Preliminary Report

Use of Abdominal Field Block Injections With Liposomal Bupivacaine to Control Postoperative Pain After Abdominoplasty

Rolando Morales Jr, MD; Henry Mentz III, MD, FACS, FICS; Germán Newall, MD, FACS, FICS; Christopher Patronella, MD, FACS, FICS; and Oscar Masters III, MD

Abstract

Background: It is well known that improving postoperative pain control in plastic surgery procedures leads to earlier mobilization, shortened hospital stay, reduced hospital costs, and increased patient satisfaction.

Objective: The authors evaluate the use of abdominal field block injections with liposomal bupivacaine (Exparel; Pacira Pharmaceuticals, Inc, San Diego, California) in postoperative pain management in patients undergoing abdominoplasty with rectus plication.

Methods: Case records from 64 female patients who underwent abdominoplasty with rectus plication were reviewed. We performed a total of 118 abdominoplasties with rectus plication, alone or in combination with other surgical procedures, from August 2012 to December 2012, but 54 patients were excluded from the series due to inadequate follow-up. Patients received liposomal bupivacaine injections in an abdominal field block fashion. Patient age, height, weight, and smoking status were recorded. Delivery of standardized postoperative intramuscular or intravenous injections and oral pain pills was recorded. Postoperative data and questionnaires were used to evaluate clinical efficacy.

Results: The average number of procedures (including abdominoplasty with rectus plication) per patient was 7. Average patient body mass index was 27 kg/m². Average pain scores were 3.5 (postoperative visit 1) and 2.8 (visit 2). The average number of oral pain pills required was 14 at the first postoperative visit and 11.5 at the second postoperative visit. Patients were able to resume normal activity at an average of 6.4 days.

Conclusions: Our experience with liposomal bupivacaine injections for regional blocks in abdominoplasty with rectus plication indicates that patients experienced reduced postoperative pain, required less postoperative narcotic medication, and resumed both earlier ambulation and normal activity. Further investigation is warranted with more clinical cases to recommend the use of this medication for routine pain management after an abdominoplasty.

Level of Evidence: 4

Keywords

abdominoplasty, liposomal bupivacaine, postoperative pain

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pain infusion pumps have shown promise in reducing postoperative pain, but results are variable in the literature. The original devices developed in the 1950s were bulky, complicated, and required constant monitoring. As the technology was refined, the pain pump has become smaller, more precise, does not have the need for continuous monitoring, and is now disposable. We published our experience with use of these pumps in 2005 and found that the pump decreased postoperative pain, encouraged earlier patient mobility, and decreased the use of oral narcotics. However, despite improvements in the device, refinements in surgical techniques, and optimization of catheter placement, these pumps still have several disadvantages, including the inconvenience of additional catheters, additional costs, their potential as a source of infection, and their potential contribution to seroma formation. As another reliable method to improve the management of postoperative pain, a liposomal bupivacaine suspension (Exparel; Pacira Pharmaceuticals, Inc, San Diego, California) was introduced to the market in early 2012. Its use for posthemorrhoidectomy pain management was first published in May 2012. Results from that study showed that it significantly reduced postoperative pain compared with bupivacaine HCL.

In this study, our objective was to investigate the use of abdominal field block injections with the liposomal bupivacaine suspension in postoperative pain management in patients undergoing abdominoplasty with rectus plication. We hypothesized that the many advantages associated with injecting a long-acting anesthetic would translate directly into decreased pain, decreased need for oral pain medications, earlier ambulation, and earlier resumption of normal activities in the postoperative recovery period.

**METHODS**

We performed a total of 118 abdominoplasties with rectus plication, alone or in combination with other surgical procedures, from August 2012 to December 2012. Sixty-four patient charts were included in this study. The remaining 54 patients were excluded because they were unable to return to the office for follow-up, could not provide accurate pain pill numbers, or could not be contacted by phone within the set time frame for performing the postoperative questionnaires. All procedures performed by 4 plastic surgeons took place at the same outpatient surgical facility and were conducted with the patient under general anesthesia. All patients received injection of liposomal bupivacaine suspension in an abdominal field block fashion. Patient age, height, weight, and smoking status were recorded. At our surgical facility, abdominoplasty patients are usually admitted for overnight observation. Postoperative intramuscular or intravenous injections administered in the recovery unit and overnight facility were recorded. Pain scores and oral pain pill requirements were recorded in the recovery unit, in the overnight facility, and at 2 subsequent postoperative visits. Patients were called later in their postoperative course by a patient coordinator to document what day they returned to normal activity. Procedures were classified by a modified level of severity as described by Feng et al., as indicated in Table 1 and Figure 1.

**Technique**

The technique of abdominoplasty remained consistent for all patients. The abdominal flap was raised and the anterior rectus fascia was plicated from the xiphoid process to the pubic symphysis. The liposomal bupivacaine was then constituted by the operative nurse. A 20-mL vial was diluted with 60 or 80 mL of sterile normal saline for a final volume of 80 or 100 mL. Using a 27-gauge needle on a 10-mL syringe, the liposomal bupivacaine suspension was injected in an abdominal field block fashion (Figures 2 and 3). Beginning cephalically, the abdominal flap was injected deep to Scarpa’s fascia at the base of the flap. As the injector proceeded laterally, the injection was directed into the fascia of the external obliques. The midline rectus plication was also addressed, with injection of the anesthetic just deep to the fascial plication. Pararectus injections were also performed just deep to the fascia. Finally, the sub-Scarpa’s tissue of the caudal flap of the transverse incision was injected, as well as the tissue around the surgical drains. After the procedure was complete, the patient was awakened from general anesthesia and transferred to the

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**Table 1. Modified Classification Level of Severity as Described by Feng et al.**

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<th>Classification of Patient Procedures by Surgery Severity Classes</th>
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**Figure 1.** Modified classification level of severity as described by Feng et al.3
recovery unit. Postoperative pain control in the recovery unit and overnight observation facility included intravascular or intramuscular injections of meperidine or morphine on an as needed basis. Twenty patients were discharged the day of surgery, and 44 patients were discharged the next day following an overnight observation. Patients returned for follow-up within the first week of surgery, but patients were called for follow-up and asked the study questions if the first postoperative visit was to exceed 4 days. At this time, patients were asked to rate their subjective abdominal pain score on a scale of 1 to 10, asked how many pain pills they had taken (or how many remained), and asked on what postoperative day they were able to walk 10 steps or more. At the second postoperative visit, these questions were repeated. Patients were also called later in their postoperative course to document what day they returned to normal activity.

RESULTS

All patients were women. The average patient age was 42 years (range, 25-67 years). The average body mass index (BMI) of the patients was 27 kg/m². Most (n = 55) patients fell into severity class IV, with an average number of 7 procedures (Figure 4). The average first postoperative contact, whether at follow-up appointment or during a phone call, was 3 days. The average time of second postoperative contact was 7 days.

The average pain scores in the recovery unit, during the first postoperative visit or call and during the second postoperative visit or call, were 5.25, 3.5, and 2.8, respectively (Figure 5). The average number of oral pain pills required at the first and second postoperative visits was 14 and 11.5, respectively. The total average cumulative postoperative pain pill requirement was 25.5 (Figure 6). The average length of time patients reported resuming normal activity postoperatively was 6.4 days (range, 1-30 days). All patients ambulated on day 1.

DISCUSSION

The liposomal bupivacaine injection suspension (Exparel) described here is a new, unique option for long-term local anesthesia. The trademark multivesicular liposomal delivery system allows molecules of bupivacaine to be encapsulated...
without altering their molecular structure. The delivery system structure resembles a spherical honeycomb. The walls of the system are made of a naturally occurring lipid layer that forms multiple aqueous chambers. Each chamber contains multiple molecules of bupivacaine. As the body resorbs the lipid walls, the unaltered bupivacaine is slowly released over time into the surrounding tissue. It has been shown that systemic plasma levels of bupivacaine can persist up to 96 hours after injection. The product is currently available only in a 20-mL single-use vial, 1.3% (13.3 mg/mL). The total dose of bupivacaine administered in a 20-mL vial is 266 mg, which is the recommended maximum dosage of liposomal bupivacaine (266 mg of liposomal bupivacaine is equivalent to 300 mg of free bupivacaine). The maximum safe dose of bupivacaine recommended is 400 mg in a 24-hour period. The major contraindication for its use is obstetrical paracervical block anesthesia. The product should be used with caution in those patients with hepatic disease. Other formulations of bupivacaine should not be administered within 96 hours following administration of the product. It is also recommended that other nonbupivacaine-based local anesthetics such as xylocaine not be admixed with the product, as it may competitively displace the bupivacaine within the liposomes and potentially affect the safety and efficacy of the product. Previous pharmacokinetic studies of the product in total knee arthroplasty have shown 2 plasma concentration peaks in an absorption profile. The first peak is within 0 to 2 hours, which is believed to be the small amount of “free” bupivacaine contained within the product. This is theoretically the time-to-onset of the product. The second peak is approximately 36 hours and subsequently decreases over time.

Our experience with liposomal bupivacaine suspension injections for abdominal field blocks in abdominoplasty with rectus plication indicates that patients require less postoperative narcotics, and they resume both earlier ambulation and normal activity. There have been previous studies of abdominoplasty with the use of anesthetics for blocks. Feng et al described administering intercostal, ilioinguinal, iliohypogastric, and pararectus blocks with a mixture of bupivacaine with epinephrine, Pontocaine, and Depo-Medrol. They reported a significant decrease in postoperative pain in the immediate recovery period. However, the study was limited in that efforts to obtain subjective pain scores from a patient in the immediate recovery period were often impaired by the systemic effects of general anesthesia. Sforza et al also used a similar technique in placing a specific anesthetic block in the transversus abdominis plane. This study was also limited to the immediate postoperative recovery period; more important, that nerve block technique is much more difficult to perform, and there is a significant risk of inadvertent peritoneal puncture. We believe our current injection technique is safer, in that it involves a more superficial injection of the anesthetic. The anesthetic is diluted with 60 or 80 mL of normal saline for a total volume of 80 or 100 mL. This larger volume is typically used in procedures where more surface area would be covered, such as an extended abdominoplasty or body lift. We found that at this dilution, the anesthetic coverage is increased without impairing efficacy. More anesthetic is deposited in the known areas of the ilioinguinal, iliohypogastric nerves; fascia just lateral to the rectus muscles; and the midline along the rectus fascia plication. Postoperative discomfort can also be minimized by injecting the areas around the surgical drains.

Previously, a bupivacaine pain pump improved the postoperative recovery experience for our patients. However, the multiple disadvantages included the added cumbersome burden of another catheter and heavy balloon pump, malfunction, kinking of the catheter, seromas, and infections. We have since fully converted to injecting liposomal bupivacaine for all our abdominoplasty and body contouring procedures. In our previous study, we found that patients took an average of 16.8 pills postoperatively for pain management; with the injection of liposomal bupivacaine, we have decreased the number of pills.

Figure 5. Pain scores. PACU, postanesthesia care unit; PO, postoperative.

Figure 6. Pain pill requirements. PACU, postanesthesia care unit; PO, postoperative.
for pain to an average of 14 at the time of the first postoperative visit. The average number of pills for the second postoperative visit was 11.5, which shows a significant decrease in the immediate postoperative recovery period. This correlates with our clinical findings, in that patient calls for pain medication refills have dropped drastically since we switched from the pain pump to injection of liposomal bupivacaine. We suspect that the decreased refill requests attest to the novel delivery mechanism of the bupivacaine. Pain pumps “bathe” the surgical bed with anesthetic, and we suspect that some of it is removed when closed suction drains are used. Some areas of the surgical bed may have “pools” of anesthetic, while other areas might be devoid of it. With direct injection of liposomal bupivacaine, the anesthetic can be delivered in known locations of the nerves and will otherwise remain where it was placed. Finally, we believe that a reduction in early postoperative analgesics may reduce the tolerance of later use and allow improved effectiveness of opiates in the second week.

We are convinced by the results of the current study that our patients’ postoperative recovery experience was significantly improved by liposomal bupivacaine, and we are continuing to expand our use of the product into other plastic surgical procedures. We are currently injecting liposomal bupivacaine for breast cosmetic procedures such as secondary procedures, reductions, lifts, and augmentations. Anecdotally, we can say that, as we predicted, those procedures that involve more internal and/or deeper tissue dissections prove to have the most significant decrease in postoperative pain. However, its cost does limit its use from an economic standpoint.

There are major limitations and deficiencies in our study that warrant further discussion. First, we did not include comparison groups. We were so impressed with the efficacy and multiple advantages with liposomal bupivacaine that we essentially stopped using the pain pump in our surgicenter. Our initial draft of this article included a “control group” of 3 patients and a single pain pump patient. However, these numbers are not high enough for meaningful comparison; the recommended minimum number of patients for a control group would be 25% of the treatment group. A second limitation was the multiple procedures we performed in conjunction with abdominoplasty with rectus plication. As one would expect, adding additional procedures creates loci of pain, not to mention the fact that some procedures are more painful than others. This would relate directly to the total number of pain pills required. Another limitation of the study is the questions we asked about the subjective pain scale and normal activity. Despite precise questioning regarding abdominal pain, some patients may not have answered the question appropriately. The question about the day on which a patient had first been able to ambulate for 10 or more steps has no reference for validity. However, we believe the average number of steps from the bed to the bathroom or another room where the patient is recovering is usually within 10 steps. Resumption of ambulation sooner in the immediate recovery period has been well established in reducing the incidence of thromboembolism. The question of “normal activity” was also subjective. We attempted to expand the question by saying, “When did you first go out of the house for reasons other than follow-up appointments—for example, stores, shopping, taking a leisure walk, school, work?” Every patient has a different personal/family life with unique baseline activity levels. Some people are baseline sedentary and avoid leaving the home, while others cannot sit still or stay at home. Also, the level of postoperative home care may have had an effect on their recovery. It was not uncommon for patients to have limited help from friends or family during their recovery period.

Another limitation to our study is the lack of complications reported. We did not experience systemic or local complications associated with the product. The most common side effects of the medication as described by the prescribing information are nausea, vomiting, and constipation. These symptoms are often associated in the recovery period with general anesthetic and narcotic administration. Our experience with the product previously did not raise significant concern over intravascular injections, as this risk is unlikely. Hematomas are known to occur with local administration into tissue. However, this would be skewed with the concurrent use of oral anticoagulation for thromboprophylaxis. We did find a unique clinical effect of the product. Many of our patients had minimal to no abdominal pain and would overexert themselves in the early postoperative recovery. This most often resulted clinically in prolonged swelling or fatigue rather than pain. No complications of incision or plication dehiscence occurred. Finally, we recognize that our study is limited due to not being a double-blinded, randomized, and active-controlled study. We only share our preliminary experience with the product and look forward to future institutional studies with more intensive investigations.

**CONCLUSIONS**

In conclusion, the simplicity of direct injection of long-acting local anesthetic for abdominal field blocks and the added benefit of decreased narcotic use suggest improved recovery with early resumption of normal activity and reduction of sequelae from oral pain medications. Further investigation is warranted with more clinical cases to recommend the use of this medication for routine pain management after an abdominoplasty.

**Disclosures**

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REFERENCES


