

# Periarticular Injection Technique to Enhance Pain Relief After Knee Arthroplasty

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## Introduction

Currently, a popular form of pain control following total knee arthroplasty is the use of periarticular injections; how the medications are injected is a critical step in the efficacy of this modality.

While many different medications can be used for periarticular injections, the technique of how and where the medication is administered is critical. An optimal volume (in this case 100 mL) facilitates adequate injection and infiltration of the critical areas. The injections should be delivered in a control syringe (a syringe that allows for aspiration and injection) so that the surgeon can aspirate before injecting into areas of concern. A small-gauge needle (size 22 is preferable) ensures that the liquid is delivered directly into the tissue with minimal trauma. The goal is to place as much of the liquid as possible into the soft tissues with minimal seepage in the joint. Multiple small-volume injections are preferable to fewer but larger-volume injections. Using two syringes expedites the process, allowing the assistant to fill one syringe while the surgeon is using the other one. A general principle is to use multiple small-volume injections delivered slowly. Placing the needle to the desired depth and then injecting as the needle is extracted from the tissue is the preferable method for delivery.

Around the knee, the periosteum of both the femur and the tibia is the primary target of the injection because of its innervation. The injections should be performed with the knee in flexion. Care should be taken to avoid plunging in the midline, in order to avoid the neurovascular structures as well as to avoid injecting into the location of the peroneal nerve laterally. Beginning with the femur, the surgeon should slowly inject into the medial and lateral periosteum, in effect causing a wheal to form under the periosteal tissue. This is clearly visible as the injection is being performed. The posterior aspect of the capsule is also richly innervated and should be carefully infiltrated as well. The best access to the femur and posterior aspect of the capsule is possible prior to implantation, and approximately one-third of the solution should be injected before the implants are placed. Once

the implants have been placed, the remaining two-thirds of the solution should be injected into the tibial periosteum and medial soft-tissue sleeve as well as the capsule of the knee. This should include the proximal portion of the extensor mechanism (we inject both sides of the incision [tendon and muscle]) as well as the lateral gutter and the periosteum around the patella. The skin incision requires a limited amount of the injection solution, approximately one-tenth of the total.

The procedure is performed with the following steps (Video 1).

## Step 1: Setup

*The setup includes the injection fluid and two control syringes with a 22-gauge needle.*

- Have your injection fluid on the field along with two control syringes to speed delivery.
- Use a 22-gauge needle to deliver liquid into the tissue itself.

## Step 2: Inject the Lateral Femoral Periosteum

*Inject around the femur before placing the implants.*

- Inject around the femur, beginning laterally, prior to placing the implants.
- Use multiple small-volume injections delivered slowly. This ensures that the tissue is actually elevated off the bone and the injection fluid does not extravasate into the joint.

## Step 3: Inject the Posterior Aspect of the Capsule

*This is another area of rich innervation that needs to be injected carefully.*

- Aspirate prior to injecting.

- Use multiple small injections across the back of the knee.
- Do not plunge into the midline or laterally near the peroneal nerve.
- Include the posterior cruciate ligament (PCL) when a PCL-retaining knee implant is going to be used.

#### Step 4: Inject the Medial Periosteum

Use a similar technique of slow small-volume injections, watching for the periosteal wheal or elevation off the bone.

#### Step 5: Inject the Capsule and Skin

Include the lateral gutter and proximal extensor mechanism as well as around the patella, with minimal injection into the skin.

- Place the needle to the desired depth and inject as the needle is being withdrawn.
- Aspirate when needed or in areas of concern.
- Aim to deliver as much of the liquid into the tissue as possible.

#### Results

Careful injection technique improves the outcome of periarticular injections for pain control. While the ideal “cocktail” of medications remains to be elucidated, how the liquid is delivered is important. Using the particular combination we have decided upon (ropivacaine [5 mg/mL, 49.25 mL], epinephrine [1 mg/mL, 0.5 mL], Toradol

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#### References

1. Dalury DF, Lieberman JR, MacDonald SJ. Current and innovative pain management techniques in total knee arthroplasty. *J Bone Joint Surg Am.* 2011 Oct 19;93(20):1938-43.
2. Kelley TC, Adams MJ, Mulliken BD, Dalury DF. Efficacy of multimodal perioperative analgesia protocol with periarticular medication injection in total knee arthroplasty: a randomized, double-blinded study. *J Arthroplasty.* 2013 Sep;28(8):1274-7. Epub 2013 Apr 20.

[ketorolac: 30 mg/mL, 1 mL], clonidine [100 mg/mL, 0.8 mL], and normal saline solution [48.45 mL] for a total volume of 100 mL) has made a vast difference in patient satisfaction and outcomes and markedly shortened recovery times<sup>1,2</sup>. Periarticular injections are well tolerated and safe.

#### What to Watch For

##### Indications

- Periarticular injections can be used in all patients undergoing total knee arthroplasty. There are no contraindications other than allergy to the medications used in the mixture.
- When combined with preemptive analgesia and a multimodal medication protocol, these injections provide excellent pain control.
- There is no need for adjunctive nerve blocks.
- Regional anesthesia is preferable to general inhalation anesthesia. The same dose of anesthetic can be used in the cocktail when a regional anesthetic is used.

##### Contraindications

- Allergy to the medications used in the injection.

#### Clinical Comments

- We believe that this form of pain control is an effective choice for patients undergoing total knee arthroplasty.
- Further study is needed to clarify the ideal medication mixture.