CHAPTER **40**

LOCAL ANESTHETIC PAIN PUMPS IN FOOT AND ANKLE SURGERY

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INTRODUCTION

Infusion pumps are designed to regulate the flow of drugs and fluids into patients.[1] They are an integral part of the care of surgical patients from anesthetic management in the operating room to postoperative management in the hospital. Local anesthetic pain pumps are commonly used for postoperative pain management. Their indications, protocol, advantages, and potential risks and complications are well documented in the orthopedic literature, however there is a paucity of published manuscripts in the podiatric literature. Local anesthetic pain pumps can greatly reduce the amount of narcotic medication needed during the initial postoperative period, thus reducing the common side effects of narcotic pain medications including nausea and vomiting, suppressed breathing, and altered mental status, thus providing a faster postoperative recovery course.

Many podiatric surgeons admit medically stable patients to the hospital for 24 to 72 hours purely for pain management after rearfoot and ankle procedures or those patients that will be a pain management challenge postoperatively either because of their history of intolerance to certain commonly used pain medications or a perceived "low pain threshold." It is the author's supposition that local anesthetic pain pumps should be considered in the management of rearfoot and ankle surgery, nerve surgery such as tarsal tunnel and revisional neuroma or stump neuroma surgery, or in the patient that your clinical acumen tells you will be difficult to manage as far as their post-operative pain is concerned.

AVAILABLE MODELS

The mechanism of action for the different types of local anesthetic pain pumps is either mechanical or electrical. These pumps are used to deliver drugs and other substances to patients at a pre-set rate. They are classified according to their application, whether ambulatory, patient controlled, anesthesia or general purpose units.[1]

Striker, maker of the Pain Pump® and Pain Pump 2® and I Flow, makers of the ON-Q systems are the manufacturers of the most commonly used local anesthetic pain pump systems. Stryker offers an infusion canister which allows for the infusion of 120cc of anesthetic. This is a vacuum driven system with a clear canister and cannulations that allow the patient and physician to follow the rate of infusion. The infusion rate can be set from 0.6–4ml per hour. The Pain Pump® and Pain Pump 2® are electromechanical pumps designed to deliver a controlled amount of medication to the patient for pain management. The Pain Pump® and Pain Pump 2® deliver local anesthetic using either one or both of the following drug delivery profiles: an hourly flow rate and a bolus PCA dosing option. The physician sets and locks the required drug delivery parameters before starting infusion. The patient can activate a bolus dosage only if the physician has selected this option. Drug delivery parameters are locked for the life of the unit. These units have either a 250cc or 400cc capacity and have programmable infusion rates of 0.5-10cc/hour, bolus amounts of 1-5 cc/hour, and bolus lockout times of 12, 30, 45, 60, 90, or 120 minutes.

The On-Q Pain Management System provides a continuous infusion of local anesthetic directly into the patient's operative site for postoperative pain management. The system consists of an elastomeric pump filled with local anesthetic. As with the previously mentioned systems, On-Q offers multiple units that basically differ in the amount of anesthetic they hold. This ranges from 65-335 mls. The rate of infusion can be adjusted from 0.5–4 ml/hour (2 per site). Bolus dosages are not available with these units.

DISCUSSION

Systemic drugs such as narcotics can provide analgesia, but often have side effects such as respiratory depression, excessive sedation, and nausea and vomiting. Regional anesthesia reduces the need for systemic medication but requires a painful injection and repeated dosing and is logistically difficult in the outpatient environment. Local anesthetic pain pumps provide the pain management relief of a regional anesthetic without the logistical challenges for the outpatient.

In a recent orthopedic study that followed 500 patients that received a local anesthetic pain pump postoperatively, there were clear advantages to the patients who had the pump compared with the patients that were managed traditionally. During the first 48 hours, patients with the pump used on average 7.6 fewer narcotic pills than a comparable group of patient with similar procedures who did not have the pain pump in place. They also found, in a subset of knee patients, physical therapy was decreased by an average of 2.1 visits, probably secondary to less quadriceps inhibition, and they went back to work an average of 3.6 days sooner.[2]

In another study evaluating forefoot operations, clear advantages in the group using the local anesthetic pain pump were again seen. One was lessening the amount of anxiety the patients perceived they had concerning severe post-operative pain. Anxiety is known to reduce the pain tolerance threshold in the patient while increasing the patient's sensitivity to pain. One hundred-forty-five patients undergoing forefoot procedures were treated. Eighty reported no pain and assigned the number 0 to their experience. Thirty of the patients indicated the number 1 as a fair assessment of the slight discomfort they had undergone at the operated site. Twenty-five felt moderate pain only on the dorsal hallux and assigned it a number 2, and in 10 cases severe and intense pain was reported (severe enough to use nonsteroidal anti-inflammatory medications). The author's results were extremely encouraging. In the 10 cases where it was necessary for analgesics, the authors found that 6 cases had the catheter malpositioned. Also, 4 cases experienced a malfunction of the irrigating system.[3]

In another study performed at the University of Texas San Antonio Health Science Center, 20 patients were evaluated postoperatively after undergoing podiatric procedures. All 20 patients had the infusion catheter placed in the area of the popliteal nerve, and 10 received 0.25% Marcaine, and the other 10 received saline. All 10 patients in the saline group had to be admitted, compared with 4 in the Marcaine group (actual total was six admissions in the Marcaine group, however two were purely for social issues). Ninety (90) percent of the Marcaine group stated they were completely satisfied with their pain management while only ten (10) percent of the saline group could say the same. Although this is a small study, it is very consistent with the data evaluated with other studies comparing pain levels and patients satisfaction when a local anesthetic pain pump is used postoperatively.

Local anesthetics delivery systems decrease postoperative pain without the effects of oral narcotic analgesics, as well as decreasing patient admissions for pain control. Increasing patient comfort after surgery reduces cost by decreasing the amount of pain medications needed, and shortening hospital stays.[4]

RISKS AND COMPLICATIONS

A common concern among surgeons considering using portable pain management technology has been the risk of infection. In reality, the risk is very small. Winters followed a group of 500 patients in their orthopedic practice who used a local anesthetic pain pump, and the infection rate was less than 0.2%.

Some studies have actually shown that local anesthetics have a bactericidal effect. In a study done by Sakuragi et al, results showed that preservative free bupivacaine possesses bactericidal activity on strains of *S. aureus, S. epidermidis,* and *E. coli* as microorganisms in the human skin flora.[5] Another study by Rosenberg et al, concluded that high concentrations of local anesthetics may provide some protection against bacterial and fungal infections, however any benefit may be negated by the fact that local anesthetics also inhibit phagocytosis and leukocytosis.[6] Based on the infection rated reported on patients using local anesthetic pain pumps, and the review of the existing literature, continuous wound site pain management does not increase the risk of developing a surgical site infection.[7]

Some studies documented slight leakage at