Local Infiltration of Liposomal Bupivacaine in Foot and Ankle Surgery to Manage Postoperative Pain

Yashraj A. Chauhan, DPM, AACFAS[a], Jason R. Miller, DPM, FACFAS[b]
[a]Post-Graduate Fellow, Pennsylvania Intensive Lower Extremity Fellowship, Premier Orthopaedics and Sports Medicine, Malvern, PA
[b]Fellowship Director, Premier Orthopaedics and Sports Medicine, Malvern, PA

Statement of Purpose

Regardless of complexity, foot and ankle surgical procedures can be extremely painful. Furthermore, there is increasing interest to minimize patient admissions and perform these procedures on an outpatient basis. Recently, liposomal bupivacaine, a non-opioid local anesthetic, was approved for administration into the surgical site for postoperative analgesia. Given its extended-release nature, liposomal bupivacaine is increasingly being utilized in attempts to provide continuous and effective local analgesia. The purpose of this study is to determine the efficacy of liposomal bupivacaine by quantifying the duration of analgesia and postoperative pain control.

Methodology & Hypothesis

A case series of 69 patients receiving a liposomal bupivacaine injection directly into the surgical site from one hospital are included in this study from the patient population of the senior author from 11/12/15 to 9/1/17. The inclusion criteria included patients who obtained forefoot/midfoot, rearfoot and/or ankle surgery. Postoperatively, unless contraindicated, all patients received post-op medications of oxycodone/acetaminophen 5 mg, ketorolac 10 mg and ondansetron 4 mg. At their first follow-up visit (within 8-10 days), patients were asked to estimate the duration of postoperative analgesia into one of four intervals: < 24 hours, 24-48 hours, 48-72 hours or > 72 hours.

Our hypothesis was that use of liposomal bupivacaine placed in and near incisions following the completion of foot and ankle surgery would adequately provide postoperative analgesia in most patients for approximately 48-72 hours. As a result (although not analyzed), we anticipate a decrease in opioid consumption postoperatively.

Procedure

After the specific forefoot/midfoot, rearfoot and/or ankle surgical procedure was performed, liposomal bupivacaine was directly infiltrated into and near the surgical site. As per manufacturer protocol, liposomal bupivacaine was injected slowly into deep tissues using a moving needle technique (inject while withdrawing the needle). Furthermore, it was infiltrated above and below fascia and into subcutaneous tissues utilizing a 25-guage needle taking care to aspirate frequently. In regards to volume, approximately 30 milliliters (mL) of 1:1:1 mix of liposomal bupivacaine:bupivacaine HCl:saline was administered for forefoot/midfoot procedures and approximately 60 mL of the aforementioned mix was administered for rearfoot and ankle procedures. A handful of patients underwent multiple procedures in terms of location; in those cases, approximately 60 mL of the cocktail was injected.

Results

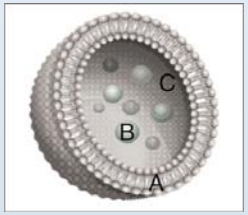
The final study population consisted of 69 patients with 87 procedures being performed (38 left and 31 right). The average age was 54.5 years and the male:female ratio was 31:38. Of the 89 procedures, 17 were performed in the forefoot/midfoot region, 16 were performed in the rearfoot region and 54 were performed in the ankle region (Table 1).

In regards to the effectiveness of the liposomal bupivacaine, 48 patients reported to having postoperative analgesia for approximately 48-72 hours, while 12 patients related to having no surgical pain even after 72 hours (Figure 1). The remaining 9 patients estimated the local anesthesia being effective for only 24-48 hours. No complications, wound problems or adverse reactions were noted from the injection.

Table 1

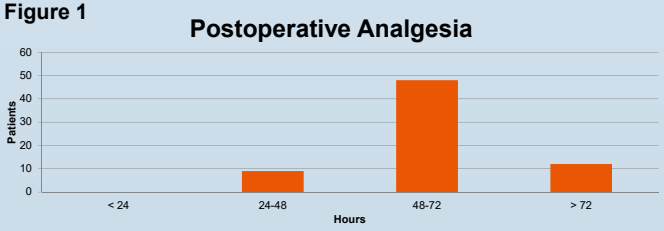
Age	(n = 69)	
Average	54.5	
Male	56.4	(19 - 83)
Female	52.8	(16 - 81)
Sex	(n = 69)	
Male	32	46.4%
Female	37	53.6%
Laterality	(n = 69)	
Left	38	55%
Right	31	45%
Procedures	(n = 87)	
Forefoot/Midfoot	17	19.5%
Rearfoot	16	18.4%
Ankle	54	62.1%

Figure 2



Liposomal bupivacaine.
A. Outer phospholipid bilayer.
B. Bupivacaine
C. Inner aqueous core.

Figure 1



Discussion

Liposomal bupivacaine is composed of liposomes with an inner aqueous core containing bupivacaine surrounded by a phospholipid bilayer (Figure 2). The outer core is heat-sensitive and allows for the extended release of bupivacaine over 72 hours without reaching systemically toxic levels.[1] For this reason, it has been increasingly utilized throughout all surgical specialties.

Several studies have shown liposomal bupivacaine to be a useful adjunct in multimodal postoperative pain control regimens. Multiple reports in the hip and knee arthroplasty literature associate the use of liposomal bupivacaine with decreased pain scores and narcotic consumption in the early postoperative period, decreased length of stay and decreased cost.[2] However, its use remains controversial and has yet to become a fully accepted anesthetic option.

The literature in regards to its application in foot and ankle surgery remains limited compared to other orthopedic specialties. In a clinical trial, Golf et al compared use of liposomal bupivacaine to placebo and found decreased pain scores up to 36 hours postoperatively, decreased opioid use and higher percentage of patients who were pain free.[3] Similarly, Robbins et al showed a significant decrease in narcotic consumption at day 1 and 2 following forefoot surgery and a trend toward decreased daily pain scores and fewer pain medication refills postoperatively.[4] Furthermore, Mulligan et al noted the use of liposomal bupivacaine to be safe and effective as an option for regional anesthetic and postoperative pain control, with comparable results to continuous popliteal sciatic nerve block.[5]

Although the previous studies exhibit the benefits of liposomal bupivacaine, our study differs in that it quantifies the duration of analgesia and postoperative pain control. We found excellent postoperative analgesia lasting up to and even greater than 72 hours in most patients. As a result, overnight admissions were decreased and physician office contacts were minimized postoperatively in regards to pain management.

References

1. Huh J, Parekh SG. Liposomal bupivacaine in hallux valgus surgery: a multimodal pain management adjunct. *J Surg Orthop Adv*. 2014;23(4):198-202.
2. Surdam JW, Linici DJ, Baynes NT, Arce BR. The use of Exparel (liposomal bupivacaine) to manage postoperative pain in unilateral total knee arthroplasty patients. *J Athroplast*. 2015;30(2):325-329.
3. Golf M, Daniels SE, Onel E. A phase 3, randomized, placebo controlled trial of DepoFoam bupivacaine (extended-release bupivacaine local analgesic) in bunionectomy. *Adv Therapy*. 2011;28(9):776-788.
4. Robbins JR, Green CL, Parekh SG. Liposomal bupivacaine in forefoot surgery. *Foot Ankle Int*. 2015;36(5):503-507.
5. Mulligan RP, Morash JG, DeOrio JK, Parekh SG. Liposomal bupivacaine versus continuous popliteal sciatic nerve block in total ankle arthroplasty. *Foot Ankle Int*. 2017;38(11):1222-1228.