

Liposomal Bupivacaine Adductor Canal Block vs Periarticular Ropivacaine Cocktail Injection for Pain Control Following Total Knee Arthroplasty

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INTRODUCTION:

Periarticular injections (PAI) have become a critical part of multimodal anesthetic regimens for total knee arthroplasty (TKA). This study compared the effectiveness of a liposomal bupivacaine adductor canal block (ACB) to a PAI consisting of ropivacaine, epinephrine, and ketorolac on postoperative pain requirements in primary TKA patients. We hypothesized that there would be no significant difference in postoperative pain scores, narcotic use and other postoperative outcomes.

METHODS:

Patients who underwent primary TKA were retrospectively identified from 2022-2023. Patients were stratified based perioperative anesthetic regimen (PAI only, PAI with an ACB, and ACB only) and matched in a 1:1:1 ratio. Patients were matched based on age, American Society of Anesthesiologists (ASA) score, body mass index (BMI), and preoperative narcotic usage. Patient demographics, as well as intra- and postoperative variables including narcotic refills, postoperative morphine requirements, pain scores, and readmissions were compared with univariable analyses.

RESULTS:

After successful 1:1:1 matching, there were 41 patients in each cohort. First postoperative pain scores were not significantly different across all groups ($p=0.360$). Pair-wise comparisons of patients receiving either PAI alone or ACB alone showed that patients receiving exclusively PAIs had lower narcotic usage at 6 hours ($P = 0.007$), 24 hours ($P < 0.001$), and 48 hours ($P < 0.001$). PAI alone also demonstrated shorter length of stay compared to ACB alone ($P = 0.007$) and had lower postoperative narcotic refills ($P = 0.035$). The rate of same day PT clearance was lowest in the ACB only group (41.5% [17/41]).

DISCUSSION AND CONCLUSION: The use of a PAI for pain control after primary TKA is supported by the arthroplasty literature and arthroplasty societies. In the present study, with differences observed in postoperative narcotic refills, morphine requirements, physical therapy clearance, and length of stay the use of PAI with or without ACB may confer a benefit to patients when compared to ACB alone.

Table 1. Patient demographics and preoperative statistics.

	ACB only (n=41)	ACB+PAI (n=41)	PAI only (n=41)	P	SD
Demographics					
Age (years) (SD)	61.4 (8.2)	64.1 (10.3)	61.9 (9.0)	0.303	0.131
Sex (n (%))					
Female	24 (58.5)	24 (58.5)	22 (53.7)	0.807	0.003
Male	17 (41.5)	17 (41.5)	19 (46.3)	0.907	0.003
Race (n (%))					
American Indian or Alaska Native	0 (0.0)	1 (2.4)	0 (0.0)		
Asian	2 (4.9)	0 (0.0)	1 (2.4)		
Black or African American	9 (22.0)	9 (22.0)	8 (19.5)		
Caucasian/White	29 (70.7)	28 (68.2)	31 (75.6)		
Other	0 (0.0)	1 (2.4)	0 (0.0)		
Physician Order	0 (0.0)	1 (2.4)	0 (0.0)		
Not Reported/Unknown	0 (0.0)	1 (2.4)	0 (0.0)		
Other	1 (2.4)	1 (2.4)	1 (2.4)		
BMI (kg/m ²) (mean (SD))	31.7 (5.1)	32.4 (6.4)	32.4 (5.9)	0.496	0.115
ASA Classification (n (%))					
I	22 (53.7)	29 (70.7)	19 (46.3)	0.075	0.208
II	19 (46.3)	10 (24.4)	22 (53.7)	0.075	0.208
Narcotic Use (n (%))					
I	19 (46.3)	20 (48.8)	16 (39.0)	0.632	0.132

Legend: P-values < 0.05 were considered significant. Abbreviations: Adductor canal block (ACB), periarticular injection (PAI), standardized mean difference (SMD), standard deviation (SD), total mean value (TM), Age (age), race (race), American Society of Anesthesiologists (ASA).

Table 2. Postoperative pain and narcotic utilization.

	ACB only (n=41)	ACB+PAI (n=41)	PAI only (n=41)	P	SD
Postoperative Pain					
First Post-Op Pain Score (mean (SD))	8.0 (8.5, 5.8)	8.0 (8.5, 5.8)	2.0 (8.5, 5.8)	0.794	0.144
First Post-Op Pain Score (n (%))					
0-3	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
4-6	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
7-9	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
10-12	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
13-15	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
16-18	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
19-21	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
22-24	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
25-27	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
28-30	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
31-33	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
34-36	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
37-39	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
40-42	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
43-45	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
46-48	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
49-51	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
52-54	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
55-57	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
58-60	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
61-63	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
64-66	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
67-69	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
70-72	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
73-75	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
76-78	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
79-81	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
82-84	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
85-87	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
88-90	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
89-91	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
92-94	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
95-97	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
98-100	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
101-103	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
104-106	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
107-109	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
110-112	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
113-115	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
116-118	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
119-121	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
122-124	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
125-127	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
128-130	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
131-133	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
134-136	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
137-139	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
140-142	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
143-145	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
146-148	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
149-151	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
152-154	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
155-157	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
158-160	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
161-163	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
164-166	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
167-169	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
170-172	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
173-175	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
176-178	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
179-181	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
182-184	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
185-187	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
188-190	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
191-193	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
194-196	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
197-199	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
200-202	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
203-205	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
206-208	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
209-211	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
212-214	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
215-217	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
218-220	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
221-223	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
224-226	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
227-229	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
230-232	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
233-235	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
236-238	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
239-241	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
242-244	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
245-247	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
248-250	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
251-253	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
254-256	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
257-259	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
260-262	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
263-265	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
266-268	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
269-271	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
272-274	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
275-277	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
278-280	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
281-283	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
284-286	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
287-289	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
290-292	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
293-295	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
296-298	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
299-301	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
302-304	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
305-307	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
308-310	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
311-313	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
314-316	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
317-319	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
320-322	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
323-325	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
326-328	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
329-331	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
332-334	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
335-337	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
338-340	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
341-343	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
344-346	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
347-349	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
350-352	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
353-355	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
356-358	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
359-361	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
362-364	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
365-367	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
368-370	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
371-373	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
374-376	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
377-379	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
380-382	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
383-385	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
386-388	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
389-391	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
392-394	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
395-397	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
398-400	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
401-403	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
404-406	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
407-409	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
410-412	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
413-415	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
416-418	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
419-421	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
422-424	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
425-427	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
428-430	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
431-433	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
434-436	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
437-439	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
440-442	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
443-445	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
446-448	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500
449-451	0 (0.0, 0.0)	0 (0.0, 0.0)	0 (0.0, 0.0)	0.500	0.500