A Tale of Two Knee Implants in the Same Person: Narcotics for the First and Anti-inflammatory Drugs for the Second

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ABSTRACT: Opioid addiction is a world-wide tragedy, with severe consequences for both the victims and the society that must care for them. The pathways to addiction are multiple but postoperative opioid prescriptions for pain management are a major contributor to this crisis. This case report describes the differences in pain management during 2 different arthroplasties of the knees in the same person. After the first arthroplasty of the right knee 10 years ago, postoperative opioids were used, but after the second arthroplasty of the left knee in 2007, anti-inflammatory drugs took the place of opioids. The first postoperative treatment with opioids was marked by addiction and a nasty withdrawal. The recovery of knee function, driving, and return to work were prolonged. After the second arthroplasty in 2007, a combination of meloxicam (COX-2 inhibitor), high-dose acetaminophen (COX-1 inhibitor at higher doses), and diclofenac topical gel (COX-1 inhibitor with local effects) produced excellent pain control and significant reduction in swelling of the operated knee. The clinical course was smooth and recovery was rapid. The patient was walking normally and driving a car at 2 weeks and took an airplane trip at 4 weeks. After arthroplasty, postoperative opioids may not be necessary for most people.

KEYWORDS: non-steroidal anti-inflammatory drugs (NSAIDs), Cyclooxygenase -1 enzyme (COX-1), Cyclooxygenase -2 enzyme (COX-2), COX-1 or 2 inhibitors, Opioids, Goniometer

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Postoperative arthroplasty of the knee is painful and narcotics are routinely prescribed to control pain.[1] Multiple side effects from opioids include constipation, drowsiness, nausea, dizziness, itching, weakness, dry mouth, sweating, appetite suppression, and addiction, to name the most common. It is unsafe to drive a vehicle while taking opioids. The worldwide opioid epidemic includes millions of persons who began their addictions following prescriptions of opioids after surgical procedures.[2]

COX-1 and COX-2 inhibitors interrupt inflammation via the prostanoid pathways, leading to a reduction in both swelling and pain.[3,4] The following case report was the experience of author D.D.S. as patient and author J.L.G. as physical therapist. In 2007, 10 years ago, narcotics were prescribed after patient's arthroplasty and in 2017 anti-inflammatory drugs were used after a second knee replacement. The details of the 2 postoperative courses are reported and shown in Table 1.

Case Report

In 2006, at age 71 years, a spontaneous microfracture of the tibial plateau of the right knee occurred in D.D.S. (patient). Four arthroscopies were unable to rescue the cartilage, and 8 months later, in July 2007, successful arthroplasty was performed without preoperative celecoxib 200 mg (by mouth) or blockade of the anterior branch of the femoral nerve. The patient was treated at home with physical therapy (J.L.G.), ice packs, and oxycodone 5 mg/acetaminophen 325 mg as needed for pain. Because of constant pain, accelerated during daily physical therapy and walking, oxycodone/acetaminophen was taken 2 to 3 times per day. Immediate onset side effects included constipation and drowsiness. Flexion was limited by swelling (see Table 1, 2007). The patient underwent a long and difficult recovery, culminating in opioid addiction and eventually an unpleasant narcotic withdrawal at postoperative week 5, driving a car started at 6 weeks, and return to work at 10 weeks.

Osteoarthritis of the left knee developed slowly and for many years was treated with increasing doses of a partial COX-2 inhibitor meloxicam 7.5 mg, starting with preexercise, then daily and eventually twice per day. Because of persistent pain and swelling, increased while walking, triamcinolone was injected into the knee but did not provide any therapeutic relief. In July 2017, arthroplasty of the left knee was performed. Preoperative celecoxib 200 mg was given by mouth. Anesthesia successfully blocked the anterior cutaneous branch of the femoral nerve, which prevented knee pain for 30 hours. After transfer from recovery room to his inpatient room, the patient immediately walked. The next morning, he was discharged to home.

Home program consisted of twice-daily physical therapy, ice packs, and every 6 hours meloxicam 7.5 mg, extra strength acetaminophen 500 mg capsules, and diclofenac sodium gel applied to the cutaneous surface around the operated knee. For many years, the patient has been unable to take oral COX-1 inhibitors (aspirin, naproxen, and ibuprofen, etc) because of gastritis with epigastric pain.[4] Topical diclofenac gel was used in place of oral COX-1 inhibitors.[5] Meloxicam at a dose of 7.5 mg, unlike COX-1 inhibitors, is a partial COX-2 inhibitor which only partially blocks COX-1 and thus maintains

Table 1. Goniometric measurements of range of motions of the operated knee and levels of pain.

	DAY 2	DAY 4	DAY 6	DAY 8	DAY 11	DAY 13	DAY 16	DAY 19	DAY 21	DAY 120
2007										
Flexion	78	76	78	70	85	87	93	98	105	120
Extension	–25	–20	–17	–14	–13	–11	–10	–8	–6	0
Pain 0-10	8–9	8–9	5–8	4–8	3–8	0–8	0–8	0–8	0–8	0
2017										
Flexion	84	90	95	100	100	100	105	110	112	120
Extension	–30	–22	–22	–16	–16	–16	–14	–13	–11	0
Pain 0-10	1–3	1–2	1–2	0–1	0–2	1–2	0–1	0–1	0–1	0

Normal: knee flexion 135° and extension 0°.
Pain levels were recorded by J.L.G. during the 3 weeks of PT home visits. Day 120 was recorded during visits in the orthopedic department. The first number was recorded at rest and the second number during walking and/or stretching exercises (pain levels: 0 = none and 10 = most severe).

synthesis of prostacyclin (PGI_2). This difference allows PGI_2 to continue to stimulate mucosal cell replication and thus eliminated epigastric pain. Knee pain was absent at rest after day 7 and never exceeded a scale of 1 or 2 while walking or during physical therapy (see Table 1, 2017). Therefore, oxycodone was never needed or taken. With this protocol, swelling of the knee was minimal, which allowed early flexion and extension of the knee. Most pain occurred in surrounding muscles and the iliotibial band. At 2 weeks, the patient's walking gait was judged to be normal by J.L.G. The patient also began driving his car at 2 weeks, as contrasted with 6 weeks after arthroplasty in 2007. At 3 weeks, the patient walked longer distances, continued all stretching and aerobic exercises, shopped for groceries and other products, and was essentially back to normal. The 3 anti-inflammatory drug combinations did not induce any side effects. After the first week, sleep was restorative and free of nocturnal knee pain.

At 4 weeks follow-up, knee x-rays and physician assessment were normal. After 4 days, the patient traveled by airplane (coach) from San Diego to Seattle and there was more stiffness and transient joint swelling during and after the trip. At 4 weeks and 5 days, after walking 2 miles, left quadriceps muscle spasm occurred (severe pain with straight leg rising) and there was an increase in swelling in the knee joint. Rest, ice packs, and continued anti-inflammatory medications resulted in return to baseline in 72 hours. At 5 weeks and 4 days, airplane travel was again associated with pain, swelling, and stiffness at rest during the 4-hour travel time. After returning home, knee pain was again minimal. Part-time physician employment was resumed at 6 weeks.

At 7 weeks, diclofenac gel was discontinued and doses of meloxicam and acetaminophen were changed to every 8 hours with no increase in pain at rest or exercises. Walking was increased to 1.8 miles every other day. Daily knee stretching exercises were continued. All normal activities were continued, except tennis. At 8 weeks, doses of meloxicam and acetaminophen were changed to twice daily. There was no increase in knee pain. At 9 weeks, acetaminophen and meloxicam were reduced to once each morning. Exercise and walking were continued once per day. At 10 weeks, all anti-inflammatory medications were discontinued. There was no pain except during maximum flexion of the operated knee. At 14 weeks, tennis was restarted.

Discussion

The idea of preventing pain by preemptive use of anti-inflammatory drugs never allowed much pain to be generated in the first place. Pain management therefore flowed from a reduction in inflammation. The maximum recommended 24-hour dose of meloxicam is 15 mg twice daily. Meloxicam 7.5 mg ×4 is 30 mg/d but spread out more evenly over 24 hours. The other COX-2 inhibitor celecoxib, taken either 100 or 200 mg every 12 hours, could be substituted for meloxicam but was not used in this case. Acetaminophen is a weak COX-1 inhibitor and therefore higher doses are needed. If consuming alcohol, out of concern for inducing hepatic necrosis, a dose should not exceed 2000 to 3000 mg/24 hours, although up to 4000 mg/24 hours is generally safe in individuals not consuming alcoholic beverages. In 2007, a small dose of acetaminophen 325 mg 3 times per day was ineffective as an anti-inflammatory drug. The COX-1 inhibitor diclofenac, delivered as a local gel around the operated knee 4 times per day, meets Food and Drug Administration (FDA)-approved dosing schedules.[5] Diclofenac gel effectively blocked most knee pain, when meloxicam was discontinued a week prior to arthroplasty in 2017. For patients without COX-1 inhibitor gastritis, an oral COX-1 inhibitor would be an alternative choice as the third drug in this protocol. OTC Aleve (naproxen) 220 mg 2 to 4 times per day might be satisfactory. About 15% of the population cannot ingest COX-1 inhibitors because of gastric pain.[4]

This case report provided a unique opportunity to study the differences in postoperative pain management, namely, opioid vs anti-inflammatory medications. Opioids were the standard postoperative choice 10 years ago and the painful, opioid-addicted, and prolonged postoperative course in 2007 was

common. The 2017 postoperative anti-inflammatory drug treatment allowed early joint movement and a large reduction in pain. Opioids were never needed. Differences in pain thresholds from one person to the other cannot explain the differences in the 2 postoperative courses because they occurred in the same patient.

Author Contributions

DS wrote first draft and edits; JG provided data for table and edits.

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