

The Anesthetic and Recovery Profiles of Low-dose Hypobaric Mepivacaine and Bupivacaine for Spinal Anesthesia in Total Hip and Knee Arthroplasty

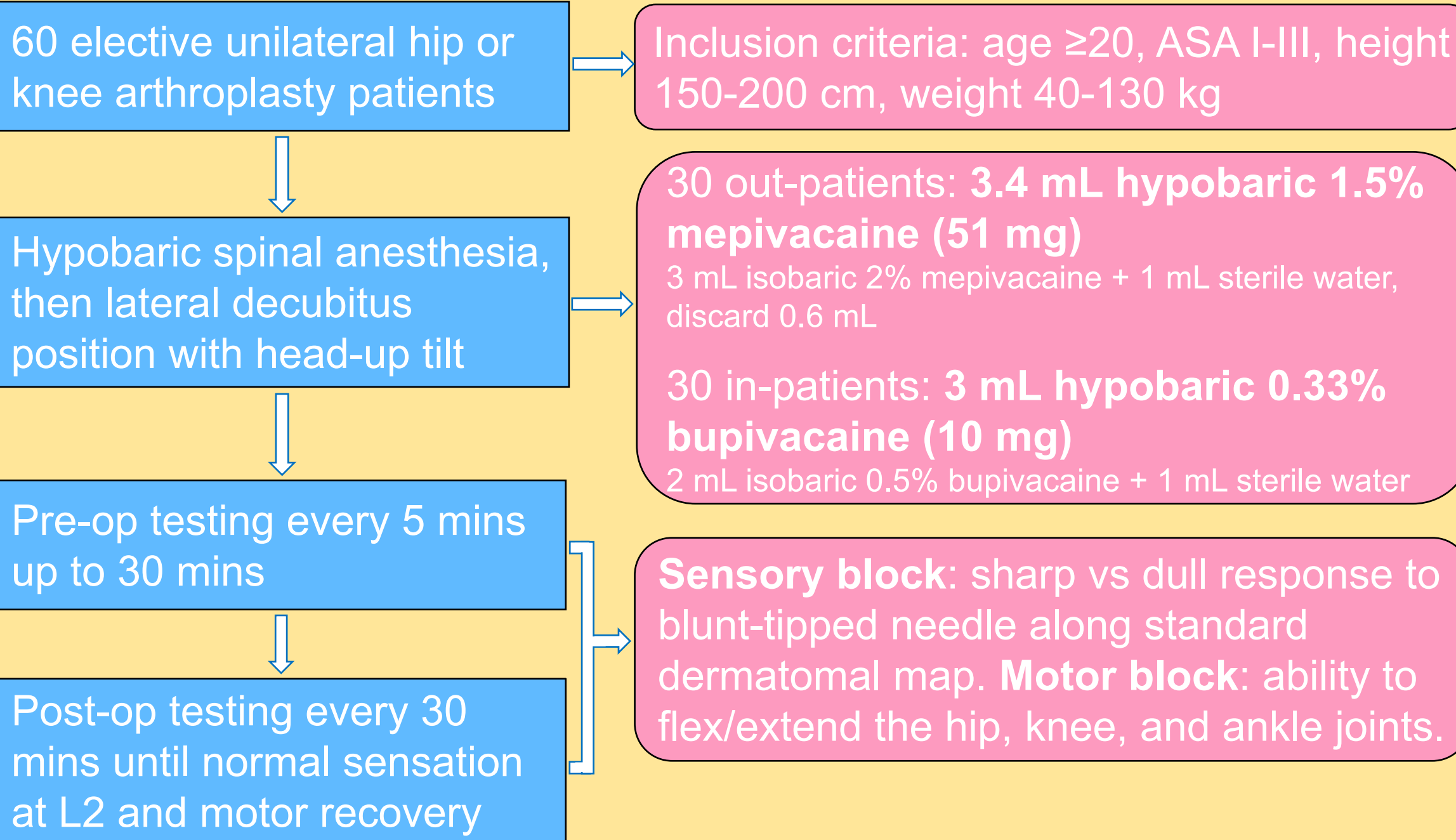
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INTRODUCTION

- There is increasing emphasis in modern orthopedic practice on same-day mobilization and hospital discharge following total joint arthroplasty.
- PROBLEM:** large doses of isobaric local anesthetic (LA) are often used to achieve adequate block height ⇒ can cause unnecessarily prolonged sensory and motor blockade.
- PROPOSED SOLUTION:** administration of hypobaric LA allows manipulation of intrathecal distribution to achieve adequate block height independent of administered dose.

METHODOLOGY



RESULTS

- 100% of patients achieved adequate block height for surgical commencement.
- Mean (SD) time to achieve sensory analgesia in the operative limb at or above:
 - T10: 7.3 (3.3) mins for mepivacaine, 8.1 (4.8) mins for bupivacaine;
 - L1: 5.7 (1.8) mins for mepivacaine, 6.2 (2.6) mins for bupivacaine.
- Four patients (7%) required anesthetic supplementation for surgical completion.
- Mean [95% CI] duration of sensory analgesia in the operative limb at or above:
 - T10: 97 [84-110] mins for mepivacaine, 127 [113-142] mins for bupivacaine;
 - L1: 115 [101-129] mins for mepivacaine, 161 [148-174] mins for bupivacaine.
- The highest level of sensory analgesia recorded before start of surgery was similar regardless of level of spinal injection.

DISCUSSION

- Unlike isobaric LA, hypobaric LA solutions have highly predictable distribution within the CSF with appropriate positioning ⇒ enables use of lower doses and faster recovery without sacrificing block onset and height.
- Both hypobaric solutions:
 - Provide a rapid onset of block to T10 and L1 ⇒ shortens time to surgical readiness which may enhance operating room efficiency;
 - Provide satisfactory surgical anesthesia regardless of level of injection ⇒ useful when lower interspaces like L5-S1 are the only accessible space;
 - Have reliable onset and recovery profiles ⇒ can be ideal for fast-track pathways prioritizing early mobilization or same-day discharge.

3.4 mL of 1.5% hypobaric mepivacaine and

3.0 mL of 0.33% hypobaric bupivacaine

have rapid onset and reliable recovery

profiles without compromising adequate

block height, favorable for modern

fast-track arthroplasty pathways.



Table 1 Pharmacodynamic profile of hypobaric mepivacaine and bupivacaine. Time is in minutes from spinal anesthesia.

	Mepivacaine		Bupivacaine	
	Mean (SD) [95% CI]	n	Mean (SD) [95% CI]	n
Preoperative				
Time to reach sensory analgesia at T10 or higher				
Operative limb	7.3 (3.3) [6.0-8.6]	24	8.1 (4.8) [6.3-10.0]	27
Non-operative limb	8.7 (4.1) [7.0-10.4]	23	10.2 (6.8) [7.4-13.1]	22
Time to reach sensory analgesia at L1 or higher				
Operative limb	5.7 (1.8) [5.1-6.4]	27	6.2 (2.6) [5.3-7.1]	29
Non-operative limb	6.4 (2.3) [5.5-7.3]	25	6.5 (2.3) [5.6-7.4]	27
Highest recorded level of sensory analgesia*	T8 (T6-T9) [T3-T12]	27	T7 (T6-T9) [T3-L1]	29
Time to reach highest recorded level	10.7 (5.7) [8.6-12.9]	27	13.4 (6.6) [11.1-15.8]	29
Time to complete motor block in both limbs	9.6 (2.9) [8.0-11.2]	13	16.8 (7.5) [12.4-21.3]	30
Time to surgical skin incision	30 (8) [27-33]	30	44 (19) [37-51]	30
Adequate sensory analgesia for start of surgery	30 (100%)	30	30 (100%)	30
Intraoperative				
Adequate block duration for surgical completion	28 (93%)	30	28 (93%)	30
Patients requiring general anesthesia	1 (3%)	30	0 (0%)	30
Patients requiring supplemental opioids	1 (3%)	30	2 (7%)	30
Postoperative				
Duration of analgesia at T10 or higher				
Operative limb	97 (27) [84-110]	17	127 (32) [113-142]	20
Non-op. limb	98 (32) [81-116]	13	124 (35) [107-141]	16
Duration of analgesia at L1 or higher				
Operative limb	115 (37) [101-129]	27	161 (34) [148-174]	27
Non-operative limb	111 (30) [98-124]	21	147 (34) [132-161]	21
Time to recovery of sensation at L2 or lower				
Operative limb	177 (42) [162-192]	29	226 (40) [212-241]	30
Non-operative limb	158 (33) [146-170]	29	202 (45) [186-218]	30
Time to recovery of motor function				
Operative limb	145 (37) [131-158]	30	217 (43) [202-233]	29
Non-operative limb	132 (36) [119-145]	30	175 (57) [155-195]	30
Recovery				
Duration in PACU	93 (37) [80-106]	30	96 (45) [80-112]	30
Time to ambulation	312 (60) [289-335]	26	586 (429) [430-742]	29
Time to hospital discharge	402 (171) [337-468]	26	1778 (443) [1617-1939]	29

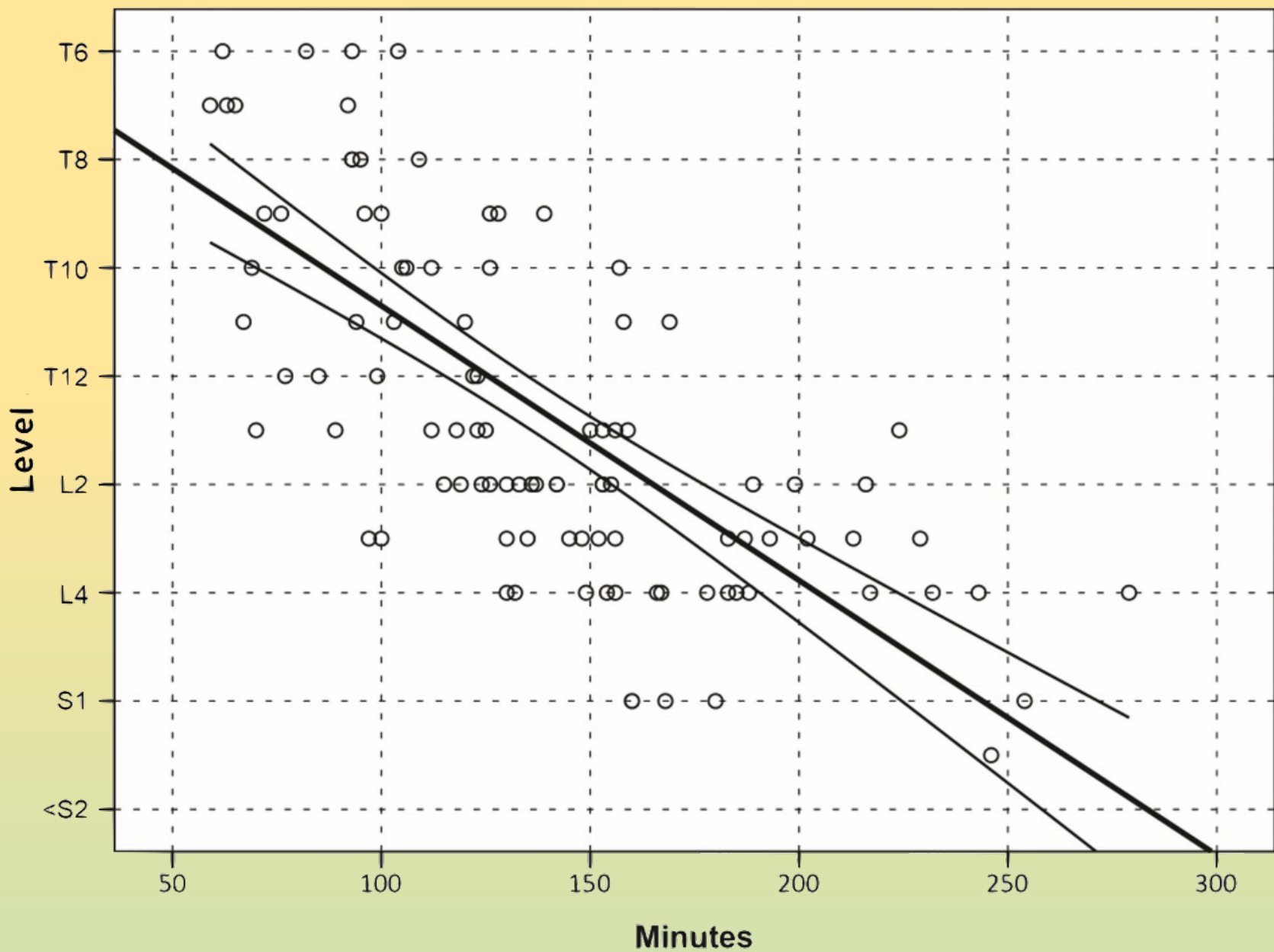


Figure 1 Mepivacaine: regression of sensory analgesia on operative limb.

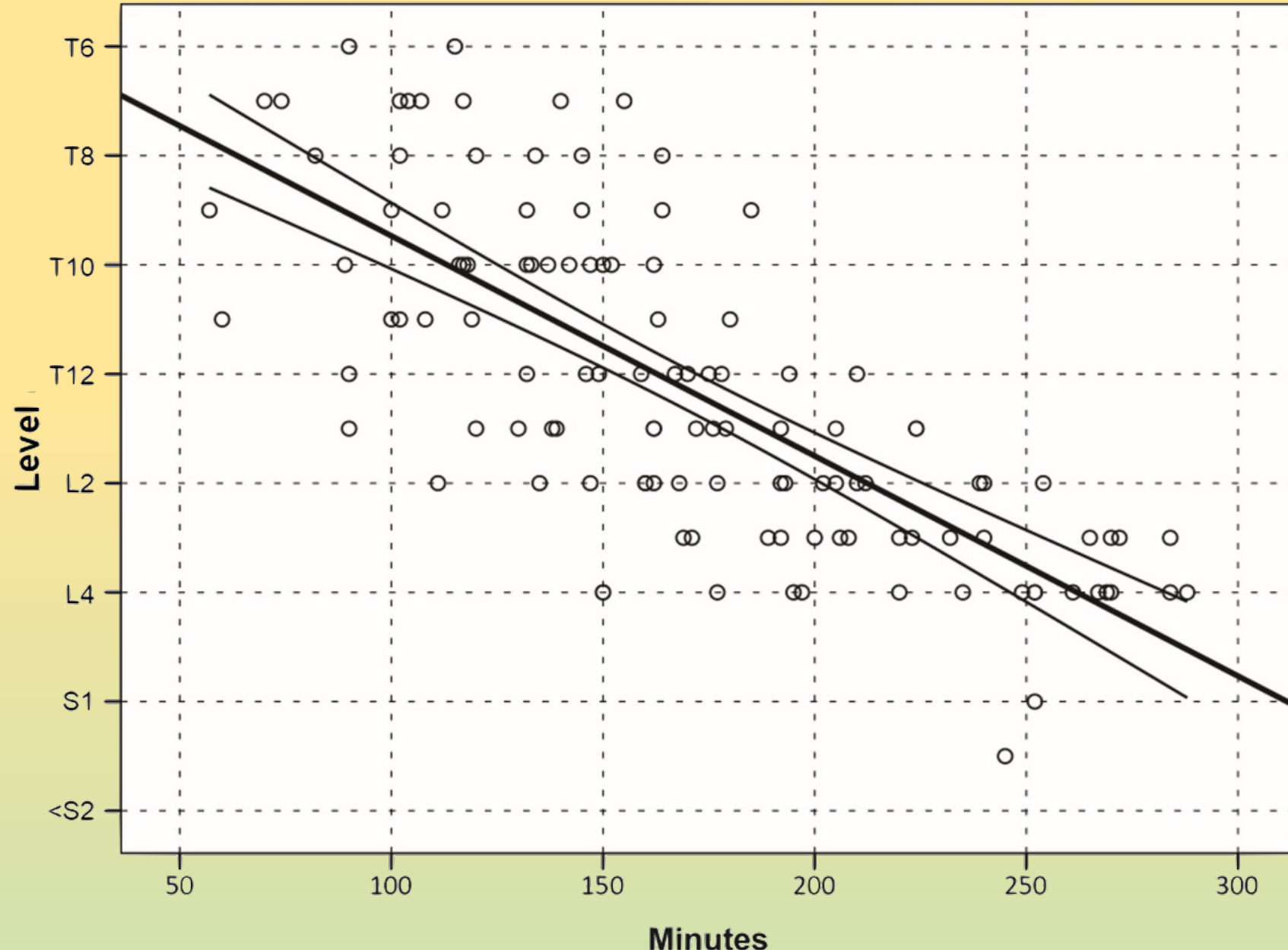


Figure 2 Bupivacaine: regression of sensory analgesia on operative limb.