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IN THIS ISSUE

EARLY INTERVENTIONS: A ROLE FOR PLATELET-RICH PLASMA IN THE TREATMENT OF EARLY KNEE OSTEOARTHRITIS?

EVIDENCE GROWS IN FAVOR OF PRP AS COST-EFFECTIVE, MINIMALLY INVASIVE TREATMENT FOR KNEE OA

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In the past, abundant anecdotal reports showing the benefits of platelet-rich plasma (PRP) in the treatment of knee osteoarthritis (OA) amassed faster than we could produce empirical data. Now, as the desire increases to use minimally invasive, cost-effective treatments prior to surgical intervention, published data are gaining ground. PRP has emerged in the literature as a cost-effective, minimally invasive way to reduce OA-associated pain and morbidity in the active aging population.

At Cleveland Clinic Florida, our patients with mild-to-moderate knee OA have shown favorable clinical outcomes with ultrasound-guided intra-articular PRP injections. In total we perform approximately 10 to 15 PRP injections per month. We have about an 80 percent success rate with an average length of pain relief of 9 to 12 months.

PRP mechanism of action

Platelets are activated by exogenous substances (calcium chloride or thrombin), endogenous thrombin and/or intra-articular cartilage. Upon platelet activation, α-granules are degranulated and secrete growth factors and anti-inflammatory cytokines, including insulin-like growth factor (IGF), platelet-derived growth factor (PDGF) and interleukin receptor antagonists. Current literature indicates these mediators inhibit cartilage degradation by regulating and promoting gene expression of tissue inhibitors of metalloproteinases (TIMP-1). This reduction in cartilage degradation makes PRP particularly useful in the treatment of osteoarthritis.

Preparation impacts injectate efficacy

PRP is prepared by centrifuging autologous whole blood. The initial centrifugation separates the patient's blood into three layers based on specific gravity: plasma, platelets and white blood cells, and red blood cells. Some PRP systems include a second centrifugation to further concentrate the platelets and separate the platelet-rich plasma from platelet-poor plasma. Differences in container size, spin time and spin rate among PRP systems produce PRP with varying amounts of leukocytes, RBCs and platelet concentrations. These differences can alter the efficacy of the injectate.

Comparing hyaluronic acid and PRP

In the past five years, at least 13 independent studies have looked specifically at PRP and knee OA, while several other recent studies have looked at the role of PRP in the healing of musculoskeletal conditions in general. Of the studies on OA, 11 directly compared intra-articular PRP with intra-articular hyaluronic acid (HA). Nine studies showed better symptom scores and clinical outcomes six to 12 months post-treatment in the PRP groups. In the two that showed no significant difference between PRP and HA, one study used only leukocyte-rich PRP. The remaining two studies compared undefined PRP to saline, and leukocyte-poor PRP to saline, and both showed better outcomes in the PRP groups.

OUR PATIENTS WITH MILD-TO-MODERATE KNEE OA HAVE SHOWN FAVORABLE CLINICAL OUTCOMES WITH ULTRASOUND-GUIDED INTRA-ARTICULAR PRP INJECTIONS.

PRP offers clinical improvements

A review of the current literature suggests that patients with knee OA have a positive response to PRP treatments. Younger, more active patients with mild OA tend to have better clinical improvements with PRP when compared to older patients with more severe OA.

PRP is a minimally invasive, cost-effective procedure with a low complication rate and a rapid recovery time. Usually, patients are able to bear weight immediately post-procedure and can return to normal activities following completion of treatment.

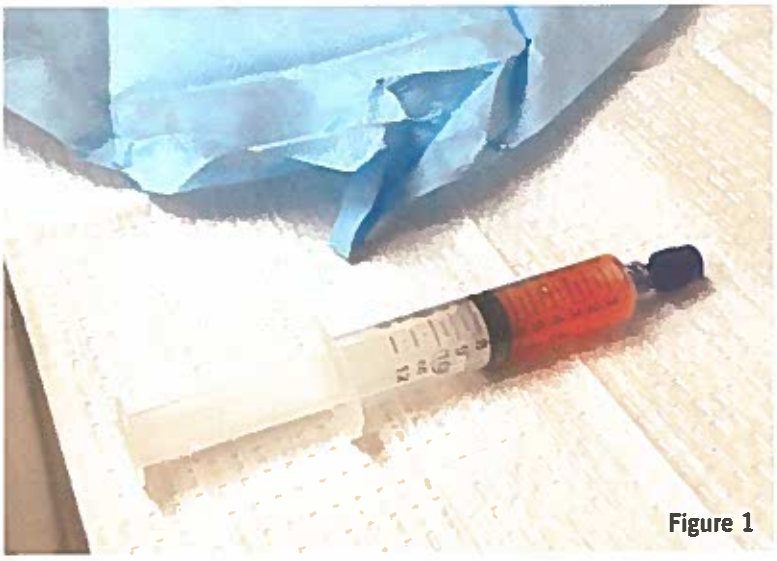

Figure 1

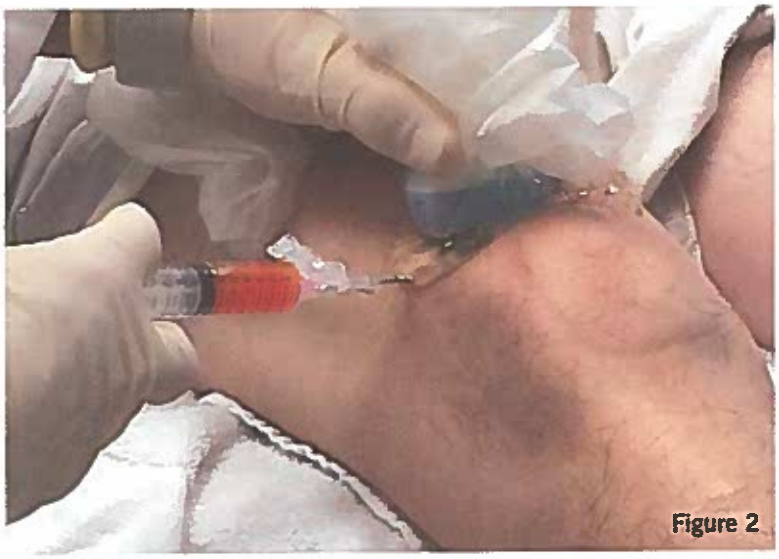

Figure 2

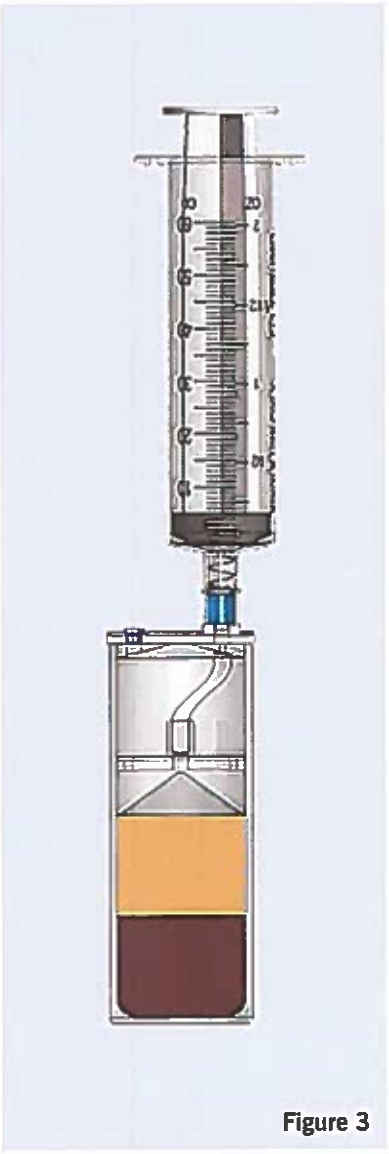

Figure 3

Figure 1. PRP post-centrifugation.

Figure 2. Injection of PRP into the knee using ultrasound guidance.

Figure 3. Separation of plasma from red blood cells.

Ideas for the future

Future studies should focus on comparing leukocyte-rich versus leukocyte-poor PRP in the treatment of OA, as different preparations of PRP yield different results.

Double-blind randomized controlled trials looking at PRP treatment in grade II and III knee OA would be useful as well. Additionally, protocols for injection technique, post-injection rehabilitation and longer follow-up times will give better information on treatment outcomes.

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GENICULAR NERVE RADIOFREQUENCY ABLATION FOR PERSISTENT PAIN

THERAPEUTIC ABLATION OFFERS SUSTAINED RELIEF FOR REFRACTORY PAIN

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Genicular nerve radiofrequency ablation (GNRFA) is a relatively new and lesser-known treatment option that is proving effective for certain patients. A recent randomized controlled trial demonstrated significant improvement with GNRFA throughout the 12-week follow-up period.[1] At Cleveland Clinic, we consider patients for GNRFA who have failed or are excluded from other treatment modalities.

Refractory knee pain a challenge

Chronic knee pain is often a challenging condition to treat. Pharmacologic interventions commonly fail to provide adequate relief and can be limited by adverse effects. Corticosteroid injections provide only temporary relief, while hyaluronate injections are expensive and controversial. Newer regenerative injection treatments such as stem cells and platelet-rich plasma are still considered experimental, and insurance does not often cover them. Surgical interventions for joint preservation are limited, and total joint replacement is often not an option for young or obese patients. Even after arthroplasty, unremitting knee pain continues to afflict some patients.

In our experience, GNRFA is a suitable management option for a subset of patients with inadequate response to more conservative modalities and even for those with postsurgical refractory knee pain.

First step: diagnostic genicular nerve block

The process begins with a diagnostic genicular nerve block under fluoroscopic or ultrasound guidance. Nerves are targeted adjacent to the periosteum on the medial aspect of the tibia, and at both the medial and lateral aspects of the femur at the junctions of the shaft and the epicondyle.

Under fluoroscopic guidance, the target is approached by introducing a spinal needle from either an anteroposterior or lateral entry point, with the final position residing adjacent to the bone. After negative aspiration, some physicians elect to administer contrast to exclude vascular uptake, avoiding a false-negative result. To conclude the procedure, 2 mL of local anesthetic is deposited on each of the superolateral, superomedial and inferomedial genicular nerves.

While GNRFA performed under fluoroscopy requires a procedure room, the ultrasound-guided procedure can be performed conveniently in the outpatient clinic setting without radiation exposure. In addition, two recent studies suggest ultrasound guidance improves accuracy of the diagnostic block by localizing arteries and soft tissues adjacent to the nerves.[2,3] Again, all three genicular nerves are routinely injected — the superomedial, superolateral and inferomedial branches. Other branches have been reported to innervate the knee, but they are not suspected to carry as much nociceptive output from the joint, so injecting them may be less effective. In patients who report pain only on the medial side of the knee, the physician may choose to inject only the nerves on that side.

When to proceed to therapeutic ablation

If the diagnostic injection produces at least 50 percent pain relief on a numeric pain rating scale, the patient is deemed a candidate for GNRFA. Exclusions include patients with systemic or local infection or electrical devices implanted in the region of the radiofrequency ablation. Additional vigilance is required in the presence of anatomic deformities or implantable cardiac rhythm devices when considering GNRFA because of the potential for a defibrillator to interpret radiofrequency as a shockable dysrhythmia. GNRFA can successfully be performed with arthroplasty or with other orthopaedic hardware in place.

> WHILE THE LITERATURE SUGGESTS RELIEF CONTINUES FOR 12 WEEKS, OUR PRACTICE HAS SEEN MANY PATIENTS SUSTAIN LENGTHY ANALGESIA, AT TIMES APPROACHING A YEAR.

The GNRFA procedure is typically performed with local anesthetic, although moderate IV sedation may be offered. Either ultrasound or fluoroscopic guidance may be used.

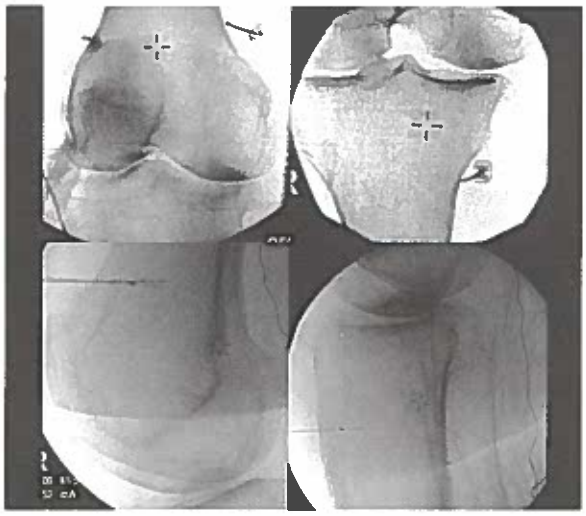

Figure. Fluoroscopic image of genicular nerve radiofrequency ablation.

Following local anesthetic infiltration, a radiofrequency cannula is guided in proximity to the locations of each nerve. Sensory stimulation can be used to confirm accurate placement. Motor stimulation is also performed to ensure the absence of adjacent motor fibers. After positive confirmation of sensory placement and negative motor testing, 2 mL of 2 percent lidocaine is administered adjacent to the nerve to mitigate pain associated with radiofrequency lesioning. Radiofrequency ablation is performed at a temperature of 70 degrees C for 90 seconds. Postprocedurally, patients remain ambulatory and often return to work the next day. A few days of localized soreness are expected following the procedure, with final results typically realized within one week.

Analgesia approaching a year

While the literature suggests relief continues for 12 weeks, our practice has seen many patients sustain lengthy analgesia, at times approaching a year.

Dr. Schaefer is Director of Musculoskeletal Rehabilitation at Cleveland Clinic. Dr. Bolash is an anesthesiologist and interventional pain management specialist in the departments of Pain Management and Evidence-Based Pain Research.

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NEW PM&R RESIDENCY, HOSPITAL

To meet the increasing national demand for physiatrists, Cleveland Clinic's Department of Physical Medicine and Rehabilitation (PM&R) has launched a residency program. The first class of residents in the three-year program began in July 2016.

As a large-volume tertiary referral center, Cleveland Clinic offers residents exposure to a diverse mix of complex patients in a variety of acute care and outpatient settings. "Our residency program will mirror our unique clinical environment," says Frederick S. Frost, MD, Chair of the Department of Physical Medicine and Rehabilitation. "We're building a curriculum to shape the next generation of PM&R clinicians, researchers and teachers."

Residents will rotate through Cleveland Clinic's main campus, its two community rehabilitation hospitals and various family health centers, as well as Cleveland Clinic Children's Hospital for Rehabilitation, the MetroHealth Rehabilitation Institute of Ohio, the Louis Stokes Cleveland VA Medical Center and the recently opened Cleveland Clinic Rehabilitation Hospital, a joint venture with Select Medical.

New Rehabilitation Hospital

The 60-bed inpatient rehabilitation hospital is adjacent to Cleveland Clinic's medical campus in Avon, Ohio, west of Cleveland. Most patients in this acute rehabilitation center participate in at least three hours of physical, occupational and speech therapy daily. A similar acute rehabilitation facility is expected to open in 2017 on Cleveland's Eastside.