

# Efficacy of Adductor Canal Block in Total Knee Arthroplasty

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## INTRODUCTION

- Post operative pain control and current recommendations for early ambulation are challenges in TKA patients <sup>7</sup>
- Femoral nerve blocks (FNB) commonly used for TKA <sup>9</sup>
- Significant muscle weakness associated with FNB <sup>9</sup>
- Adductor canal block (ACB) claims similar analgesic actions with less quadriceps weakness <sup>2, 4, 6, 7</sup>
- Preservation of quadriceps strength enables earlier ambulation <sup>2, 7, 9</sup>

## RESULTS

- Little to no negative effects on quadriceps strength <sup>2, 4, 5, 6, 7</sup>
- ACB outperformed FNB in muscle strength and ambulation <sup>2, 4, 6, 7</sup>
- Consistently lower pain scores when evaluated against placebo <sup>1, 3, 5,</sup>
- Analgesic properties were equivalent to FNB <sup>2, 4, 6, 7</sup>
- Proximal placement showed less opioid requirements <sup>8</sup>
- Prolonged analgesia effects with continued mobility benefits in continuous catheters <sup>4, 7</sup>
- Used in combination with multimodal analgesic regimen <sup>1-7</sup>
- Inconsistent reports of decreasing total opioid consumption <sup>3, 4, 6, 7</sup>

## Evidence-Based Studies

Evidence Source	N	Intervention	Findings
Grevstad et al. <sup>1</sup> (2014)	49	Randomized double blind placebo control Group A received LA at start of physical therapy and at 45 minutes received NS via ACB, Group B received the opposite regimen. VAS was used to evaluate pain at rest and active 45-degree flexion	Group A overall demonstrated a lower VAS during flexion and at rest. The number of patients that had moderate to severe pain at rest at baseline decreased from 57% to 8%. 25% of patients reported no therapeutic effect of the block and 78% reported moderate pain during flexion. Only patients with severe movement related pain were assessed at 24-48 hours postoperatively.
Grevstad et al. <sup>2</sup> (2015)	49:	Randomized double blind control Compared ACB and FNB. Inclusion criteria of TKA patients POD 1 or 2 with VAS of severe pain during active flexion. Quadriceps MVIC was assessed 2 hours after PNB. Ambulation assessed by TUG test	48% of the ACB doubled their baseline MVIC, FNB showed a 16% decrease from pre-block baseline. Pain scores were overall decreased, but there was no notable difference. The ACB performed the TUG test faster at 32 sec, compared to FNB at 52 sec, which was even slower than baseline. 2 participants in each group were unable to complete the TUG test at baseline. After FNB 7 participants were unable to complete TUG test. All patients were able to complete TUG test following ACB. Only immediate effects of treatment were assessed, failed to evaluate duration of these effects or end outcomes.
Jaeger et al. <sup>3</sup> (2012)	41	Randomized double-blind placebo controlled Via ACB catheter patients were either injected with 30 ml 0.75% ropivacaine or normal saline 30 minute post-operatively.	No statistical significance was seen in pain during 45-degree flexion 1 hour postoperatively. Pain VAS was reduced in the 1-6 hour post-operatively. ACB also showed a reduction in nausea and a 37% decrease in morphine consumption comparatively. Trial focused on severe pain in the immediate postoperative period. Sample size was insufficient to draw final conclusions. Patients received IV opioids prior to ACB injection, which could have altered analgesic results.
Jaegar et al. <sup>4</sup> (2013)	48	Double-blinded randomized controlled Continuous ACB or FNB. injected with 30 ml of 0.5% ropivacaine then a continuous rate of 8ml/h of 0.2% ropivacaine for 24 hours	The ACB demonstrated 52% of preserved quadriceps strength vs 18% FNB of percentage of baseline. No significant difference of opioid consumption, adverse morphine effects, pain at rest and active flexion and adductor strength. Postoperative catheter placement prevented complications such as entrapment underneath the tourniquet or dislodgement.
Jenstrup et al. <sup>5</sup> (2012)	71	Parallel double-blind placebo controlled randomized ACB post operatively 30 ml ropivacaine 0.75% then bolused 15 ml at 6, 12, 18 hours. Placebo received regimen with NS	ACB had reduced opioid consumption, faster performance in ambulation using the TUG test at 24 hours and lower pain scores during 45-degree flexion. Pain scores at rest were not significantly different. Post-operative nausea and vomiting showed no significant reduction in occurrence however, the placebo group had more frequent antiemetic administration. Advocate ACB in combination with multimodal analgesic therapy, but not as a complete analgesic. Evaluation of ambulation had promising results that warrant further analysis in muscle strength and fall risks.
Kim et al. <sup>6</sup> (2014)	93	Prospective double blind randomized control Compared single injection ACB or FNB. Assessed postoperative pain scores, total opioid consumption and quadriceps strength	ACB had higher dynamometer readings at 6-8 hours post procedure. The quadriceps strength in ACB group was better preserved, but still lower than baseline. The ACB group displayed superior analgesia based on pain scores and opioid consumption. At 24-48 hours no clinically significant difference existed in pain scores, opioid consumption, or quadriceps strength. Epidural PCA was used as part of a multimodal therapy could have skewed pain scores.
Shah et al. <sup>7</sup> (2014)	98	Randomized control Continuous ACB vs FNB each group received an initial dose of 30 ml 0.75% ropivacaine, followed by 30ml of 0.25% ropivacaine every 4 hours until 0800 on POD 2.	The ACB outperformed FNB on all muscle strength and ambulation assessment tools. Comparable results in opioid consumption, pain scores, and maximum knee flexion at discharge was seen as. ACB had a decreased length of hospitalization. Multiple ambulation and early functional recovery assessment tools were used. Population was 72% female. Patients in both groups had a multimodal pain regimen including IV PCA, which could have influenced the evaluation of analgesic properties

## DISCUSSION/CONCLUSION

- Mild quadriceps weakness may be caused by vastus medialis blockade, surgical effects, or movement limited by pain
- Establishing optimal concentrations, volumes, adverse effects and potential additives require further research
- No current reports of saphenous nerve injury from ACB <sup>10</sup>
- Expert knowledge in landmark identification recommended for clinical and didactic educators
- Consider ACB as a viable option in a multimodal approach to postoperative pain management in TKA patients

## KEY REFERENCES

1. Grevstad U, Mathiesen O, Lind T, Dahl JB. Effect of adductor canal block on pain in patients with severe pain after total knee arthroplasty: a randomized study with individual patient analysis. *Br J Anaesth.* 2014;112(5):912-919.
  2. Grevstad U, Mathiesen O, Valentiner LS, Jaeger P, Hilsted KL, Dahl JB. Effect of adductor canal block versus femoral nerve block on quadriceps strength, mobilization, and pain after total knee arthroplasty: a randomized, blinded study. *Reg Anesth Pain Med.* 2015;40(1):3-10.
  3. Jaeger P, Grevstad U, Henningsen MH, Gottschau B, Mathiesen O, Dahl JB. Effect of adductor canal-blockade on established, severe post-operative pain after total knee arthroplasty: a randomised study. *Acta Anaesthesiol Scand.* 2012;56(8):1013-1019.
  4. Jøger P, Zaric D, Fomsgaard JS, et al. Adductor canal block versus femoral nerve block for analgesia after total knee arthroplasty: a randomized, double-blind study. *Reg Anesth Pain Med.* 2013;38(6):526-532.
  5. Jenstrup MT, Jaeger P, Lund J, et al. Effects of adductor canal-blockade on pain and ambulation after total knee arthroplasty: a randomized study. *Acta Anaesthesiol Scand.* 2012;56(3):357-364.
  6. Kim DH, Lin Y, Goytizolo EA, et al. Adductor canal block versus femoral nerve block for total knee arthroplasty: a prospective, randomized, controlled trial. *Anesthesiology.* 2014;120(3):540-550.
  7. Shah NA, Jain NP. Is continuous adductor canal block better than continuous femoral nerve block after total knee arthroplasty? Effect on ambulation ability, early functional recovery and pain control: a randomized controlled trial. *J Arthroplasty.* 2014;29(11):2224-2229.
  8. Mariano ER, Kim TE, Wagner MJ, et al. A randomized comparison of proximal and distal ultrasound-guided adductor canal catheter insertion sites for knee arthroplasty. *J Ultrasound Med.* 2014;33(9):1653-1662.
  9. Perlas A, Kirkham KR, Billing R, et al. The impact of analgesic modality on early ambulation following total knee arthroplasty. *Reg Anesth Pain Med.* 2013;38(4):334-339.
  10. Henningsen MH, Jaeger P, Hilsted KL, Dahl JB. Prevalence of saphenous nerve injury after adductor canal-blockade in patients receiving total knee arthroplasty. *Acta Anaesthesiol Scand.* 2013;57(1):112-117.
6. Illustrations Available at: <http://www.neuraxiom.com/html/addcan.html>. Accessed June 2, 2015.

