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Intraoperative Liposomal Bupivacaine Is Associated With Reduced Opioid Use and Enhanced Recovery After Total Knee Arthroplasty: a Multi-Center Registry Study

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OBJECTIVE

To evaluate the real-world effectiveness of liposomal bupivacaine (LB) versus conventional local anesthetics (LAs) in patients undergoing primary total knee arthroplasty (TKA)

CONCLUSIONS

1. Intraoperative/Postoperative LB is associated with improved pain control and functional outcomes as well as reduced opioid use after TKA compared with conventional LAs
2. The reduction in length of stay (LOS) with LB is especially relevant in ambulatory surgery rapid recovery protocols

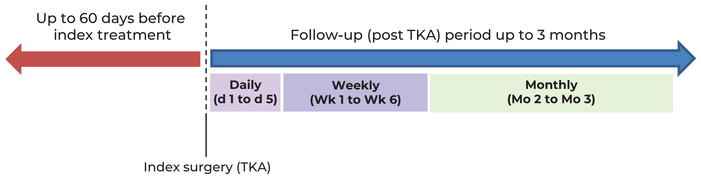
INTRODUCTION

- Optimized perioperative pain control for TKA is imperative to shorten LOS and facilitate enhanced outcomes[1]
- There is an unmet need for real-world data on pain, opioid, and recovery outcomes with LB, a long-acting LA that can extend postoperative analgesia
- The Innovations in Genicular Outcomes Registry (IGOR) is a prospective, observational registry in which clinical decision-making is performed in a collaborative manner by treating physicians and their patients, with standardized collection of real-world data including clinical data, assessments of patient-reported outcomes, reimbursements, and healthcare resource utilization[2]

METHODS

- Data were collected from IGOR for opioid-naive patients who underwent unilateral primary TKA between September 2021 and December 2024 for up to 3 months of follow-up after surgery (Figure 1)
  - The numerical rating scale (NRS) was used to assess acute pain during the first postsurgical week, and the Brief Pain Inventory-Short Form (BPI-SF) was used to assess chronic pain for subsequent time points
  - Opioid use was evaluated by an analgesic questionnaire
  - Functional outcomes were measured with the Knee Injury and Osteoarthritis Outcome Score for Joint Replacement
  - LOS (hours from facility admission to discharge) was also recorded
- Case and control patients were determined on the basis of intraoperative analgesia (LB and conventional LAs [bupivacaine or ropivacaine], respectively)
- Comparative analyses of longitudinal outcomes were performed with multivariable generalized linear mixed-effects models with appropriate distributions (eg, LOS was compared via multivariable negative binomial regression modeling)

Figure 1. Study design.



TKA, total knee arthroplasty.

RESULTS

- Overall, 225 patients who did not receive opioids on the night before surgery or in the preoperative area were included (LB, n=42; conventional LAs, n=183) (Table)
  - Patients were predominantly female with a mean age of 67 years
  - Those receiving LB had higher baseline pain severity scores and lower baseline physical function scores than those receiving conventional LAs

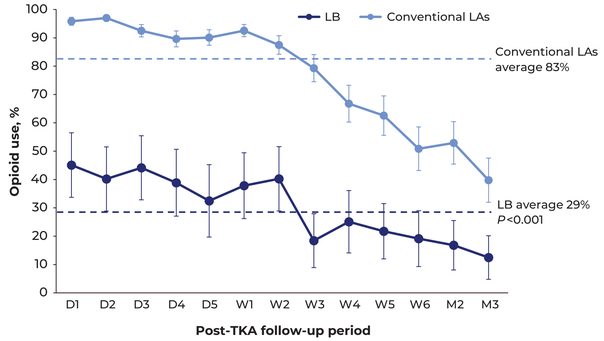
Table. Baseline Demographics

	LB (n=42)	Conventional LAs (n=183)	Total (N=225)	*P* value
Days since TKA, mean (SD)	470.5 (159.9)	250.7 (130.1)	291.7 (160.6)	<0.001
Age, mean (SD), y	66.3 (7.4)	67.3 (8.3)	67.1 (8.1)	0.418
Sex, n (%)				
Male	14 (33.3)	78 (42.6)	92 (40.9)	
Female	28 (66.7)	105 (57.4)	133 (59.1)	
Race/Ethnicity, n (%)				<0.001
Asian	1 (2.4)	2 (1.1)	3 (1.3)	
Black or African American	16 (38.1)	6 (3.3)	22 (9.8)	
White	25 (59.5)	171 (93.4)	196 (87.1)	
Other/Unknown	0	4 (2.2)	4 (1.8)	
BMI, mean (SD)	32.9 (6.89)	30.8 (5.58)	31.2 (5.89)	0.052
K-L grade, n (%)				0.254
2 (mild)	2 (4.8)	2 (1.1)	4 (1.8)	
3 (moderate)	3 (7.1)	11 (6.0)	14 (6.2)	
4 (severe)	37 (88.1)	170 (92.9)	207 (92.0)	
Baseline PCS, mean (SD)	25.4 (15.5)	17.1 (11.1)	18.6 (12.4)	0.003
Baseline pain severity,[a] mean (SD)	6.1 (2.5)	4.3 (2.0)	4.6 (2.2)	<0.001
Baseline physical function,[b] mean (SD)	40.2 (17.9)	51.3 (13.1)	49.3 (14.7)	<0.001

BMI, body mass index; BPI-SF, Brief Pain Inventory-Short Form; K-L, Kellgren-Lawrence; KOOS, JR, Knee Injury and Osteoarthritis Outcome Score for Joint Replacement; LA, local anesthetic; LB, liposomal bupivacaine; PCS, Pain Catastrophizing Scale; TKA, total knee arthroplasty. [a]BPI-SF. [b]KOOS, JR.

- The proportion of patients with opioid use over 3 months after surgery was also ~3-fold lower in those receiving LB compared with those receiving conventional LAs (average percentage over 3 months: 29% vs 83%; *P*<0.001) (Figure 3)

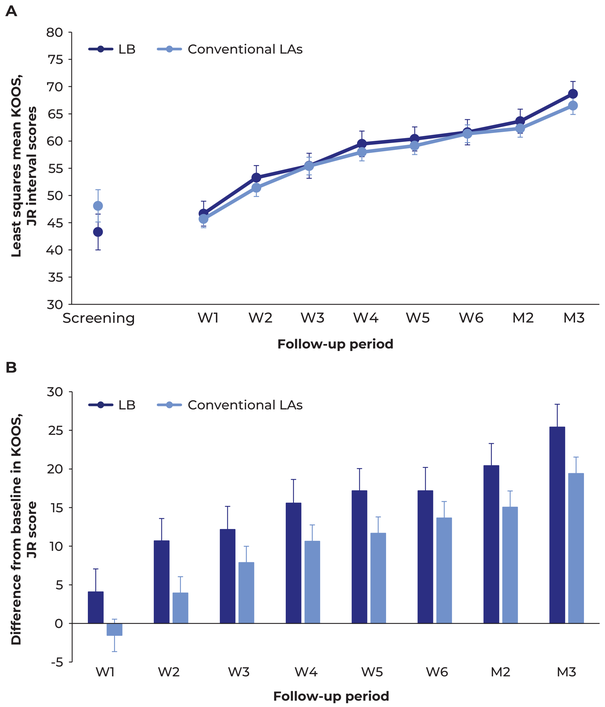
Figure 3. Self-reported opioid use.



D, day; LA, local anesthetic; LB, liposomal bupivacaine; M, month; TKA, total knee arthroplasty; W, week.

- Patients receiving LB had improved physical function from baseline compared with those receiving conventional LAs (1.5 vs 1.0 standard deviation improvement; *P*<0.001) (Figure 4)
  - Both groups showed similar consistent improvement in joint-specific function (*P*=0.174; Figure 4A)

Figure 4. (A) Trend of physical function over 3 months of follow-up. (B) Change from baseline in physical function.

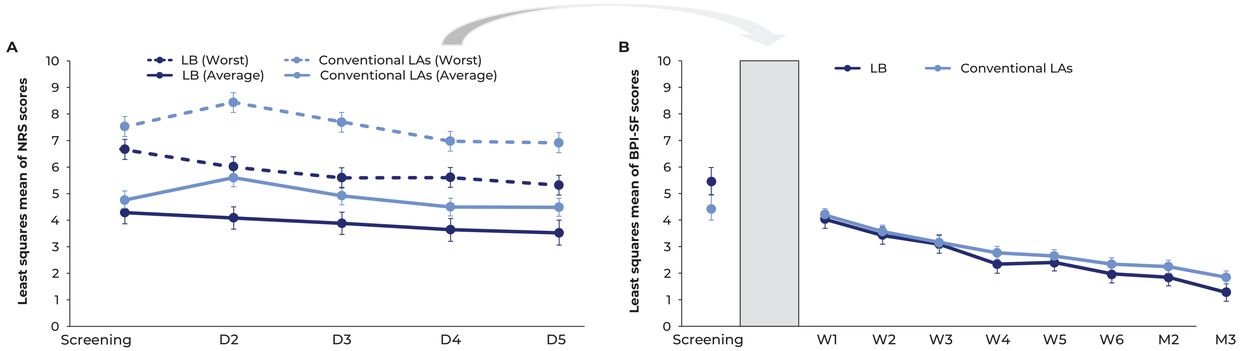


KOOS, JR, Knee Injury and Osteoarthritis Outcome Score for Joint Replacement; LA, local anesthetic; LB, liposomal bupivacaine; M, month; W, week.

- Patients who received LB were also discharged significantly earlier than those receiving conventional LAs (15.0 vs 20.6 h; *P*=0.007)

- Patients receiving LB demonstrated lower average and worst pain scores (as measured by NRS) than those receiving conventional LAs in the first 5 days (average pain, 3.9 vs 4.9 [*P*<0.001]; worst pain, 5.9 vs 7.1 [*P*<0.001]) as well as lower average pain scores measured by BPI-SF scores in the subsequent 3 months (2.6 vs 2.9; *P*=0.03) after TKA (Figure 2)
  - Worst pain scores within the first 5 days were also significantly lower among patients receiving LB compared with those receiving conventional LAs (*P*<0.001)

Figure 2. (A) Average and worst numerical rating scale scores within 5 days after TKA. (B) Average pain severity within 3 months after TKA.



D, day; LB, liposomal bupivacaine; M, month; TKA, total knee arthroplasty; W, week.

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REFERENCES: 1. Stevenson et al. *J Clin Orthop Trauma*. 2018;9(1):40-45. **2.** Dasa et al. *Ther Adv Musculoskelet Dis*. 2024;16:1759720x241304193.

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