

# Genicular Nerve Cryoneurolysis for Knee Osteoarthritis Pain

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## OBJECTIVE

To provide analgesia after a scheduled total knee arthroplasty (TKA) by targeting the deep genicular nerve via fluoroscopically guided cryoneurolysis

## CONCLUSIONS

- 1 Cryoneurolysis is a steroid-free, non-opioid option for pain management after TKA that preserves tissue compared with thermal ablation techniques
- 2 In a case report of a patient with severe tricompartmental osteoarthritis, cryoneurolysis of the deep genicular nerve enabled rapid recovery after TKA, with no opioid use beyond the first week and prompt return to physical activities



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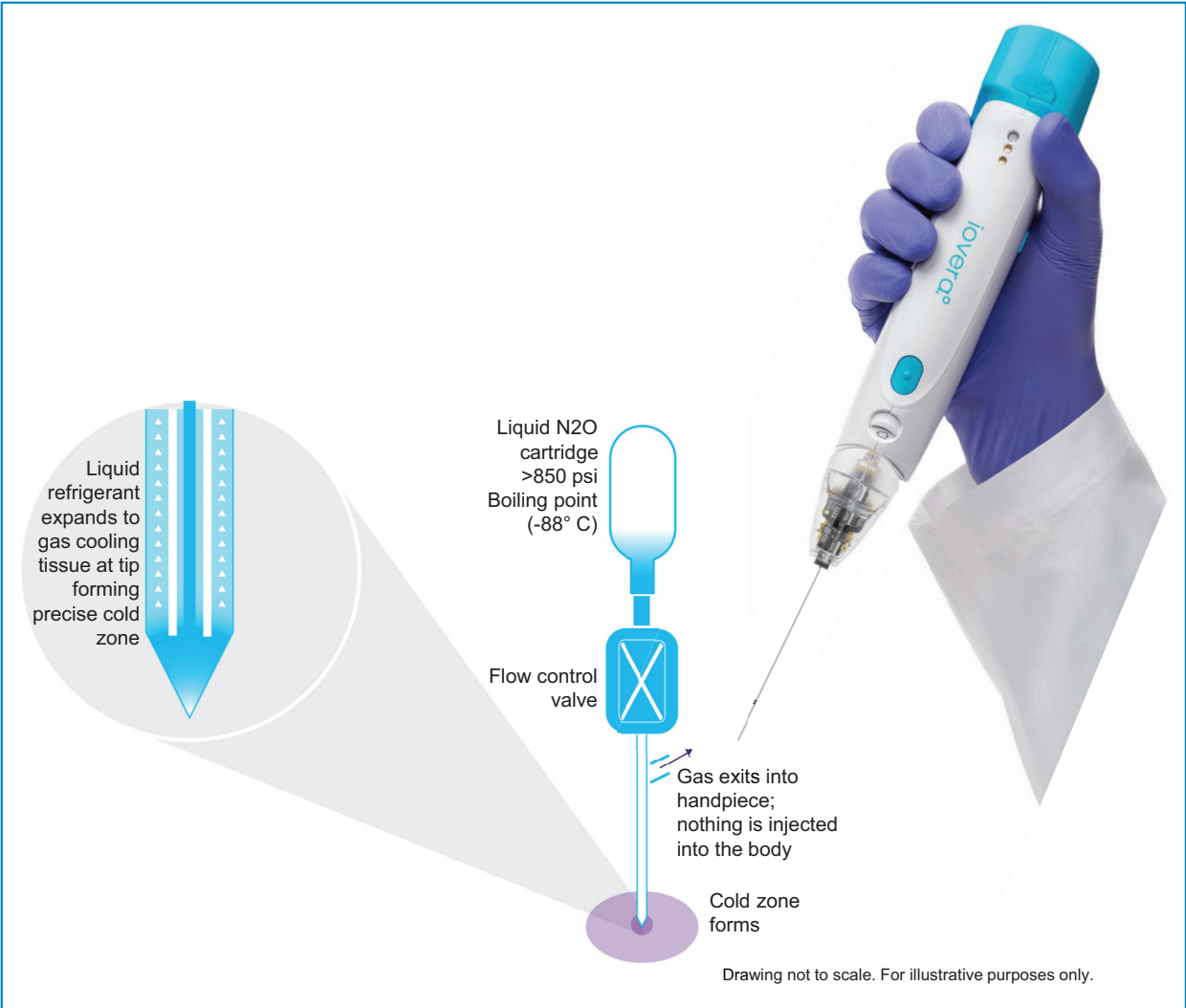
ACKNOWLEDGMENTS: Assistance with poster preparation was provided under the direction of the authors by MedThink SciCom and funded by Pacira BioSciences, Inc.

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## INTRODUCTION

- Patients with knee osteoarthritis may undergo TKA, and postsurgical pain often necessitates the use of opioids<sup>1</sup>
- Radiofrequency ablation (RFA) of the genicular nerve prior to TKA has been used to reduce postoperative opioid usage, but this can lead to tissue destruction<sup>2,3</sup>
- Cryoneurolysis is an alternative to RFA that uses cold temperatures to cause Wallerian degeneration of the targeted nerve, allowing for nerve regrowth (Figure 1)<sup>4</sup>
- Prior studies have indicated that preoperative cryoneurolysis of the genicular nerve administered using anatomic landmarks can reduce pain and opioid use after TKA<sup>5</sup>

Figure 1. Schematic demonstrating cryoneurolysis lesion formation using a handheld cryoneurolysis system.



Psi, per square inch.

## METHODS

### CRYONEUROLYSIS TECHNIQUE

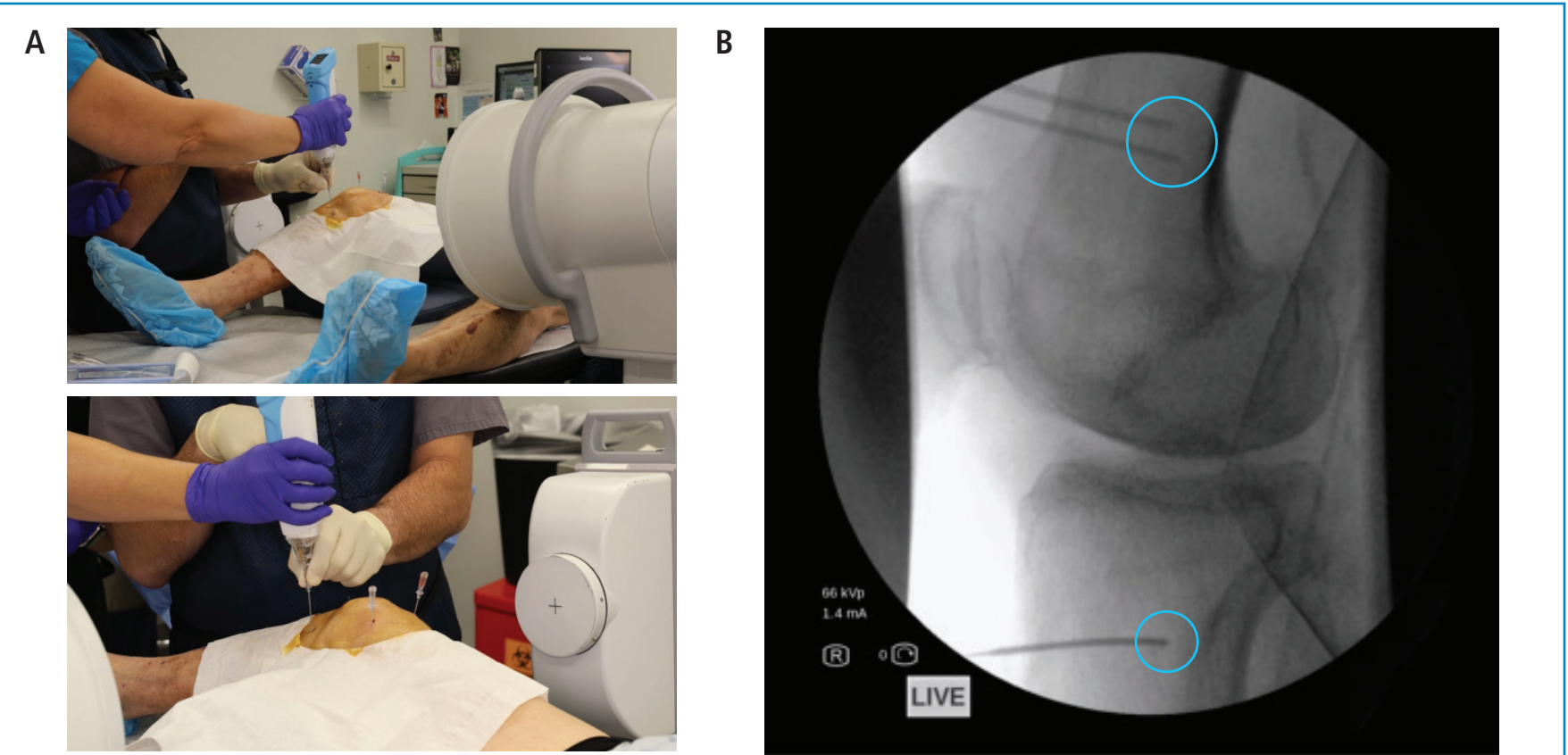
- Description and images of the cryoneurolysis technique are shown in Figures 2 and 3

Figure 2. Overview of the cryoneurolysis technique targeting the deep genicular nerves.

1. Cryoneurolysis of the 3 deep genicular nerves was performed under fluoroscopic guidance at a free-standing ambulatory surgical center 12 days prior to TKA
2. Superficial areas above the nerves were anesthetized using local anesthetic, and skin wheals were raised under fluoroscopic guidance for placement of introducer needles <ul style="list-style-type: none"><li>• Skin wheals were raised just above the medial and lateral femoral condyles along the medial and lateral borders of the distal femur</li><li>• Another skin wheal was raised just below the proximal tibial head along the medial border of the tibia</li></ul>
3. Introducer needles were advanced through the skin wheals under fluoroscopic guidance until bone was contacted, and cross-table lateral view confirmed that the needle tip was mid-shaft in both the femur and tibia
4. Following needle placement and aspiration, a mixture of 4 mL of 0.25% bupivacaine and 4 mL of 1.00% lidocaine was injected for local anesthesia
5. Cryoneurolysis was performed sequentially for 1 minute and 46 seconds at all 3 genicular nerve sites

TKA, total knee arthroplasty.

Figure 3. Application of cryoneurolysis treatment using a handheld device (A) guided by fluoroscopic identification of the deep genicular nerves (B).



## RESULTS

### CASE PRESENTATION

- A 77-year-old male presented with severe bone-on-bone pain (rated as 10/10) in the right knee and was assistive-device dependent
- Magnetic resonance imaging revealed severe tricompartmental osteoarthritis and end-stage osteoarthritis in the medial compartment
  - Depression of the medial tibial plateau suggested old fracture, chronic remodeling due to osteoarthritis, or insufficiency fracture
  - Other observations included extensive complex tear of the medial meniscus, possible nondisplaced lateral meniscus tear, hyperintense signals in the anterior cruciate ligament suggestive of mucoid degeneration, and large joint effusion with synovitis
- Prior treatment history included previous joint operation in the patient's twenties and injections with viscosupplementation since 2016
  - Viscosupplementation provided the initial benefit of >50% pain control; pain had regressed over 6 years of repeat treatment
  - Viscosupplementation followed 3 weeks later by a genicular nerve block initially resulted in "virtually no pain," but subsequent genicular nerve block resulted in an only 25% improvement in pain
- An orthopedic surgeon recommended TKA for bone-on-bone presentation; preoperative cryoneurolysis was used to provide postoperative analgesia

### FOLLOW-UP AFTER CRYONEUROLYSIS PROCEDURE

- After cryoneurolysis and before TKA, the patient rated his pain as 8 to 9 (of 10) and reported consistent use of over-the-counter pain medication for analgesia
- Immediately following TKA, he took 1 opioid pill (hydrocodone 5 mg/acetaminophen 325 mg) per day for 1 week to aid with pain during bedtime and required no opioids thereafter
- The patient reported using a walker for 2 days after TKA and was walking unassisted by the ~1-month follow-up, with a knee range of motion of 5 to 95 degrees
- He was able to drive within 1 week and was driving long distances by ~7 weeks after the TKA
- At the ~2-month follow-up, knee range of motion was 5 to 110 degrees
- The patient reported golfing daily by ~9 weeks after TKA