



INTRAPEEC Injection with Liposomal Bupivacaine Mixed with Bupivacaine Can Prolong Postoperative Control of Pectoral Spasm After Subpectoral Breast Implantation: Case Report

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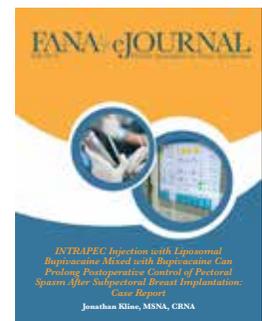
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INTRAPEEC injection with liposomal bupivacaine mixed with bupivacaine can prolong postoperative control of pectoral spasm after subpectoral breast implantation: case report

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INTRODUCTION

This case study reports the use of a liposomal bupivacaine and bupivacaine (Marcaine) mixture as the agent for INTRAPEEC injection, leading to prevention of intraoperative and postoperative pectoralis muscle spasm from subpectoral breast reconstruction. Liposomal bupivacaine is a high-concentration slow release formulation of bupivacaine encapsulated in liposome known as DepoFoam. The indications for liposomal bupivacaine are continuing to expand and currently can be used for single-dose infiltration in adults and interscalene brachial plexus nerve block. Safety and efficacy have not been established in other nerve blocks. As of this writing, liposomal bupivacaine is indicated for infiltration injections and was recently approved by the Food and Drug Administration for interscalene brachial plexus block for shoulder surgery. In 2018, a novel technique described specifically for the purpose of intraoperative as well as postoperative control of pectoralis muscle spasm was reported, called the INTRAPEEC¹. This ultrasound-guided injection is instituted before surgery, theoretically preventing spasm and pain before surgical insult.

Review of literature

In 2018, a report was published involving a novel ultrasound-guided technique to target relaxation of the pectoralis major muscle via a simple, direct intramuscular injection. The article reported favorable results for not only the patient postoperatively but also the surgeon intraoperatively. An important aspect of the case report was that relaxation and flaccidity of the pectoralis muscle was achieved absent parenteral muscle relaxants¹. Shin and colleagues² performed intramuscular injections of the pectoralis and subscapularis muscles for pain after mastectomy. Curiously, this pain manifested itself in the shoulder. They reported that postmastectomy shoulder pain could successfully be treated from this combination technique. Their technique does describe an intramuscular injection performed under ultrasound. However, it targeted postoperative treatment options for a persistent symptomatic patient. No mention of preoperative placement is found². Govshievich and colleagues³ reported a case presentation of a interfascial pectoral injection performed postoperatively for muscular pain after breast surgery. This involved using the traditional PECs 1 block as a diagnostic measure to more accurately identify the pain generator. The PECs 1 block was done using ultrasound with symptom relief³. In 2011, O'Donnell and colleagues⁴ successfully treated a patient with persistent pectoral muscle spasms after remote breast surgery. Again, this injection was performed after breast surgery as a treatment for spasms of the pectoralis major muscle. In this

case they injected botulinum toxin type A (Botox) as a treatment for pectoral muscle spasm and pain relating to surgery. In 2014, Leiman and colleagues⁵ reported the successful use of liposomal bupivacaine for an ultrasound-guided PECs 1 block specifically for the management of postoperative pain after breast surgery. This technique involves placement of a local in the fascial plane between the pectoralis major and minor targeting the medial and lateral pectoral nerves. This suggests that the regional placement of liposomal bupivacaine is likely safe and efficacious for this goal-directed intervention. Finally, Trignano et al⁶ reported an injection of the pectoral muscle, using botulinum toxin type A, for relief of pectoral muscle spasms in 2012. Although the team reported favorable results of the injection, the pectoral muscle in this case was used as a flap for head and neck surgery and does not exactly match the described technique of INTRAPEEC. But mention of the technique seems warranted to support proof of concept.

Case presentation

A 43-year-old woman weighing 76 kg, PS 2, presented for bilateral breast reconstruction and implant revision and fat grafting transfer from the abdomen to the breast. Her surgical history was extensive including 16 prior breast surgeries beginning with bilateral mastectomy with latissimus flap creation and immediate reconstruction. Various complications caused her multiple breast surgeries, which resulted in acute pectoral spasm after manipulation of implants, which was troublesome but would eventually resolve over the next several months, and chronic latissimus flap spasm that was persistent in nature. Her latissimus spasm pain remained persistent. Her surgical history also included total vaginal hysterectomy. She was prescribed the following medications before surgery as part of the institutional protocol: doxycycline 100 mg orally twice a day before surgery; enoxaparin 40 mg subcutaneously on postoperative day 1; mupirocin 2% topical ointment to bilateral nares twice a day for 5 days before surgery; cyclobenzaprine 10 mg orally every 8 hours, as needed for muscle spasm; oxycodone/acetaminophen 5/325 mg orally every 4 to 6 hours, as needed for postoperative pain; and montelukast 10 mg orally at bedtime for 3 months after surgery for muscle spasm control. Her preoperative laboratory values included H/H 14/41, platelets of 271, normal electrolytes, and albumin of 4.2. Following thorough explanation, both the surgeon and the patient consented for the investigational procedures. In this case the surgeon played an integral role in consent as he was the owner and operator of the surgical office suite and essentially functioned as the institutional review board. The patient was taken to the

operative suite and assisted into a comfortable prone position. Monitors were applied and 4 mg intravenous (IV) midazolam was administered. Bilateral erector spinae (ESP) blocks were performed under ultrasound guidance with a Terason 3300 (Teratech, Burlington, MA) in a spine setting paired with a covered linear probe using a Pajunk 120 mm SonoBlock needle with an in-plane approach. After the ESP block, the patient was assisted supine, pre-oxygenated, and had general anesthesia induced with 200 mg propofol intravenous. A number 3 laryngeal mask airway was placed and secured followed by placement of bilateral ultrasound-guided INTRAPEC injections. The INTRAPEC injections were done above the anechoic line of the existing breast implant, directed into the deep and largest portion of the pectoralis major muscle, similar to the original INTRAPEC article of 2018¹ (Figure 1). For all techniques, the patient received a total of 30 mL liposomal bupivacaine, 30 mL bupivacaine 0.25%, diluted with 20 mL sterile saline, yielding 80 mL of total solution. Bupivacaine liposome can only be mixed with sterile saline or bupivacaine. Do not mix with non-bupivacaine-based local anesthetics. This may cause an immediate release of local anesthetic from the liposomal component. The bilateral ESP blocks consumed a total of 50 mL of the local anesthetic solution. The bilateral INTRAPEC injections consumed the remaining 30 mL, with 15 mL being placed under ultrasound guidance into the pectoralis major muscle as described previously (Figure 2). The patient also received 30 mg IV ketorolac, and 10 mg IV dexamethasone and 8 mg IV ondansetron. The general anesthesia was maintained with an infusion of IV propofol at a rate of 140 mcg/kg/min for the duration of the case. The bilateral breast revision was

completed uneventfully, and the procedure completed without the need for any opiate medications. The surgeon again reported similar experiences intraoperatively such as a dramatic decrease in pectoralis muscle spasm especially during the application of electrocautery. Near case completion, the propofol infusion was stopped and the patient allowed to emerge. The patient was taken to the post-anesthesia care unit and met discharge criteria to home in 50 minutes. At that time the patient was pain-free, spasm-free, and opioid-free.

Upon discharge, the patient and spouse were instructed to fill out a simple tool for the evaluation of pain and spasm with a numeric scale from 1 to 10 in two categories (Figure 3). The first focus was a surgical pain scale with numeric values to be reported every 6 hours. The second focus of the pain tool asked the patient to report her discomfort from pectoral spasm over postoperative days 1 and 2. The results are posted in the sample reporting tool shown in Figure 3 in sequence of day 1 above day 2. Daily contact was maintained with the patient for 5 days postoperatively. The patient reported a pain-free recovery for 3 days inclusive of over 60 hours. Additionally, she reported zero spasms over the next 5 days. Formal study communication ceased at that point. Lastly, the only opioid pain medicine taken was a total of 2 oral doses of oxycodone. The first was taken for sleep on postoperative day 3 at bedtime. The second and final oral opioid reported was taken on postoperative day 4 after activity that may have influenced her pain level. Typically, patients are prescribed cyclobenzaprine (Flexeril) as an agent to help control pectoralis muscle spasm from implantation and surgical manipulation. Despite filling the prescription for cyclobenzaprine, the patient did not take any as pectoral spasm was absent.

Figure 1 (below). Actual ultrasound image of the patient's INTRAPEC. Note the needle placed in plane, directed to the thickest portion of the pectoralis muscle. Injections were a total of 15 mL of liposomal bupivacaine and bupivacaine mix. Image courtesy of Jonathan Kline, CRNA, and Twin Oaks Anesthesia.

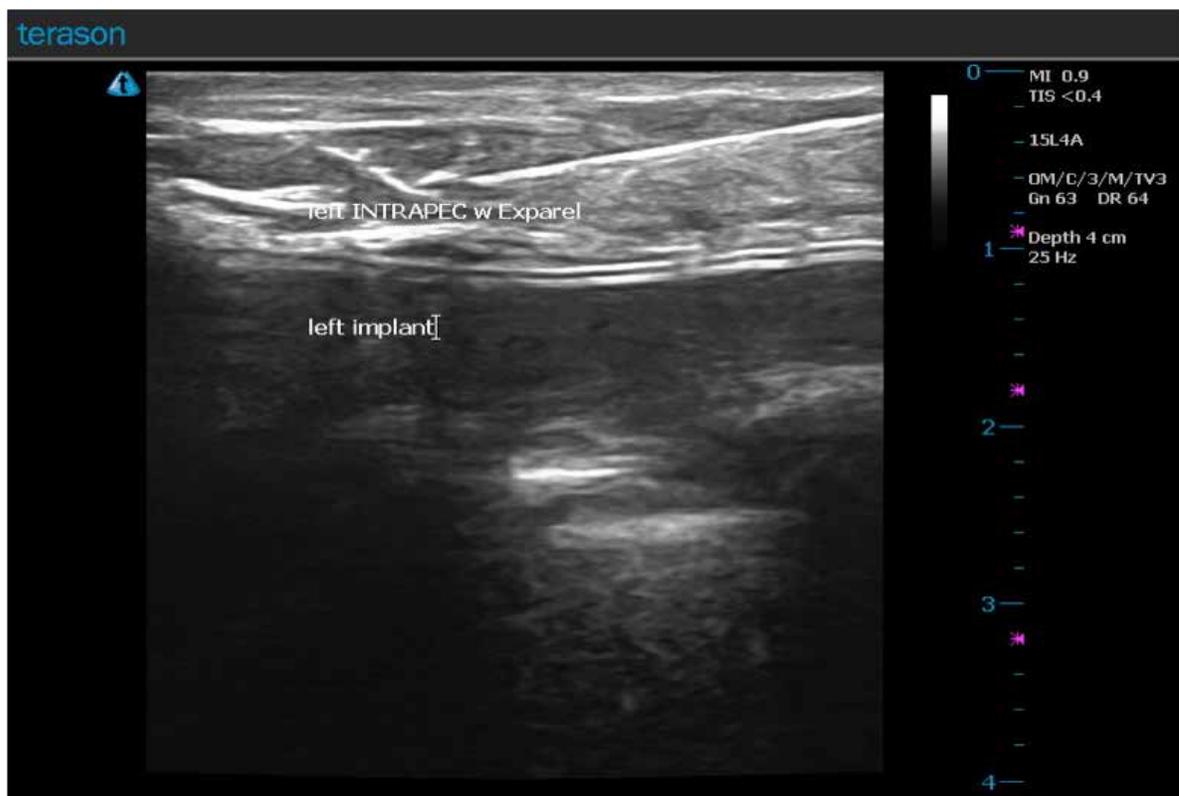


Figure 2 (below). Post left INTRAPEC injection. Note the infiltration and dispersion of local anesthetic solution containing both liposomal bupivacaine and bupivacaine mix. Image courtesy of Jonathan Kline, CRNA, and Twin Oaks Anesthesia.

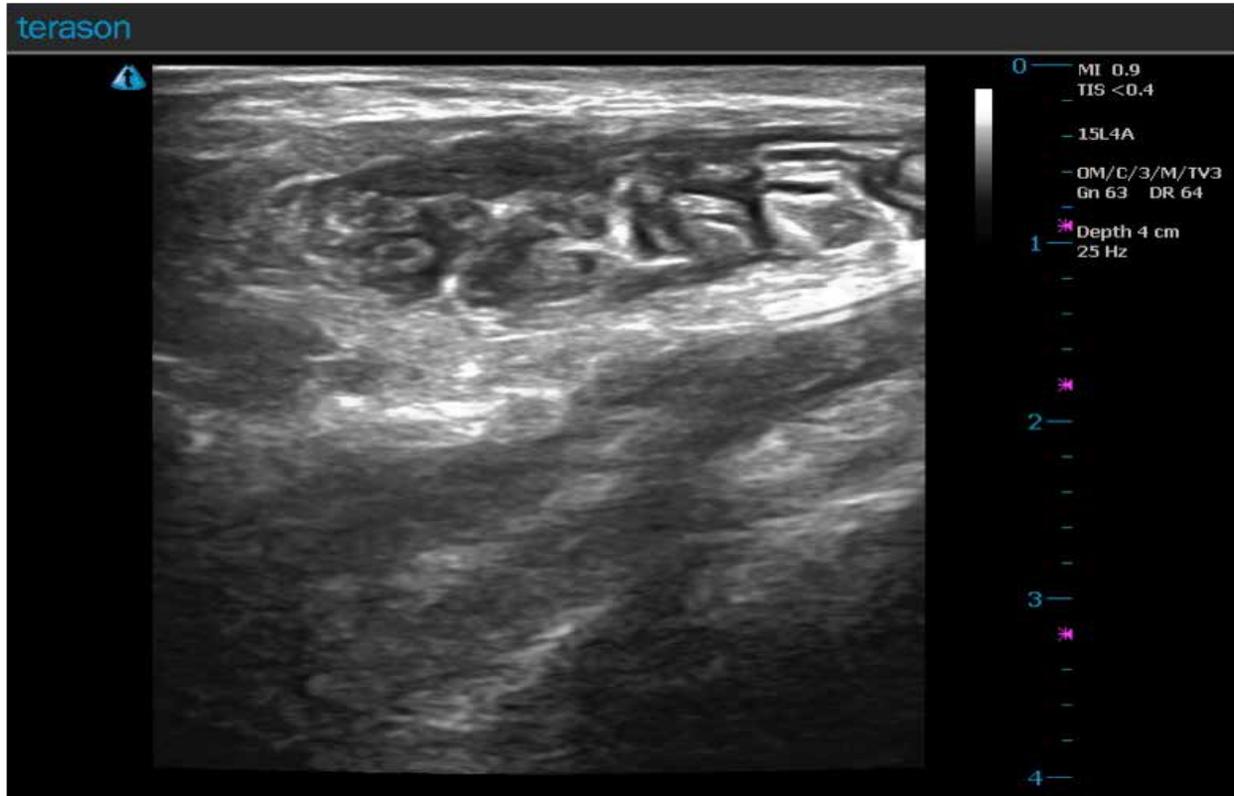


Figure 3 (below). Actual patient reporting tool designed for description of both pain and spasm after subpectoral breast implantation surgery for a 2-day reporting period. The tool is used to report numeric values from 0, being no pain or spasm, to 10, being unbearable pain or spasm. Additional comments were provided by the patient and are included here: “Post op day 4 showed the most increase in pain hitting a level of 4/5 however I was also more active this day.”

TIME	12AM-6 AM	6AM-12PM (lunch)	12PM-6PM	6PM-12AM	Comments
Pain	1	2	2	2	
Spasm	0	0	0	0	

TIME	12AM-6 AM	6AM-12PM (lunch)	12PM-6PM	6PM-12AM	Comments
Pain	1	2	1	2	
Spasm	0	0	0	0	

Conclusion

This case presents the first preprocedural placement of liposomal bupivacaine/bupivacaine mix via the ultrasound-guided INTRAPEC technique. The INTRAPEC technique seems to be simpler, easier, and structurally more superficial than the nearest alternative of the PECs 1 technique described by Blanco⁷. Similar goals for the injection were established before its institution including not only postoperative pain and spasm, but importantly, intraoperative control of pectoralis major spasm. Similar results were noted in the immediate and near postoperative time frames as in the original report of INTRAPEC. However, a prolonged effect of pain and spasm control was noted with the addition of liposomal bupivacaine. In this case, spasm control was reported to the end of the reasonable study period, inclusive of 5 days or 120 hours. This seems to suggest two things. The first is that the INTRAPEC injection seems to be safe and effective for control of both intraoperative and postoperative pectoralis muscle spasm after subpectoral breast implantation. The second element is that the addition of a liposomal bupivacaine/bupivacaine mix can safely prolong the spasm control provided by the INTRAPEC technique. More work needs to be done to establish the safety and efficacy of the INTRAPEC technique, but early reports are encouraging.

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Questions

POST TEST

1. Depofoam is the substance in liposomal bupivacaine used to encapsulate and slowly release the local anesthetic?
 - A. True
 - B. False
2. Which of the following muscular structures is responsible for postoperative spasm and pain after breast implantation?
 - A. Pectoralis major
 - B. Pectoralis minor
 - C. Sartorius
 - D. Serratus
3. Shin et al (2014) reported postmastectomy pain could manifest as shoulder pain and can be successfully treated by intramuscular injection.
 - A. True
 - B. False
4. Liposomal bupivacaine is approved by the Food and Drug Administration for interscalene brachial plexus block only.
 - A. True
 - B. False
5. The novel technique of INTRAPEC has been shown to decrease both intraoperative and postoperative pectoralis major spasm from subpectoral breast implantation.
 - A. True
 - B. False
6. Postoperative intramuscular-type injections have been successfully used to treat postoperative spasm pain.
 - A. True
 - B. False
7. Botulinum toxin type A (Botox) injection into the pectoralis major muscle has been shown to be effective in relieving postoperative pectoralis major spasm.
 - A. True
 - B. False
8. T or F? According to the article, a PECs 1 block has been used as a diagnostic modality to aid in the treatment in postoperative spasm from breast implantation.
 - A. True
 - B. False
9. Which of the following regional techniques was combined with the INTRAPEC injection to provide analgesia from the fat grafting and breast reconstruction surgery?
 - A. Intercostal block
 - B. TAP block
 - C. Bilateral IL/IH blocks
 - D. Erector spinae block
10. Liposomal bupivacaine can be mixed with which of the following local anesthetics?
 - A. Bupivacaine
 - B. Lidocaine
 - C. Tetracaine
 - D. Carbocaine
11. According to the case presentation, the total final expanded volume of solution used for the regional technique was which of the following?
 - A. 25 mL
 - B. 50 mL
 - C. 80 mL
 - D. 100 mL
12. Which of the following condition for perioperative pain management becomes a challenge in a physical status 2 patient having repeat breast reconstruction.
 - A. Preexisting pain
 - B. Opioid tolerance
 - C. Liver impairment
 - D. Heart failure

13. In the case presentation, the INTRAPEC injection successfully prevented postoperative pectoralis spasm for which of the following periods of time?
- 24 hours
 - 2 days
 - 3 days
 - 5 days
14. Patients may be prescribed which of the following medications to prevent postoperative pectoralis major spasm after breast implantation/reconstruction?
- Amlodipine
 - Cyclobenzaprine
 - Phenylephrine
 - Oxycodone
15. In this case report, the patient did not require cyclobenzaprine for postoperative pectoralis major muscle spasm after the INTRAPEC injection.
- True
 - False
16. According to the case presentation, after successful pain and spasm control with the INTRAPEC injection, the first postoperative oral opioid was not needed until which of the following postoperative days?
- 2 days
 - 3 days
 - 4 days
 - 5 days
17. The INTRAPEC injection has been reported to be simpler, easier, and more superficial than the traditional PECs 1 block.
- True
 - False
18. Exparel should only be mixed with sterile normal saline or bupivacaine?
- True
 - False
19. Which of the following probe is ideal for intrapec injections if the pectoralis major muscle is 1cm in depth?
- Linear
 - Curved
 - Cardiac/sector
 - None of the above
20. Advantage of intrapec injections for breast reconstruction include which of the following?
- Reduced intraoperative narcotic requirement
 - Reduced pectoralis major spasm during electrocautery
 - Reduced postoperative pectoralis major muscle spasm
 - All of the above