complications in patients with symptomatic osteoarthritis of the hip undergoing total hip arthroplasty.

Strength of Recommendation: Limited Evidence ★★☆☆

Description: Evidence from two or more "Low" strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.



CLINICAL PRACTICE

Anaesthetic care of patients undergoing primary hip and knee arthroplasty: consensus recommendations from the International Consensus on Anaesthesia-Related Outcomes after Surgery group (ICAROS) based on a systematic review and meta-analysis

Neuraxial anaesthesia is preferred for KNEE arthroplasty

Neuraxial anesthesia is recommended for HIP arthroplasty

Fewer complications with neuraxial anesthesia

- HIP

- Mortality
- Pulmonary
- Acute renal failure
- Thrombo-embolic events
- Stroke
- Infections
- Blood transfusion
- Postoperative falls
- No difference: cardiac, gastro-intestinal, wound compl, nerve injury

- KNEE

- Pulmonary
- Acute renal failure
- Urinary tract infection
- Thrombo-embolic events
- Infections
- Wound complications
- Blood transfusion
- Critical care admission
- Readmission: OR 0,48

Urinary retention !

Why spinal in ambulatory surgery ?

Table 3. Effects of Central Neuraxial Block Versus General Anesthesia on Ambulatory Surgical Patients

Outcome	n	Number of trials	Central neuraxial block* (mean)	General anesthesia* (mean)	OR or WMD** (95% confidence interval)	P value
Anesthesia induction time (min)	384	7	17.8	7.8	8.1 (4.1 to 12.1)	0.0001
PACU time (min)	476	10	56.1	51.9	0.42 (-7.1 to 7.9)	0.91
VAS in PACU (mm)	563	7	12.7	24.4	-9 (-15.5 to -2.6)	0.006
Nausea	637	12	5%	14.7%	0.40 (0.15 to 1.06)	0.06
Phase 1 bypass	218	4	30.8%	13.5%	5.4 (0.6 to 53.6)	0.15
Need for postoperative analgesics	716	11	31%	56%	0.32 (0.18 to 0.57)	0.0001
Time until discharge from ASU (min)	839	14	190	153	34.6 (13 to 56.1)	0.002
Excellent patient satisfaction	709	11	81%	78%	1.5 (0.8-23.1)	0.45

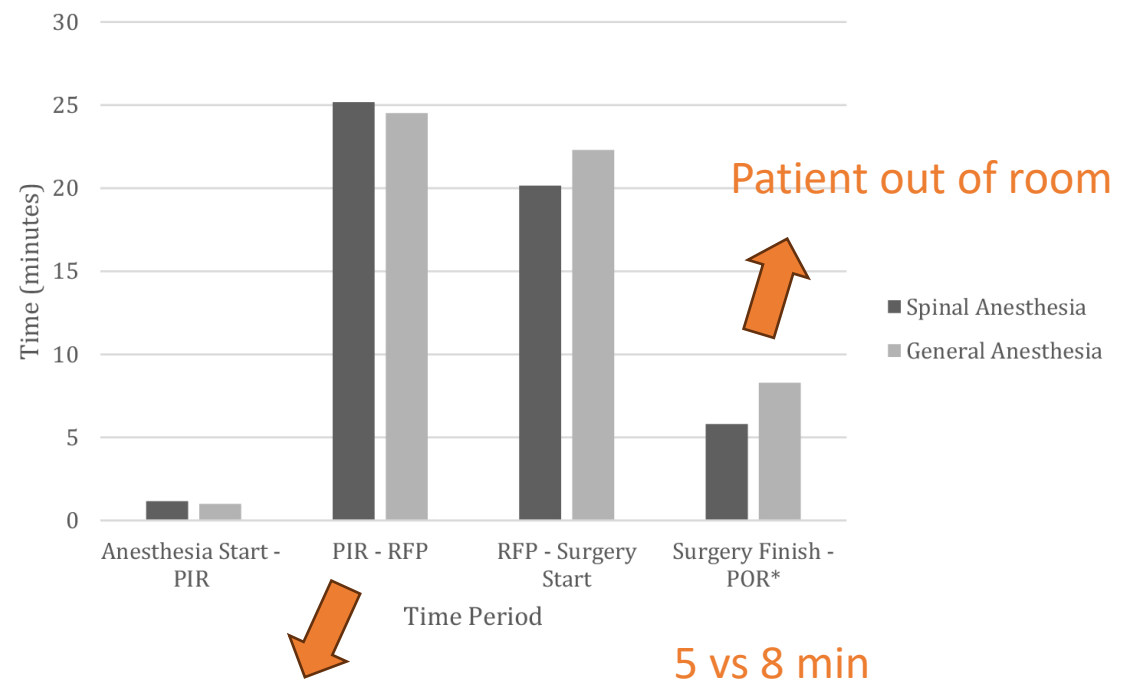
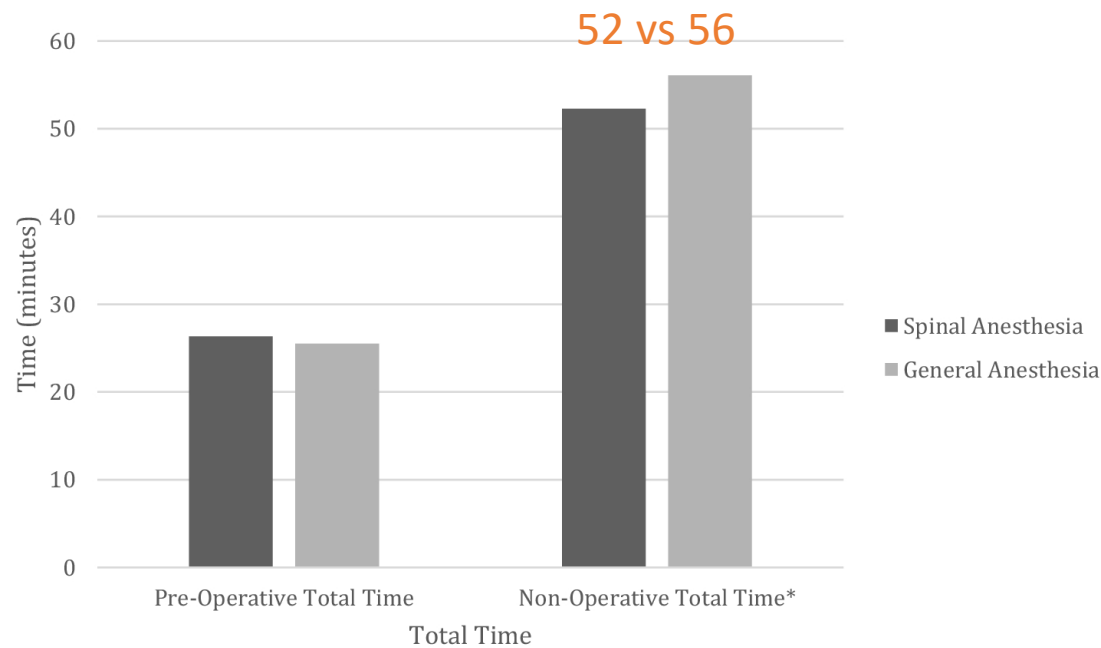
OR = odds ratio; WMD = weighted mean difference; * weighted by subject number; ** weighted by inverse variance; PACU = postanesthesia care unit; ASU = ambulatory surgical unit; POD = postoperative day; VAS = visual analogue scale.

15 randomized controlled trials with 1003 patients were included for meta-analyses.

Liu SS, Strodbeck WM, Richman JM, Wu CL.

A comparison of regional versus general anesthesia for ambulatory anesthesia: a meta-analysis *Anesthesia and analgesia* 2005; **101**: 1634-42

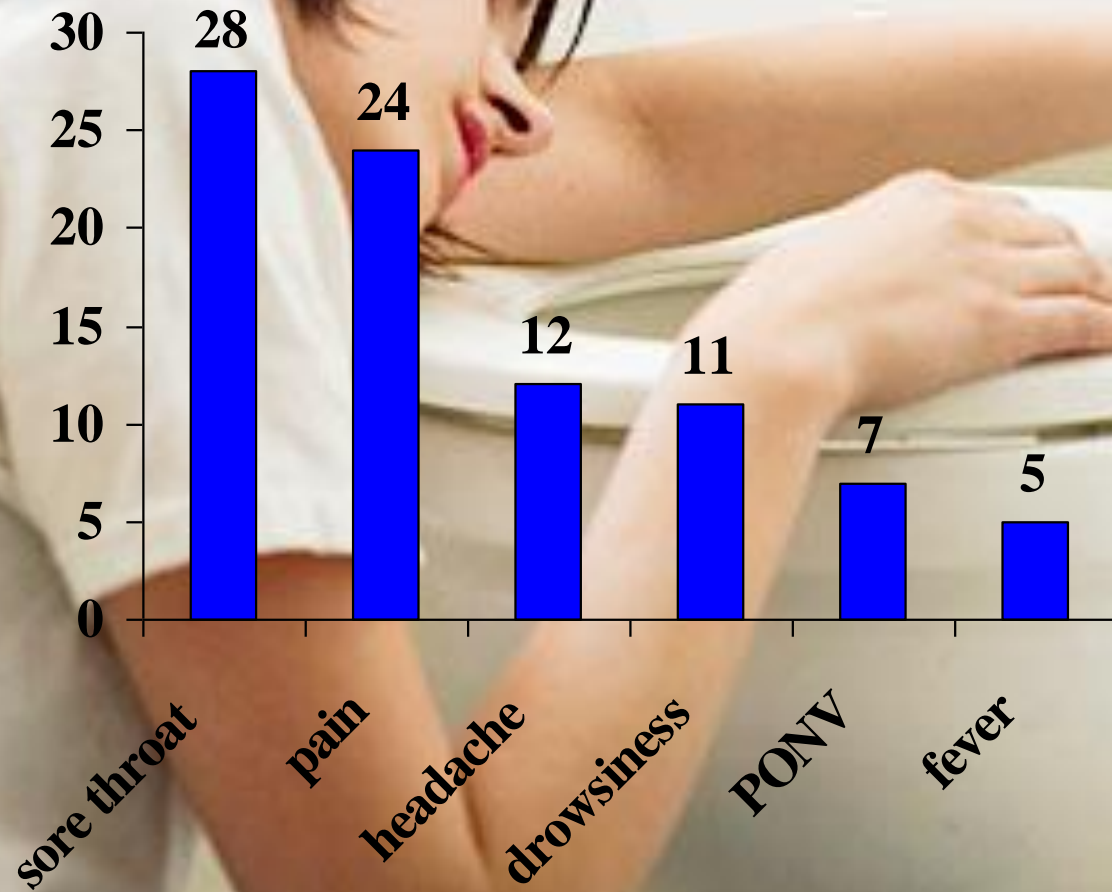
Operative room time: spinal vs general anesthesia



Sowers M
Operative room time comparison between general and spinal anesthesia in total hip arthroplasty: an institutional study.
Arch Orthop Trauma Surg. 2023 Aug;143(8):4755-4761

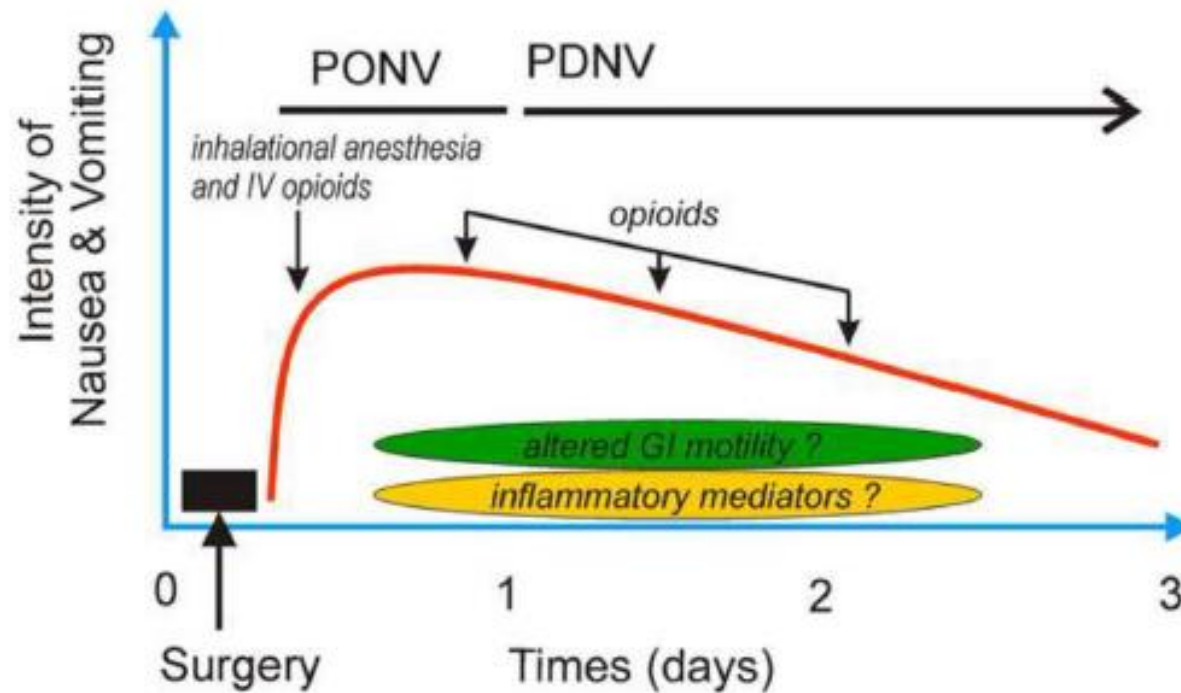
Patient in room
Ready for procedure

Postoperative symptoms



PONV-PDNV

General anaesthesia is the clinical use of potent and *potentially lethal* drugs, to produce a state of controlled, reversible *poisoning* to achieve narcosis, analgesia and reflex suppression administered with professional skill,...



PONV risk factors

- Female gender
- Non-smoking
- History of PONV-Motion sickness
- Opioids in PACU

PONV-PDNDV

- PONV risk factors
- Female gender
- Non-smoking
- History of PONV-Motion sickness
- Opioids in PACU

RESEARCH ARTICLE

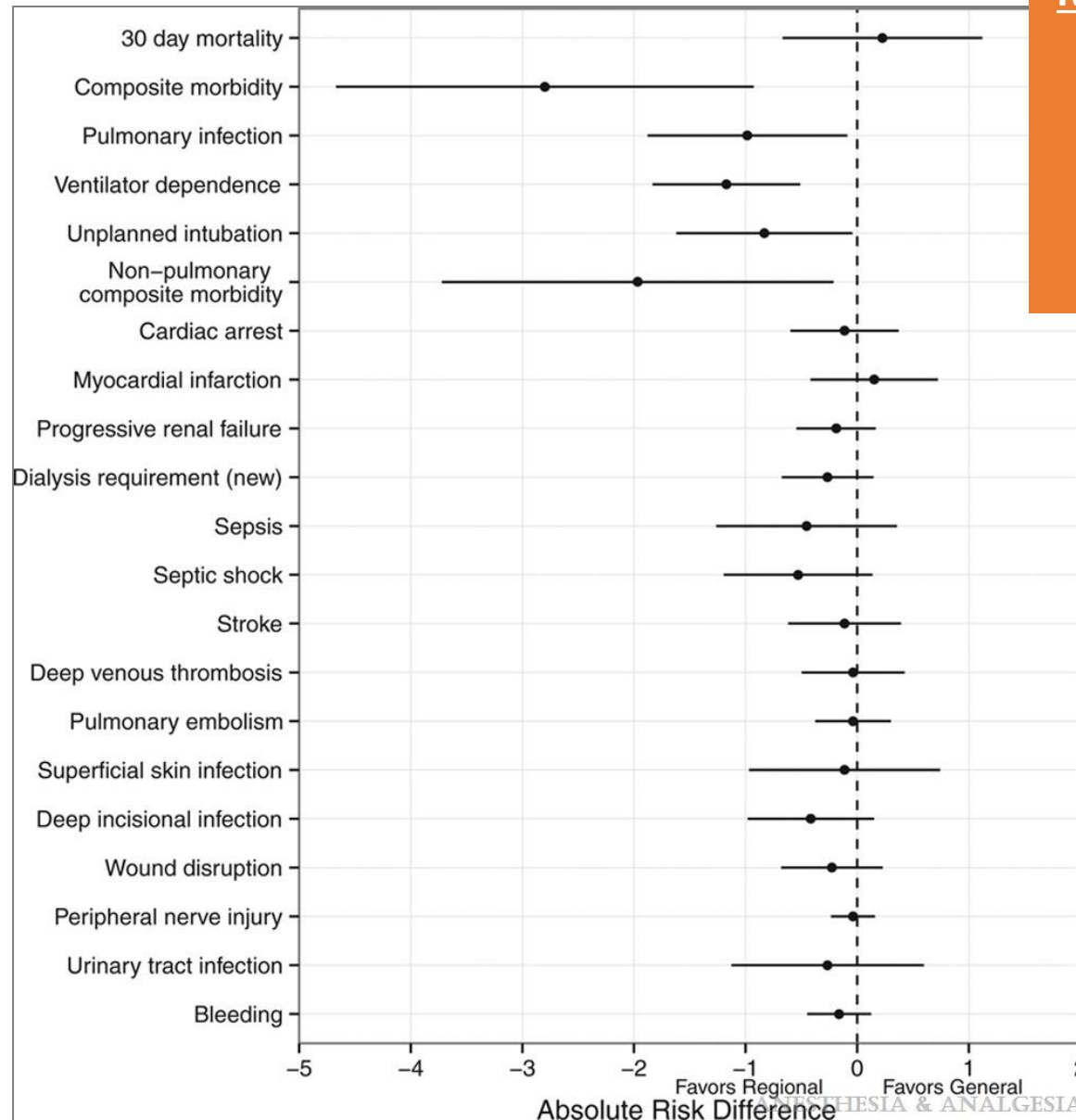
Open Access

Higher occurrence of nausea and vomiting after total hip arthroplasty using general versus spinal anesthesia: an observational study



Regional Versus General Anesthesia in Surgical Patients with Chronic Obstructive Pulmonary Disease: Does Avoiding General Anesthesia Reduce the Risk of Postoperative Complications?

Hausman, Mark S. Jr.; Jewell, Elizabeth S.; Engoren, Milo
Anesthesia & Analgesia 120(6):1405-1412, June 2015.



The effect of regional versus general anesthesia on postoperative morbidity and 30-day mortality for patients with chronic obstructive pulmonary disease. All outcomes are as defined by the National Surgical Quality Improvement Program data sheet, chapter 4, updated April 1, 2009.

Regional versus general anesthesia in COPD

- Regional anesthesia in severe COPD = less postoperative pulmonary complications
- Only spinal anesthesia and peripheral nerve block
- Not for dyspnea at rest

Laparoscopic cholecystectomy under neuraxial anesthesia

- Case report: severe lung disease (pre-transplantation)
- CSE at Th10; bupi 5 mg, suf 2,5 μ g
- Epidural postop; bup 0,125% 5 ml/hr
- the patient followed the whole operation on a video monitor
- patient was able to move himself unaided back from the operating table to his bed

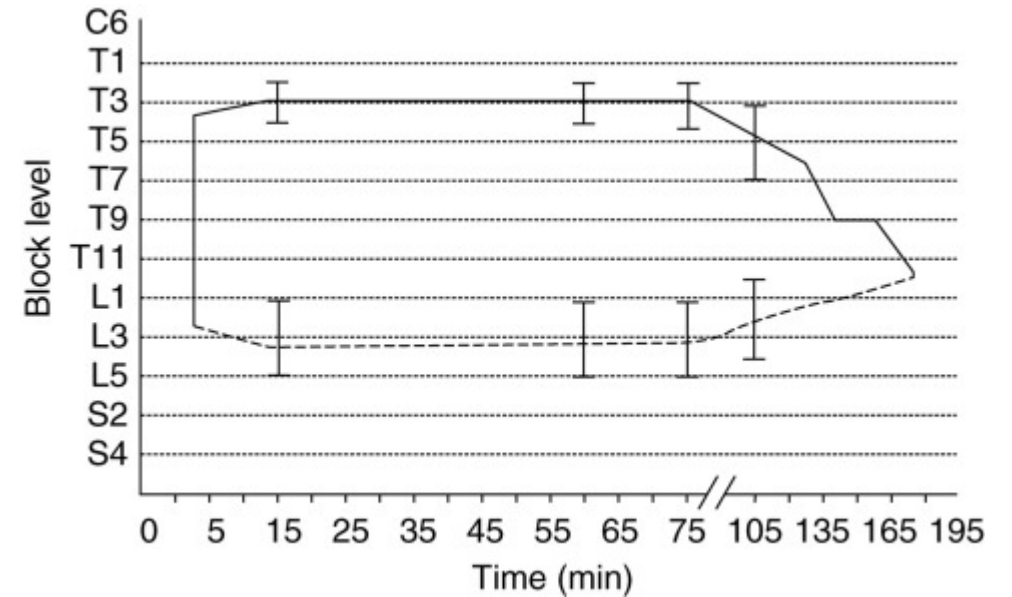
van Zundert AA et.

Segmental spinal anaesthesia for cholecystectomy
in a patient with severe lung disease.

Br J Anaesth. 2006 Apr;96(4):464-6.

Laparoscopic cholecystectomy under neuraxial anesthesia

- 20 patients
- Successful block
- Fentanyl, midazolam, ephedrine
- 17 patients ambulatory surgery



van Zundert AA et al.

Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia: a feasibility study.

Br J Anaesth. 2007 May;98(5):682-6.

Longo MA, Cavalheiro BT, de Oliveira Filho GR.
Laparoscopic cholecystectomy under neuraxial anesthesia
compared with general anesthesia: Systematic review and
meta-analyses.
J Clin Anesth. 2017 Sep;41:48-54.

11 studies

Hypotension and bradycardia (NA)

25% shoulder pain

PONV in GA

Vincenzi P, Stronati M, Isidori P, et al.
Opioid-Free Segmental Thoracic Spinal Anesthesia with
Intrathecal Sedation for Breast and Axillary Surgery: Report of
Four Cases.
Local Reg Anesth. 2022 May 9;15:23-29.

Anesthesia and analgesia methods for outpatient anterior cruciate ligament reconstruction



L. Baverel^{a,*}, T. Cucurulo^b, C. Lutz^c, Colombet^d, J. Cournapeau^e, F. Dalmay^f, N. Lefevre^{g,h}, R. Letartreⁱ, J.-F. Potel^j, X. Roussignol^k, L. Surdeau^d, E. Servien^l, the French Arthroscopic Society

- No differences spinal vs general
 - Degree of pain
 - Opioid requirement
 - Delayed discharge
 - Complication

- Multimodal analgesia
 - NSAIDs
 - LIA
 - Dexamethasone
 - Cryotherapie



Watching My Surgeon Cut Into My Knee

- 1) I don't like general anesthesia's side effects.
- 2) For a long year, my knee pain had resisted straightforward diagnosis and treatment. I wanted an ah-ha! glimpse of the problem.

Main factors influencing patient choice

- Patient's choice
- Patient's fear
- Patient's stress and anxiety
- Expected quality of recovery
- Efficacy of the technique

Determining the Choice of Spinal Anesthesia in Patients Undergoing Laparoscopic Surgery: Results of a Multicenter International Study

Alfonso Capdevila · Christophe Aveline · Laurent Delaunay ·
Youssef Bouaziz · Paul Zetlaoui · Olivier Choquet · Laurent Jouffroy ·
Anne Herman-Demars · Francis Bonnet

Spinal anesthesia with short acting local anesthetics has been preferred to general anesthesia in ambulatory surgery and results in high degree of patient satisfaction

Factors Determining the Choice of Spinal Versus General Anesthesia in Patients Undergoing Ambulatory Surgery: Results of a Multicenter Observational Study

Xavier Capdevila · Christophe Aveline · Laurent Delaunay ·

Hervé Bouaziz · Paul Zetlaoui · Olivier Choquet · Laurent Jouffroy ·

Hélène Herman-Demars · Francis Bonnet

Ideal local anesthetic

- Rapid onset of action
- Adequate potency
- Predictable duration (short)
- Decreased urinary retention
- Decreased neurotoxicity (preservative free and anti-oxidant-free)
- Decreased systemic side effects (pseudocholinesterase)
- Rapid clearheaded recovery
- Minimal adverse effects; pain, PONV
- Early oral intake
- Early ambulation



TNS

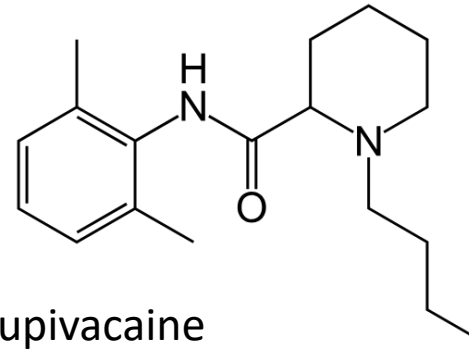


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Sixteen trials reporting on 1467 patients, 125 of whom developed TNS, were included in the analysis. The use of lidocaine for spinal anaesthesia increased the risk of developing TNS. There was no evidence that this painful condition was associated with any neurologic pathology; the symptoms disappeared spontaneously by the fifth postoperative day. The relative risk (RR) for developing TNS after spinal anaesthesia with lidocaine as compared to other local anaesthetics (bupivacaine, prilocaine, procaine, levobupivacaine, ropivacaine, and 2-chloroprocaine) was 7.31 (95% confidence interval (CI) 4.16 to 12.86). Mepivacaine was found to give similar results as lidocaine and was therefore omitted from the overall comparison to diminish the heterogeneity.

Low dose bupivacaine



HYPERBARIC bupivacaine

15 mg

10 mg

7,5 mg

5 mg

Table 1. Study Results

	Group			
	I	II	III	IV
Highest level of block, median (range)	T-5 (T4-7)*	T-8 (T6-10)	T-8 (T4-11)	T-8 (T4-12)
Time to highest level	15 ± 1	14 ± 1	15 ± 1	12 ± 1
Time to two-segment regress	151 ± 15*	89 ± 6*	60 ± 5	47 ± 3
Time to S-2 regress	343 ± 29*	194 ± 13*	144 ± 14	123 ± 7
Time until out of bed	395 ± 28*	223 ± 12*	161 ± 12	140 ± 6
Time to urination	428 ± 34*	241 ± 14*	186 ± 14	163 ± 8
Time to discharge	471 ± 35*	260 ± 15*	202 ± 14	181 ± 8
Motor block: Bromage scale: 0-1-2-3	0-0-0-15*	0-1-7-7*	0-7-8-0*	0-13-2-0
Sensory block: requested/required pain treatment	0/15	0/15	0/15	4/15

* $P \leq 0.05$ versus adjacent groups in the table: all times are presented in minutes (mean ± SEM) rounded off to the nearest whole minute.



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journal homepage: www.arthroplastyjournal.org



Spinal Versus General Anesthesia for Outpatient Total Hip and Knee Arthroplasty in the Ambulatory Surgery Center: A Matched-Cohort Study

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ABSTRACT

Background: Spinal anesthesia is the predominant regimen in outpatient total joint arthroplasty (TJA), but induction often is unsuccessful, unobtainable, or against patient preference. We compared outcomes of same-day discharge (SDD) TJA with spinal versus general anesthesia in a free-standing ambulatory surgery center (ASC).

Methods: We took 105 general anesthesia TJA and one-to-one nearest-neighbor matched them to 105 spinal anesthesia TJA over 7 years at 1 ASC. The rate of successful SDD, minutes to discharge, postoperative pain and nausea, and 90-day complications were compared. Postanesthesia care unit outcomes were additionally stratified by spinal anesthetic (mepivacaine versus bupivacaine).

Results: All spinal anesthetic patients underwent SDD compared with 103 (98%) general anesthetic patients ($P = .498$). Mepivacaine spinal anesthesia patients spent the fewest minutes in postanesthesia care unit prior to discharge from the facility (206), followed by general anesthesia (227), and bupivacaine spinal anesthesia (291; $P < .001$). General anesthesia patients had the highest levels of pain at 1 hour (5.2 versus 1.5 versus 1.5) and 2 hours (3.2 versus 2.0 versus 1.3) postoperatively, and rates of nausea (48 versus 22 versus 28%) compared with mepivacaine and bupivacaine spinal anesthesia, respectively. The 90-day complications (6 versus 7), admissions (1 versus 3), and reoperations (5 versus 2) were similar among spinal and general anesthesia, respectively ($P \geq .445$).

Conclusions: Both spinal and general anesthesia led to reliable SDD with similar 90-day complication rates. General anesthesia facilitated faster discharge from the ASC compared with bupivacaine spinal anesthesia but led to higher levels of pain and incidence of nausea postoperatively.

Level of Evidence: Level 3, Retrospective Cohort Comparison.

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- **Same day discharge 100%** for spinal vs 98% for general
- **PACU stay:** 206 minutes for mepivacaine – 227 for GA – 291 for bupivacaine
- GA more **pain** at 1 and 2 hrs postop
- **PONV 48%** for GA vs 24% for spinal

Spinal for knee arthroscopy

low dose

bupivacaine 7,5 mg + fentanyl
prilocaine 20 mg + fentanyl

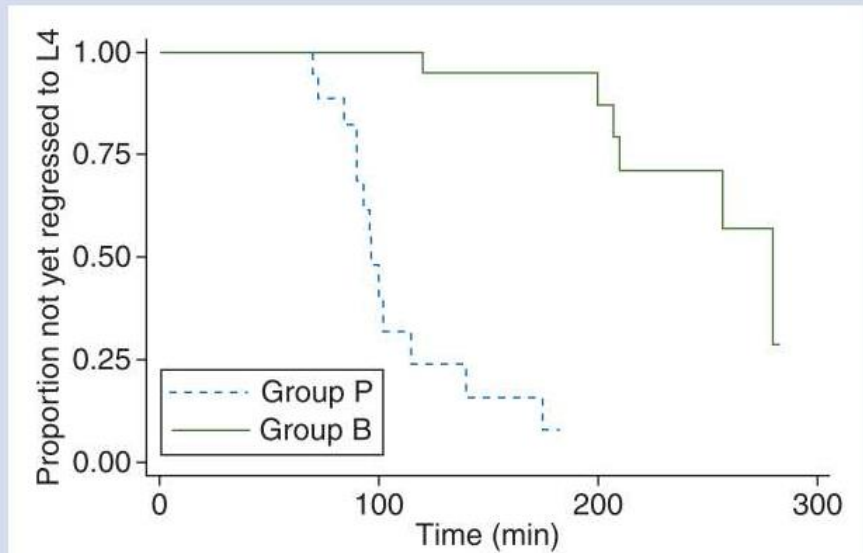
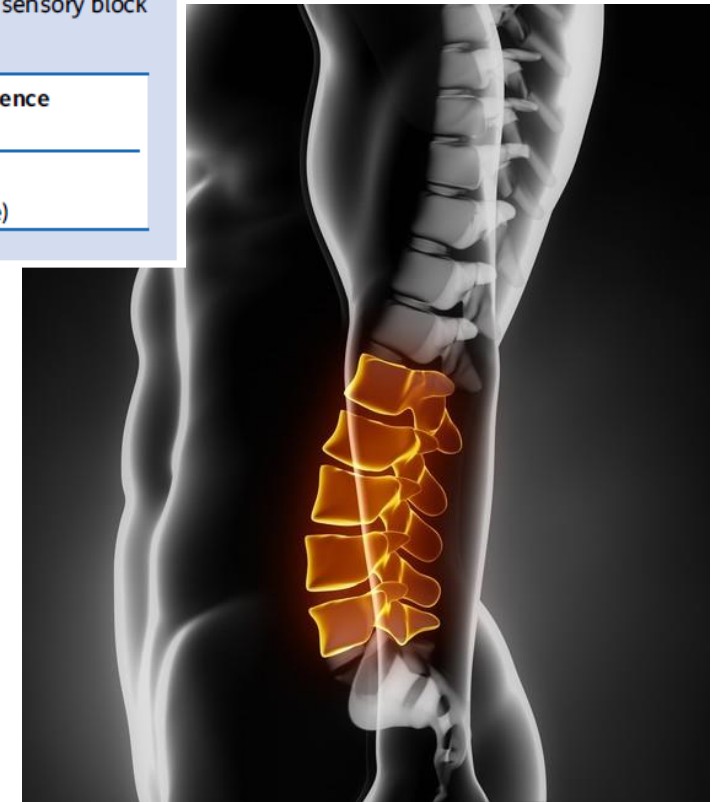


Fig 1 Times in minutes for regression of sensory block to dermatome level L4. Regression to L4 occurred more rapidly in Group P than in Group B. Proportion not yet regressed to L4 refers to the proportion of subjects in each group in whom sensory block level had not yet regressed to dermatome level L4.

Table 2 Median times (in minutes) for regression of sensory block to L4

Group	No. of subjects	Median time (95% confidence intervals)
P	22	97 (90-115)
B	26	280 (207-not computable)



Dose-response curve: heavy prilocaine

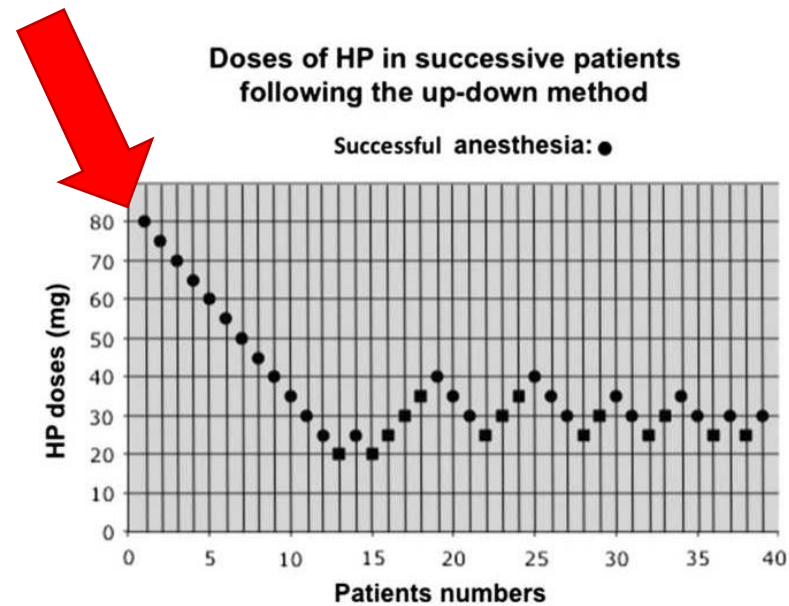
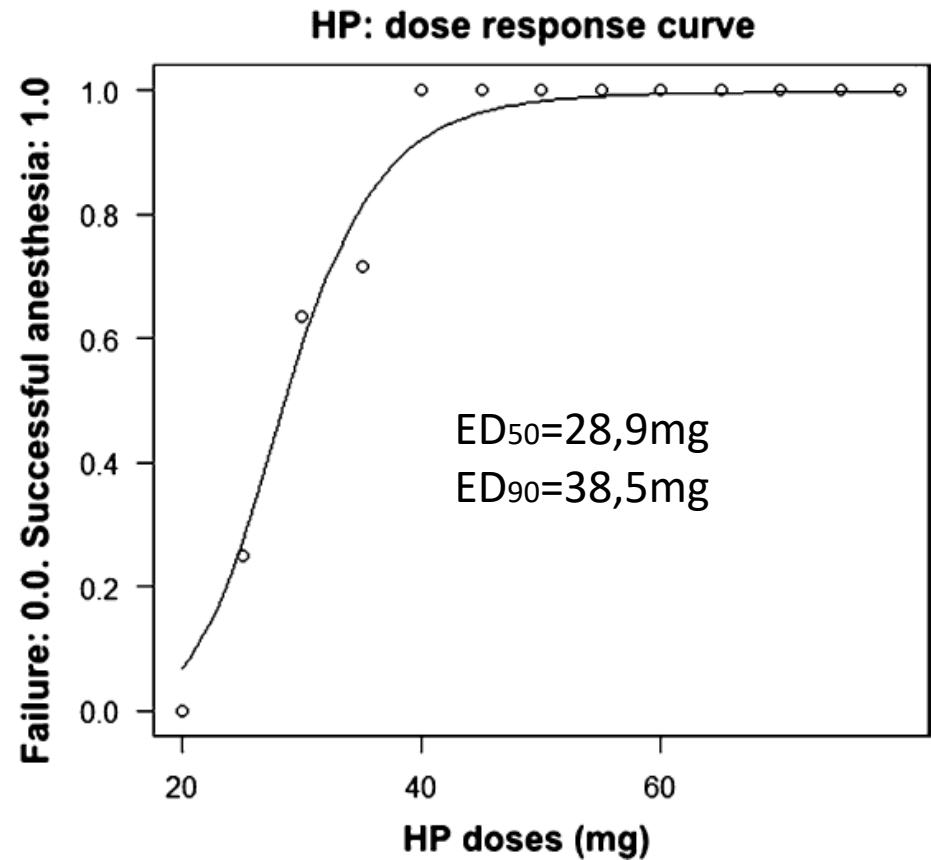


Fig. 1 Doses of hyperbaric prilocaine (HP) in 39 successive patients following the up-and-down method



Guntz E et al.
ED₅₀ and ED₉₀ of intrathecal hyperbaric 2% prilocaine in ambulatory knee arthroscopy.
Can J Anaesth. 2014 Sep;61(9):801-7.

Short-acting local anesthetic

	<u>Heavy prilo</u>	
• Rapid onset	14,5 min	
• Predictable duration of sensory block	205 min	+/- 36 min
• Rapid recovery of motor block		
• Minimal side effects:		
• Hypotension	0	
• TNS, transient neurologic symptoms	0	0,03%
• Urinary retention	0	1%

Guntz E et al.

ED50 and ED90 of intrathecal hyperbaric 2% prilocaine in ambulatory knee arthroscopy.

Can J Anaesth. 2014 Sep;61(9):801-7.

Ambrosoli AL, et al. Safety and effectiveness of prilocaine for spinal anesthesia in day surgery setting 3291 patients.

J Anesth Analg Crit Care. 2023 Oct 20;3(1):40.

Hyperbaric prilocaine 40 mg

- Complete motor block in
 - 30% after 5 min
 - 72% after 10 min
 - After 30 min in 86% of patients (successful sensory block)
 - 6,8% no motor block
- Urinary retention
 - 40 mg: 0%
 - 50 mg: 8,3%
 - 60 mg: 23,3%

Guntz E

Intrathecal chloroprocaine or hyperbaric prilocaine for ambulatory knee surgery?

J Exp Orthop. 2021 Feb 24;8(1):15.

Gebhardt V

Retrospective analysis of mepivacaine, prilocaine and chloroprocaine for low-dose spinal anaesthesia in outpatient perianal procedures.

Int J Colorectal Dis. 2018 Oct;33(10):1469-1477

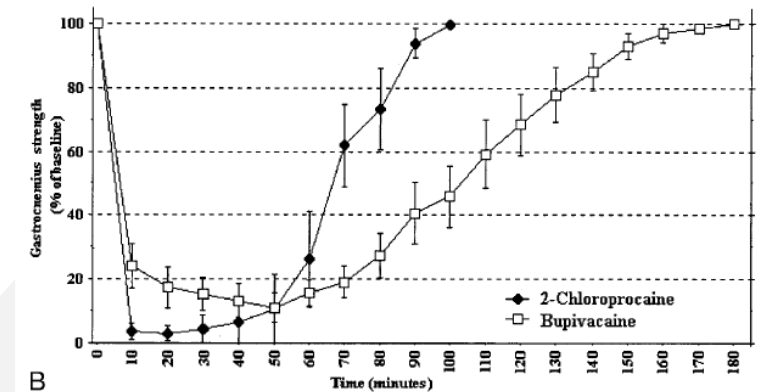
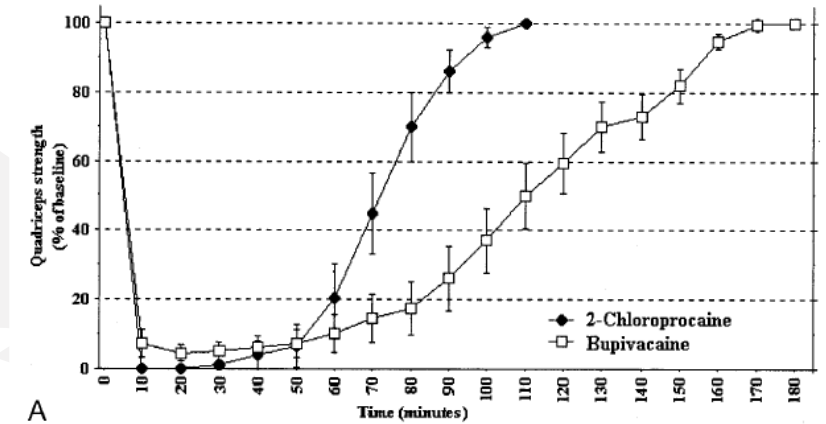
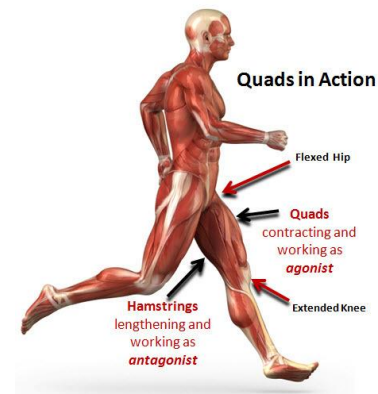
2-CP 40 mg vs low dose bupi 7,5 mg

Yoos JR, Kopacz DJ.

Anesthesia and analgesia 2005; **100**: 566-72

Time to

- Discharge
- Block regression
- Ambulation
- Spontaneous voiding



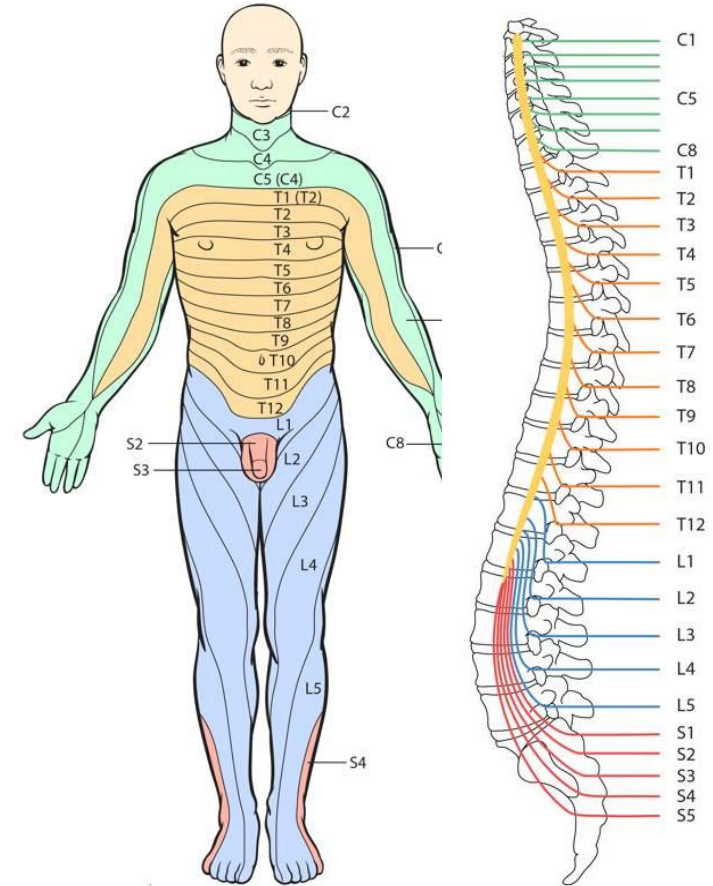
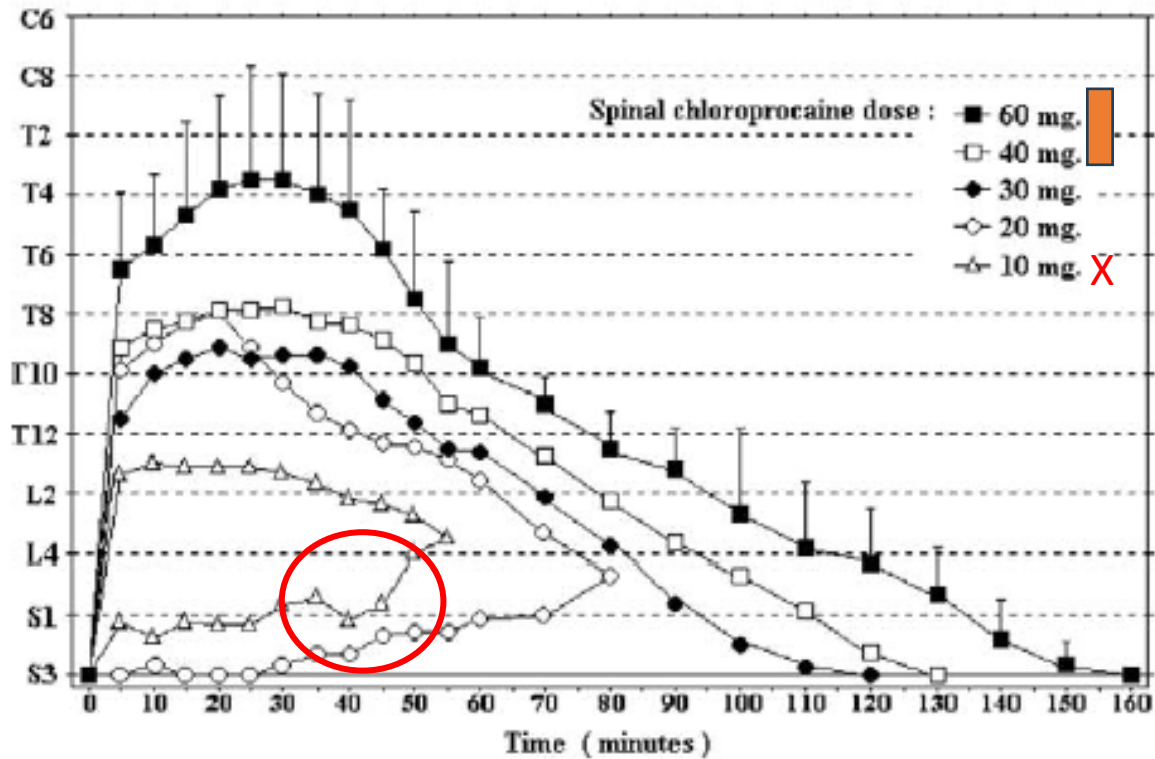
Teunkens A

Comparison of 2-Chloroprocaine, Bupivacaine, and Lidocaine for Spinal Anesthesia

Regional anesthesia and pain medicine 2016; **41**: 576-83

Spinal 2-chloroprocaine: minimum effective dose

Peak block height – regression to L1 - analgesia



Kopacz DJ.
Spinal 2-chloroprocaine: minimum effective dose.
Reg Anesth Pain Med 2005 Jan-Feb;30(1):36-42.

9 articles in Anesth Analg 2004-2005

Regression of chloroprocaine

Yoos JR, Kopacz DJ. *Anesthesia and analgesia* 2005; **100**: 566-72

Longer onset time
Shorter block duration
Longer time to achieve T10
Faster motor recovery

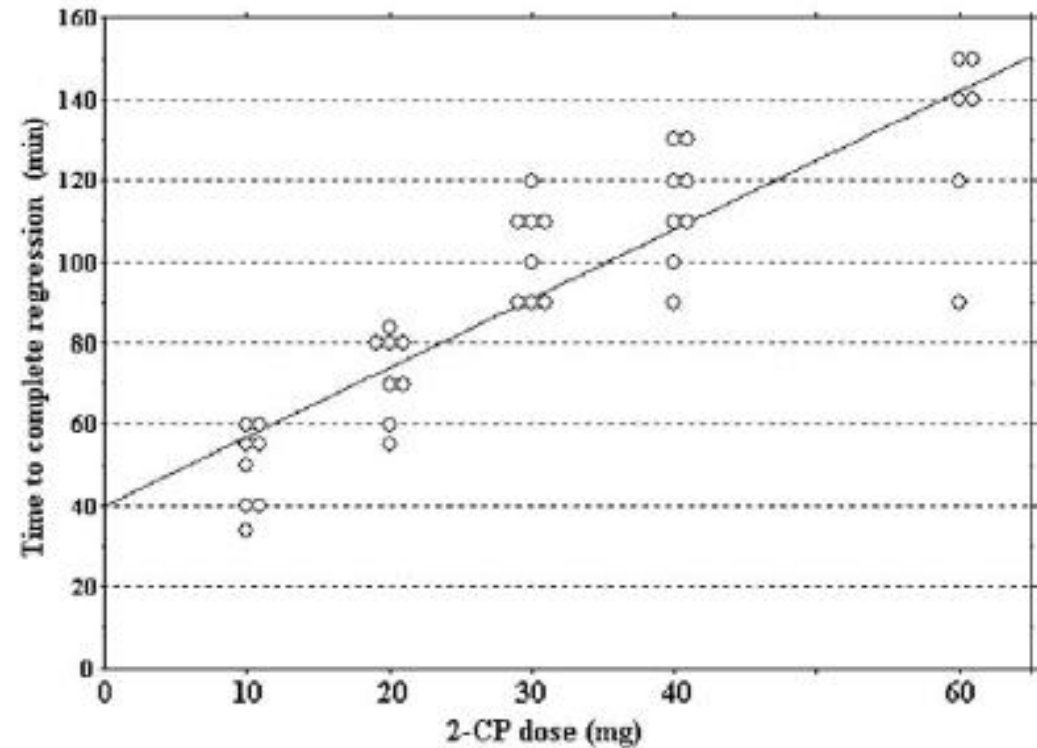
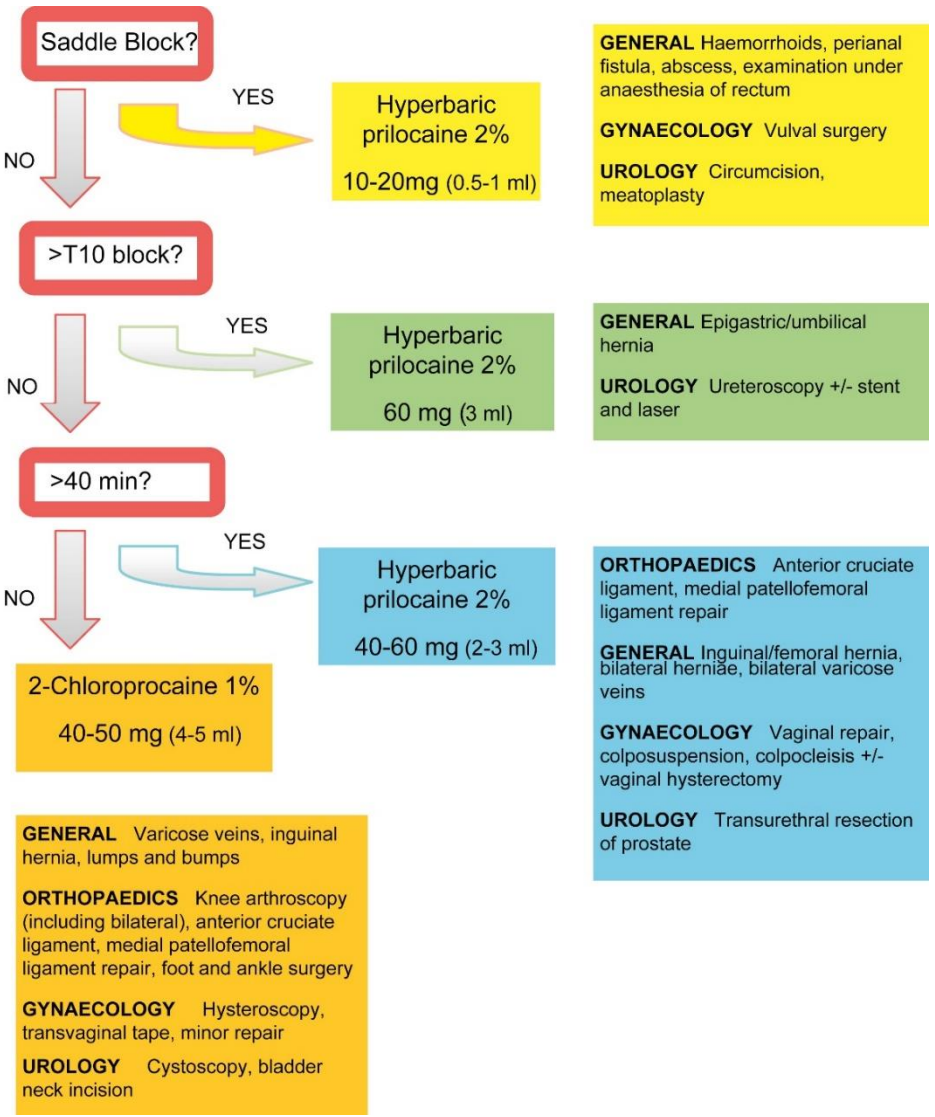


Fig 2. Time to complete regression increases with dose from 10 to 60 mg of spinal 2-CP (linear regression, $P < .001$, $y = 40.1 + 1.7x$, $r^2 = 0.76$).

Gebhardt V

Using [chloroprocaine](#) for spinal anaesthesia in outpatient knee-arthroscopy results in earlier discharge and improved operating room efficiency compared to mepivacaine and prilocaine.

Knee Surg Sports Traumatol Arthrosc. 2019 Sep;27(9)



Rattenberry W, Hertling A, Erskine R.
Spinal anaesthesia for ambulatory surgery.
BJA Educ. 2019 Oct;19(10):321-328.

Spinal anesthesia

can provide many of the desired properties of the ideal technique for ambulatory surgery

prilocaine and 2-chloroprocaine are the local anesthetics of choice

provides an alternative approach for patients with co-morbidities predisposing to higher perioperative risk

benefits include reduced PONV and PDNV

Proficiency with the use of short-acting spinal anesthetic is a core competency of anaesthesia specialty training

