

Opioid Use after TKA in Patients Receiving Cryoneurolysis and Liposomal Bupivacaine

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Introduction

Total knee arthroscopy (TKA) is a common surgery with a painful recovery. Two promising modalities to reduce pain and opioid consumption following TKA are preoperative cryoneurolysis and perioperative local infiltration of liposomal bupivacaine. Preoperative cryoneurolysis targets the infrapatellar branch of the saphenous nerve and anterior femoral cutaneous nerve, and liposomal bupivacaine is a local anesthetic. The benefits of preoperative cryoneurolysis or liposomal bupivacaine alone have been shown in other studies. [1][2][3] To our knowledge, no study to date has examined whether the combination of preoperative cryoneurolysis and perioperative liposomal bupivacaine is superior to cryoneurolysis alone.

Application & Anatomy

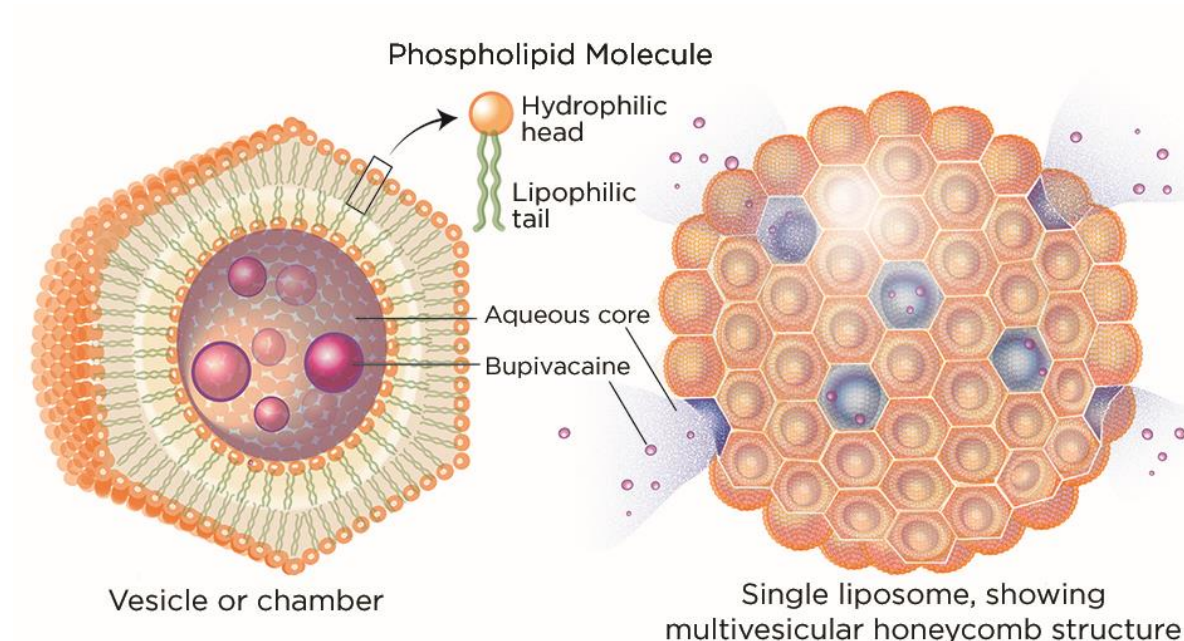


Figure 1: Liposomal Bupivacaine structure [4]



Figure 2: Cryoneurolysis device [1]

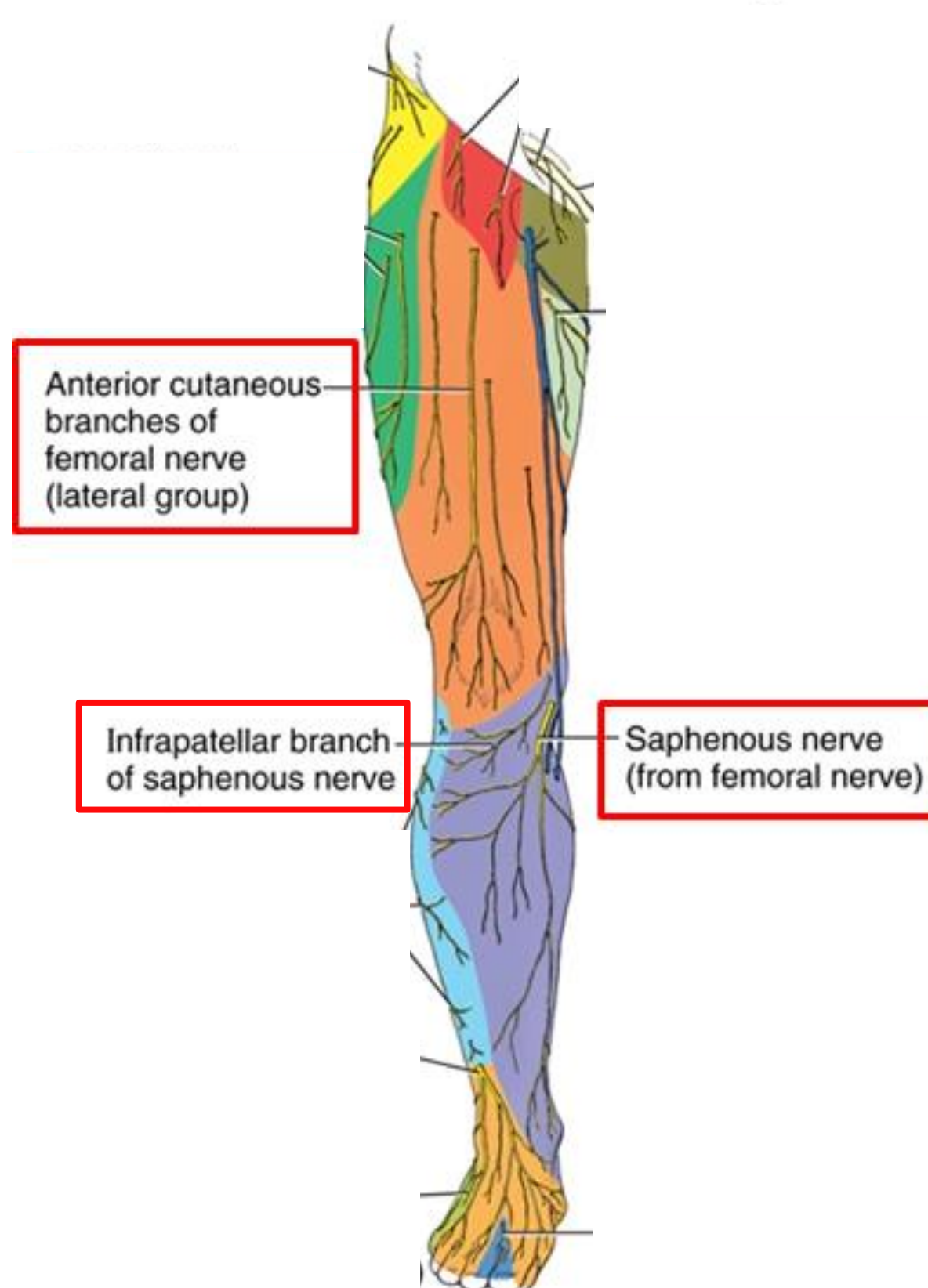


Figure 3: Lower limb nerve distribution [5]

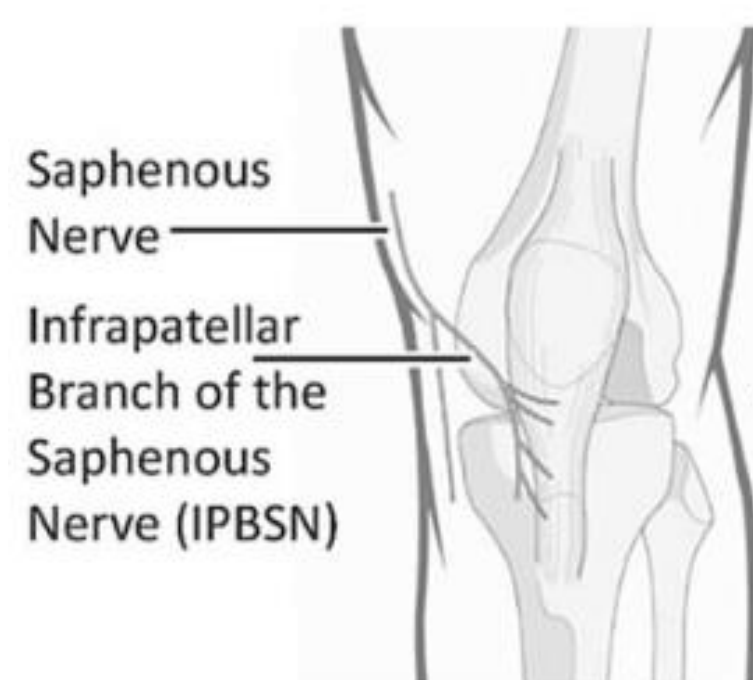


Figure 4: IPBSN penetration [6]

Materials & Method

This was a retrospective chart review of patients who underwent primary TKA performed by a single surgeon at a university-based tertiary care hospital. We compared opioid prescription following TKA in patients who received either perioperative cryoneurolysis plus perioperative liposomal bupivacaine (CB) or cryoneurolysis alone (C) as part of a multimodal pain management approach. Patients who did not receive opioids were excluded. Patients in the C group had surgery performed between March 1, 2017 and March 18, 2018 while patients treated with CB had their surgery performed between March 19, 2018 and March 31, 2019. Cryoneurolysis was administered 5 days prior to surgery. The primary outcome was total morphine milligram equivalent (MME) prescribed per patient following TKA.

Patient Demographics

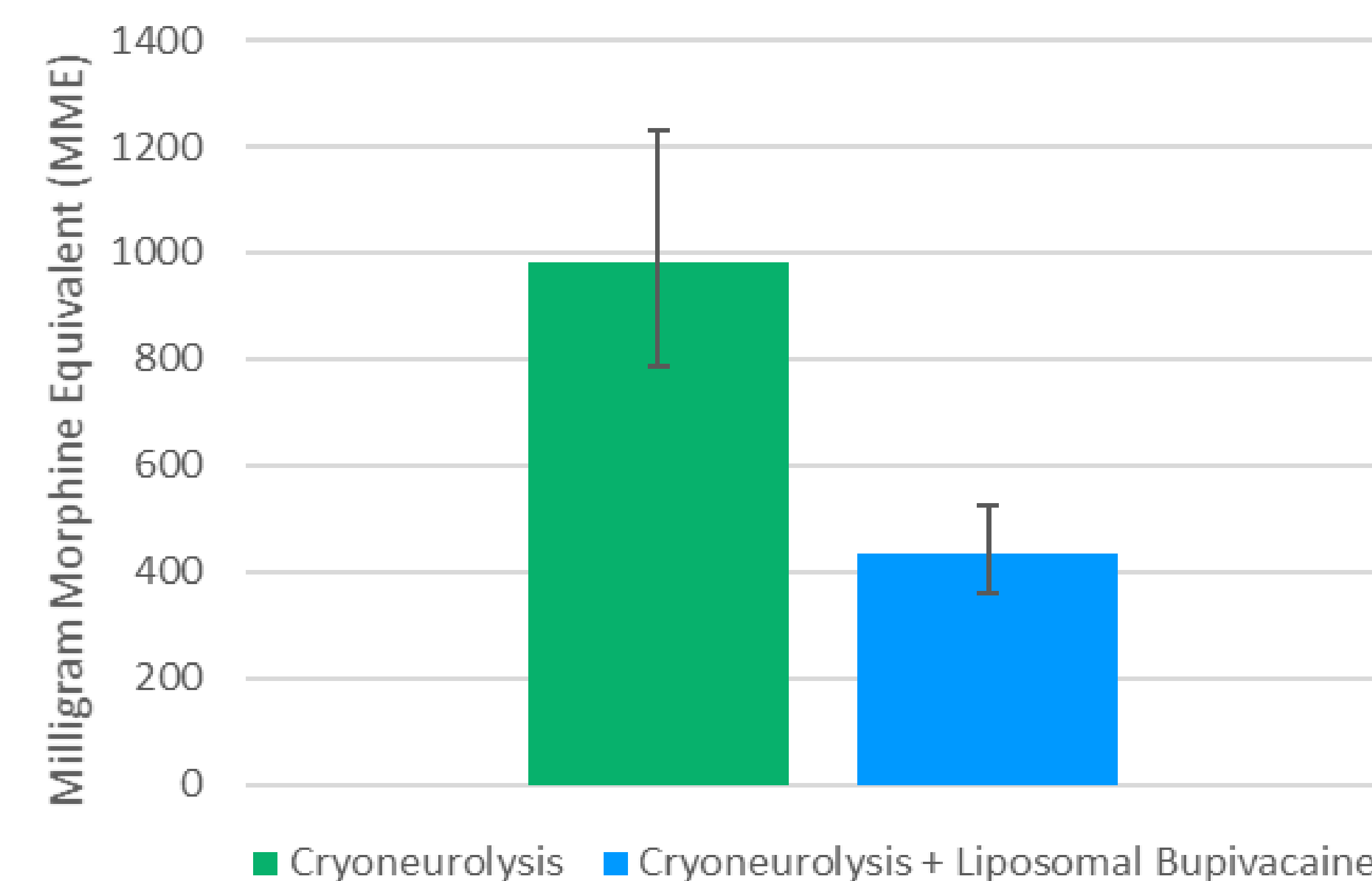
	Cryoneurolysis (n =74)	Cryoneurolysis + Liposomal Bupivacaine (n =105)	p-value
----- mean (SD) -----			
Age, years	68.6 (9.6)	68.3 (8.5)	0.869
BMI, kg/m ²	31.5 (5.4)	32.8 (5.6)	0.097
Deformity, °	7.9 (4.3)	7.6 (4.4)	0.698
----- % (n) -----			
Gender			0.070
Male	24.3 (18)	37.1 (39)	
Female	75.7 (56)	62.9 (66)	
Race			0.067
African American/Black	37.8 (28)	38.5 (40)	
White	60.8 (45)	51.9 (54)	
Other	1.4 (1)	9.6 (10)	

References

- [1] Dasa V, Lensing G, Parsons M, Harris J, Volaufova J, Bliss R. Percutaneous freezing of sensory nerves prior to total knee arthroplasty. *Knee*. 2016;23(3):523-8.
- [2] Ma J, Zhang W, Yao S. Liposomal bupivacaine infiltration versus femoral nerve block for pain control in total knee arthroplasty: A systematic review and meta-analysis. *Int J Surg*. 2016;36(Pt A):44-55.
- [3] Mont MA, Beaver WB, Dysart SH, Barrington JW, Del Gaizo DJ. Local infiltration analgesia with liposomal bupivacaine improves pain scores and reduces opioid use after total knee arthroplasty: results of a randomized controlled trial. *J Arthroplasty*. 2018;33(1):90-96.
- [4] Schematic multivesicular liposomes. <https://todaysveterinarypractice.com/nocita-dogs-cats/>. Accessed October 7, 2020
- [5] Innervation of the knee. Adapted from <http://quizlet.com/29786836/knee-and-popliteal-fossa-flash-cards>. Accessed October 7, 2020
- [6] Innervation of the lower limb. https://www.researchgate.net/figure/Iovera-device-A-infrapatellar-branch-of-the-saphenous-nerve-B-and-treatment-line-in_fig1_315463786. Accessed October 7, 2020

Preliminary Opioid Results

Opioids Prescribed vs Pain Management Modality



	Cryoneurolysis (n=58)	Cryoneurolysis + Liposomal Bupivacaine (n=65)	p-value
----- mean (95% CI) -----			
MME (Opioid)	984 (786,1231)	433 (358,523)	< 0.0001

Conclusions & Next Steps

This study shows that a multimodal pain protocol that includes perioperative cryoneurolysis and perioperative liposomal bupivacaine provides superior pain control as evidenced by significantly lower opioid use post TKA compared to cryoneurolysis alone. Limitations of this study included that patients were treated during different periods of time and that opioid use was based on prescription data rather than on actual use. Future research that prospectively examines post-TKA outcomes, such as range of motion, patient-reported outcomes, and objective function tests, in addition to opioid use in patients randomized to different multimodal pain regimens is warranted.