

CLINICAL REPORT

CRYONEUROLYSIS NERVE BLOCK FOR TOTAL KNEE ARTHROPLASTY

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INTRODUCTION

Patients undergoing a total knee arthroplasty (TKA) typically experience significant postoperative pain.¹⁻³ However, the narcotics utilized to treat this pain are often associated with side effects such as nausea, ileus, emesis, and drug dependence.^{1,3,4} A variety of anesthetic and pain control protocols have been investigated and used to minimize perioperative pain, though all involve the use of additional medications.⁴⁻⁷ Cryoneurolysis (iovera[®], Myoscience, Fremont, CA) does not involve the injection of any drug, allows for complete and safe regeneration of the target nerve, and has shown promise in reducing knee pain.^{8,9,11} It was hypothesized that a pre-operative cryoneurolytic block 5 days prior to surgery would decrease TKA postoperative pain.

PROM Data Collected at Baseline and at the 2, 6 and 12 weeks postoperative visit:

- KOOS
- Oxford Knee Score
- SF12
- PROMIS

Secondary Measures included:

- Length of Hospital Stay
- Morphine Equivalents prescribed over 12 weeks post-op

METHODS

Forty-eight patients were included in this Institutional Review Board approved, retrospective chart review: 24 patients undergoing TKA prior to March 31, 2014 comprised the Control group and 24 patients undergoing TKA following cryoneurolysis comprised the cryoneurolysis treated (Cryo) group. Subjects in the treated group received a cryoneurolysis treatment to the infrapatellar branch of the saphenous nerve (ISN) and the anterior femoral cutaneous nerve (AFCN) (shown in Figure 2) five days prior to TKA. Subjects in the Control group received standard pre-operative care. Patient reported outcome measures were collected using the KOOS, Oxford Knee Score, SF12 and PROMIS scales at baseline (pre-cryoneurolysis), and at the 2, 6 and 12 weeks postoperative visit. Secondary measures included hospital length of stay and amount of narcotic pain medication requested by patients at the 2, 6 and 12 week postoperative visits. Discharge criteria included the ability to walk 50 feet with a walker or crutches, to get in and out of bed and on and off a toilet independently, and pain control with oral medications.

RESULTS

The average morphine milligram equivalents (MME) requested and therefore prescribed over the 12 week postoperative period was statistically significantly lower ($p=0.0006$) in the Cryo group compared to the Control group (Figure 1). Because a change in the standard pre-operative care occurred before March 31, 2014 some of the patients in the Control group were given either a femoral or adductor canal block, while the cryoneurolysis treated patients were only given an adductor canal block. However, the results demonstrate that, regardless of block type, the length of hospital stay for the Cryo group was lower than that of the

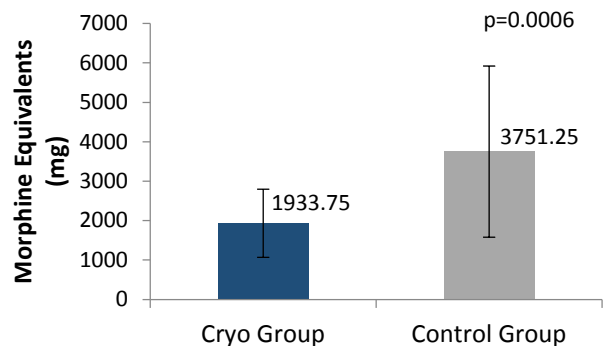


Figure 1. Average Morphine Equivalents prescribed over 12 Weeks for Cryo versus Control group.

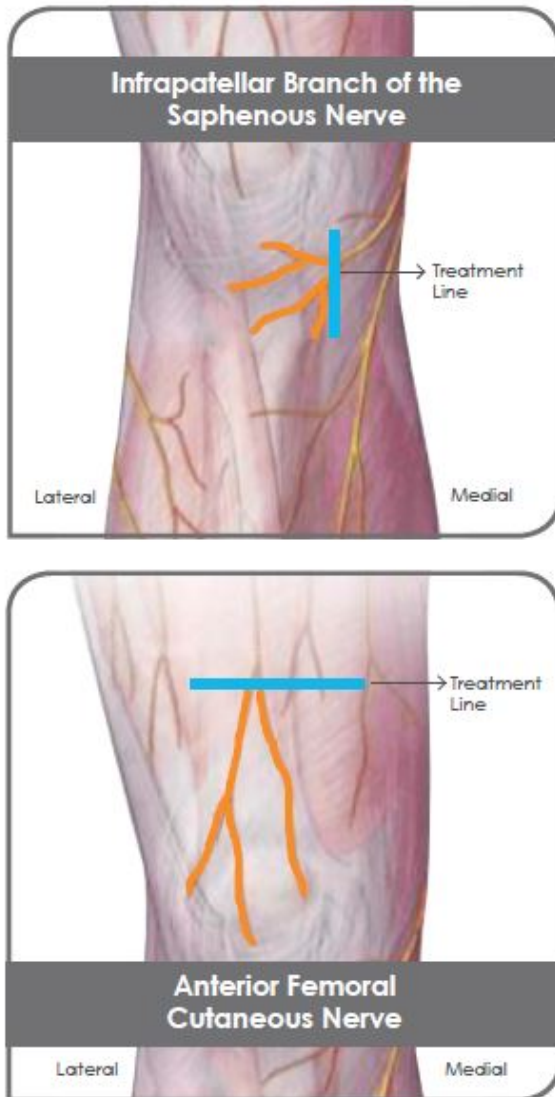


Figure 2. Nerves treated with cryoneurolysis prior to Total Knee Arthroplasty
 TOP: The Infrapatellar Branch of the Saphenous Nerve (ISN) innervates the anterior inferior portion of the knee.
 BOTTOM: The Anterior Femoral Cutaneous Nerve (AFCN) innervates the anterior superior portion of the knee.

DISCUSSION

The results demonstrate that, in some instances, the Cryo group had pain and symptoms scores that were statistically significantly better than those of the Control group. Though the two groups show similar average functional and pain scores for the additional patient-reported outcome measures collected at each of the follow-up time points the Cryo group required just half of the narcotics to achieve the same results as the Control group. This overall reduction in narcotic use may lessen the probability of opioid-induced complications.

Control. Further, when comparing patients in both groups who only received the adductor canal block the average hospital length of stay was also statistically significantly lower (Pearson's chi-square test, $p=0.011$) in the Cryo group compared to the Control group (Figure 3).

The KOOS Symptoms and Stiffness score is composed of 7 questions whose answers reflect the patient's assessment (during the past week) of knee symptoms and joint stiffness as well as the ability to straighten and bend their knee. (A higher KOOS Symptom score indicates less knee symptoms.) Both groups showed a statistically significant difference in KOOS Symptoms score at 6 weeks post-operation compared to baseline ($p<0.05$). As shown in Figure 4, patients in the Cryo group had KOOS symptoms scores that were statistically significantly higher ($p<0.05$) than those of the Control group at both 6 and 12 weeks post-operation. The average difference in KOOS Symptoms score between the two groups at 6 and 12 weeks post-operation were 12 and 13.4 respectively, which exceeds the Minimally Important Change (MIC) of 8-10 for the KOOS Scale.¹⁰

The KOOS Pain score is composed of 9 questions whose answers reflect the patient's assessment (during the past week) of knee pain due to a variety of activities including walking on a flat surface, ascending or descending the stairs and lying in bed. (A higher KOOS Pain score indicates less knee pain.) Figure 5 demonstrates that patients in the Cryo group had KOOS pain scores that were statistically significantly higher ($p<0.05$) than those of the Control group at both 6 and 12 weeks post-operation. The average difference in KOOS Pain score between the two groups at 6 and 12 weeks post-operation were 11.2 and 13.4 respectively, which exceeds the Minimally Important Change (MIC) of 8-10 for the KOOS Pain Scale.¹⁰

There were no significant differences in average scores for all additional outcome measures (KOOS, Oxford Knee Score, SF12 and PROMIS) for any of the follow-up time points.

The drawbacks to the study include the historical group as a control and the lack of randomization. Two additional drawbacks include the use of narcotics prescribed rather than the number consumed and the resolution of the length of hospital stay.

Future studies will seek to standardize these variables to confirm and better understand the benefits that cryoneurolysis treatment may provide to TKA patients. Additional studies may be required to establish the economic benefits associated with reduced narcotic use and reduced length of hospital stay.

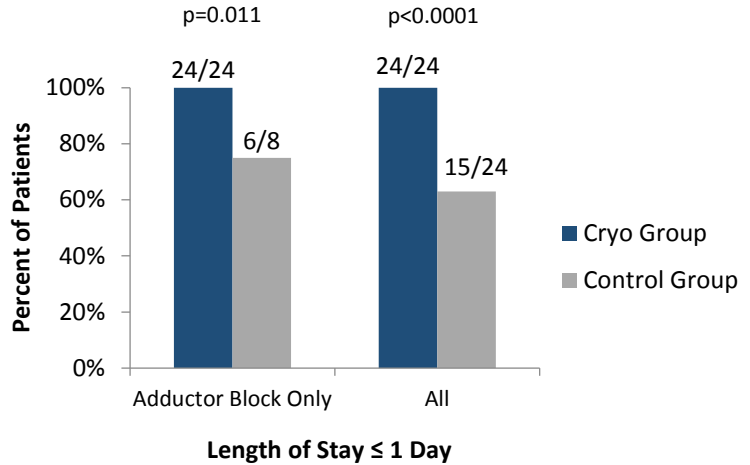


Figure 3. Percent of patients in the Cryo versus Control group whose length of hospital stay was ≤ 1 day as a function of nerve block type. The p-value of 0.011 is for the Adductor block only comparison.

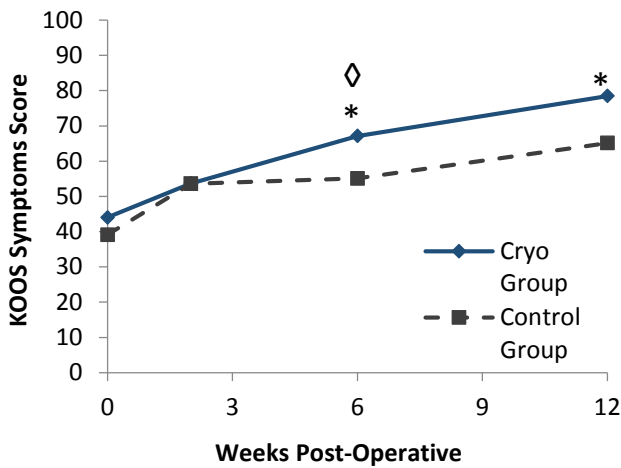


Figure 4. The KOOS Symptom Score for the Cryo versus Control group. The * denotes statistical significance ($p<0.05$) between the groups. The ◊ denotes statistically significant difference for both groups in mean improvement relative to baseline.

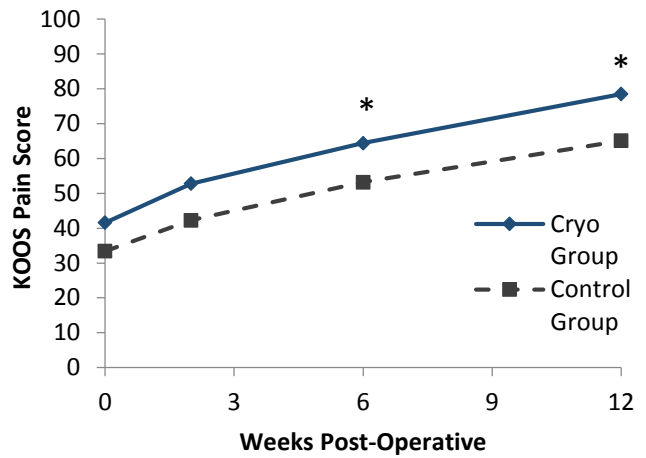


Figure 5. The KOOS Pain Score for the Cryo versus Control group. The * denotes statistical significance ($p<0.05$) between the groups.

CONCLUSION

Cryoneurolysis to block the ISN and AFCN prior to TKA appears to be an effective method for reducing postoperative narcotic use and length of hospital stay. Additional research is required to further establish this method as a viable preoperative practice for patients undergoing TKA.

Updated results are based on “Percutaneous Cryoneurolysis Nerve Block for Total Knee Arthroplasty to Reduce Postoperative Pain and Improve Patient Outcomes” by Dasa V., Bliss R., Lensing G., Parsons M. and Harris P. and presented at the 2015 Orthopaedic Research Society Annual Meeting. Results presented here are consistent with the previous analysis.

Disclosures: Dr. Dasa is a paid consultant for Myoscience, Inc.

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