EXPAREL®
(bupivacaine liposome injectable suspension)

Administration Case Report: Pectus Excavatum with Nuss Bar Placement

This case report represents the individual experience of Dr Casey Stondell, and is intended to demonstrate his methodology for using EXPAREL in patients undergoing Nuss bar placement for pectus excavatum.

Pacira BioSciences, Inc. recognizes that there are alternative methodologies for administering local anesthetics, as well as individual patient considerations when selecting the dose for a specific procedure.

EXPAREL is a local anesthetic that produces postsurgical analgesia in patients aged 6 years and older. It is administered via single-dose infiltration. When infiltrated into the surgical site, it produces local analgesia. It may also be infiltrated in the fascial plane to produce regional analgesia as a regional field block. Regional anesthetic techniques to produce regional analgesia include, but are not limited to, transversus abdominis plane (TAP) block, pectoralis (PEC) and serratus anterior plane (SAP) blocks, erector spinae plane (ESP) block, and quadratus lumborum (QL) block. EXPAREL may also be administered in adults as an interscalene brachial plexus nerve block, a sciatic nerve block in the popliteal fossa, and an adductor canal block to produce postsurgical regional analgesia.

CASE INFORMATION

Physician Name	Casey Stondell, MD
Affiliation	Pediatric Anesthesiologist Shriners Hospitals for Children Sacramento, California
Surgical Case Performed	Pectus Excavatum with Nuss Bar Placement
Site of Care	Inpatient

PATIENT CHARACTERISTICS

Gender	Male
Age	14 years
Weight	47.1 kg
Patient History and Characteristics	The patient was a healthy 14-year-old male with a history significant only for severe pectus excavatum with a Haller index of 5.83. A preoperative computed tomography of the chest showed severe narrowing/compression of the anteroposterior chest with leftward displacement of the heart. The patient had no associated cardiopulmonary dysfunction at rest or with activity.

The recommended dose of EXPAREL for infiltration in adults is based on the size of the surgical site, the volume required to cover the area, and individual patient factors that may impact the safety of an amide local anesthetic. The maximum dose of EXPAREL should not exceed 266 mg. The recommended dose of EXPAREL for patients aged 6 to <17 years old is 4 mg/kg, up to a maximum of 266 mg. The recommended dose of EXPAREL in adults for interscalene brachial plexus nerve block, sciatic nerve block in the popliteal fossa, and adductor canal is 133 mg. The recommended dose of EXPAREL in adults for adductor canal block is 133 mg (10 mL) admixed with 50 mg (10 mL) of 0.5% bupivacaine HCl, for a total volume of 20 mL.

EXPAREL can be administered unexpanded (20 mL) or expanded to increase volume up to a total of 300 mL (final concentration of 0.89 mg/mL [ie, 1:14 dilution by volume]) with normal (0.9%) saline or lactated Ringer's solution.

PROCEDURAL DETAILS

Incision Size	Two incisions (approximately 10 cm in length each) in bilateral midaxillary lines just below the nipple line for Nuss bar placement and intercostal cryoanalgesia along with multiple small incisions for thoracoscopic port access.
Incision Type	Thoracic
Preoperative Analgesics Used	Oral acetaminophen 650 mg (continued every 6 hours after surgery) Oral celecoxib 100 mg (ibuprofen continued every 6 hours after surgery, with the first dose given 12 hours after celecoxib administration) Scopolamine patch to decrease the risk of postsurgical nausea and vomiting Oral gabapentin 300 mg qhs was started on the day of surgery and continued for 30 days after surgery.
Patient/Parent Education Regarding Pain Management	Dr Stondell discussed the plan for perioperative pain management with the patient and his family. He explained the benefits of combining multimodal analgesia, regional anesthesia—in this case bilateral thoracic ESP blocks with EXPAREL® (bupivacaine liposome injectable suspension) and 0.25% bupivacaine—and intercostal cryoanalgesia to improve pain control and decrease opioid requirements. Dr Stondell explained that in the past, patients undergoing this procedure would often stay in the hospital for up to 7 days, but with the initiation of his current protocol, most patients go home on POD 1 or 2 and require minimal opioids.
Dosing and Administration	Bilateral ESP blocks, each with EXPAREL 7 mL* admixed with bupivacaine 0.25% 13 mL in a 20 mL syringe 7 mL x 13.3 (mg/mL) = 93.1 mg EXPAREL admixed with 13 mL 0.25% bupivacaine = 32.5 mg of bupivacaine TOTAL DOSE: 14 mL (186 mg)† EXPAREL 26 mL (65 mg) bupivacaine
Needle Size, Number of Syringes	For each thoracic ESP block, Dr Stondell used a 21-gauge, 90-mm Tuohy needle attached to extension tubing and a 3-way stopcock. On the stopcock was a 20 mL syringe containing the local anesthetic (see above for details) and a 10 mL syringe containing normal saline. The saline was used to confirm adequate spread in the correct plane prior to injecting the local anesthetic.
Relevant Prep Instructions	Dr Stondell has found that in pediatric patients, performing ESP blocks in the prone position after induction of general anesthesia is the best way to optimize the ultrasound image and ensure a successful block. He induces anesthesia and secures the airway on the patient's gurney and then turns the patient prone onto the operating room table. The gurney is left in the room so that immediately after the block is completed, the patient is turned supine with minimal time required for position changes.
Other Intraoperative Analgesics	Ketamine 1 mg/kg was administered during induction. IV fentanyl 200 mcg was given during the case. No long-acting opioids were given. Intercostal cryoanalgesia was performed by the surgeons at 5 levels bilaterally. Peak analgesia from this procedure is not obtained for at least 24 hours, which is why regional anesthesia is an imperative part of Dr Stondell's opioid-sparing protocol.

POD=postoperative day; qhs=every night at bedtime.

*EXPAREL is available in 10 mL and 20 mL vials.
†EXPAREL dose is slightly under the recommended maximum weight-based dose of 4 mg/kg.

Bupivacaine HCl (which is approved for use in patients aged 12 and older) may be administered immediately before EXPAREL or admixed in the same syringe, as long as the ratio of the milligram dose of bupivacaine HCl to EXPAREL does not exceed 1:2. Admixing may impact the pharmacokinetic and/or physicochemical properties of EXPAREL, and this effect is concentration dependent. The toxic effects of these drugs are additive and their administration should be used with caution, including monitoring for neurological and cardiovascular effects related to local anesthetic systemic toxicity. Other than with bupivacaine, EXPAREL should not be admixed with other drugs prior to administration.

INFILTRATION NOTES

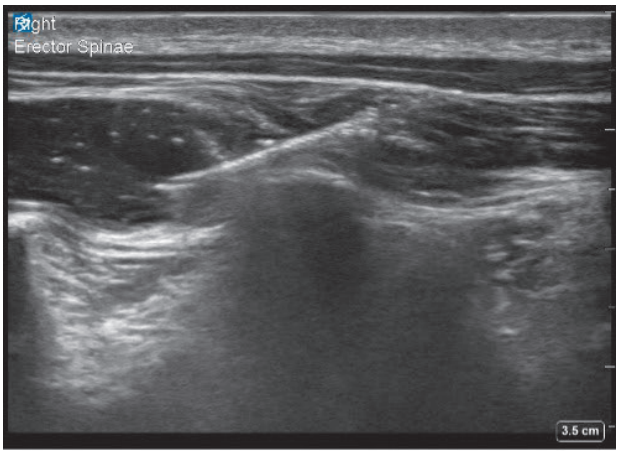
With the patient in the prone position and a pillow under the patient's hips to decrease lordosis, the spine and surrounding structures are stable and symmetrical while minimizing any abnormal spine flexion/extension or rotation. This makes visualization of anatomical landmarks and needle placement much easier, compared to performing this block in the lateral position.

The skin was prepped and a linear high-frequency ultrasound probe was used to identify the fifth rib by placing the probe in the sagittal plane lateral to the spine. The probe was then moved medially until the fifth transverse process was identified.

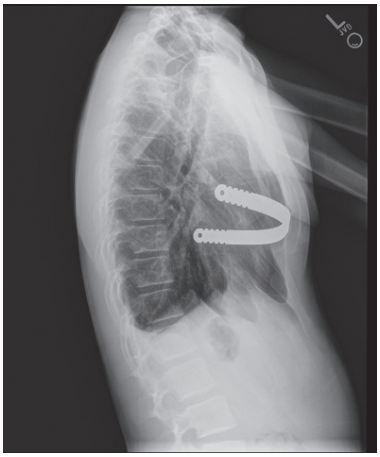
The transverse process can likewise be located by first identifying the spinous process and then moving laterally. A 21-gauge Tuohy needle was advanced in plane toward the transverse process until bone was encountered.

The needle was retracted slightly and a small bolus of saline was injected to ensure adequate spread in the correct plane. The stopcock was turned and the local anesthetic admixture of EXPAREL and 0.25% bupivacaine was injected after negative aspiration.

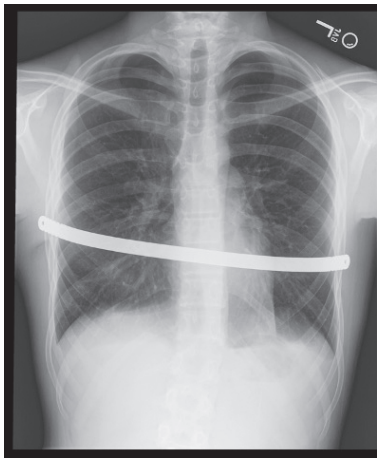
The same procedure was performed on the opposite side. The patient was then turned supine and transferred to the OR bed.



▲ Ultrasound image of thoracic ESP block with local anesthetic spread



▲ Lateral view of the thoracic cavity s/p Nuss bar placement



▲ Anterior/posterior view of the thoracic cavity s/p Nuss bar placement

POSTSURGICAL INSTRUCTIONS INCLUDING PRESCRIPTIONS PROVIDED AND RECOVERY MILESTONES AND GOALS

The patient was told that having some discomfort after surgery is normal and that, if the discomfort became intolerable despite scheduled multimodal analgesics, first-line therapy should consist of diazepam. Muscle spasm pain is very common after Nuss bar placement and diazepam often works well to treat this pain, helping to decrease opioid requirements. If pain remained intolerable despite diazepam, oral oxycodone was to be given.

PATIENT FOLLOW-UP

In the PACU, the patient received IV diazepam 2 mg. Later that evening he received one additional dose of IV diazepam 2.5 mg and one dose of oral oxycodone 2.5 mg. He received no further diazepam or opioids during his admission. His maximum revised FLACC pain score throughout his admission was 1/10. He was discharged on POD 1 with scheduled acetaminophen, ibuprofen, and gabapentin, as well as prn diazepam and prn oxycodone.

On the day of discharge he took one dose of oral diazepam 2.5 mg before bedtime. The next day he took two doses of oral oxycodone 2.5 mg. He required only multimodal non-opioid analgesics from that time on. On POD 4, Dr Stondell spoke with the patient's parents and they said his pain continued to be well controlled without any need for diazepam or opioids. The patient and his parents were very satisfied with his pain control and level of function.

FLACC=face, legs, activity, cry, consolability; IV=intravenous; OR=operating room; PACU=post-anesthesia care unit; POD=postoperative day; prn=as needed; s/p=status post.

IMPORTANT SAFETY INFORMATION

Indication

EXPAREL® (bupivacaine liposome injectable suspension) is indicated to produce postsurgical local analgesia via infiltration in patients aged 6 years and older and regional analgesia in adults via an interscalene brachial plexus nerve block, sciatic nerve block in the popliteal fossa, and an adductor canal block. Safety and efficacy have not been established in other nerve blocks.

Important Safety Information

EXPAREL is contraindicated in obstetrical paracervical block anesthesia.

Adverse reactions reported in adults with an incidence greater than or equal to 10% following EXPAREL administration via infiltration were nausea, constipation, and vomiting; adverse reactions reported in adults with an incidence greater than or equal to 10% following EXPAREL administration via nerve block were nausea, pyrexia, headache, and constipation.

Adverse reactions with an incidence greater than or equal to 10% following EXPAREL administration via infiltration in pediatric patients six to less than 17 years of age were nausea, vomiting, constipation, hypotension, anemia, muscle twitching, vision blurred, pruritus, and tachycardia.

Do not admix lidocaine or other non-bupivacaine local anesthetics with EXPAREL. EXPAREL may be administered at least 20 minutes or more following local administration of lidocaine.

EXPAREL is not recommended to be used in the following patient populations: patients <6 years old for infiltration, patients younger than 18 years old for nerve blocks, and/or pregnant patients.

Because amide-type local anesthetics, such as bupivacaine, are metabolized by the liver, EXPAREL should be used cautiously in patients with hepatic disease.

Warnings and Precautions Specific to EXPAREL

Avoid additional use of local anesthetics within 96 hours following administration of EXPAREL.

EXPAREL is not recommended for the following types or routes of administration: epidural, intrathecal, regional nerve blocks **other than interscalene brachial plexus nerve block, sciatic nerve block in the popliteal fossa, and adductor canal block**, or intravascular or intra-articular use.

The potential sensory and/or motor loss with EXPAREL is temporary and varies in degree and duration depending on the site of injection and dosage administered and may last for up to 5 days, as seen in clinical trials.

Warnings and Precautions for Bupivacaine-Containing Products

Central Nervous System (CNS) Reactions: There have been reports of adverse neurologic reactions with the use of local anesthetics. These include persistent anesthesia and paresthesia. CNS reactions are characterized by excitation and/or depression.

Cardiovascular System Reactions: Toxic blood concentrations depress cardiac conductivity and excitability, which may lead to dysrhythmias, sometimes leading to death.

Allergic Reactions: Allergic-type reactions (eg, anaphylaxis and angioedema) are rare and may occur as a result of hypersensitivity to the local anesthetic or to other formulation ingredients.

Chondrolysis: There have been reports of chondrolysis (mostly in the shoulder joint) following intra-articular infusion of local anesthetics, which is an unapproved use.

Methemoglobinemia: Cases of methemoglobinemia have been reported with local anesthetic use.

Disclosure: Dr Stondell is a paid consultant for Pacira BioSciences, Inc.

Full Prescribing Information is available at www.EXPARELpro.com.
For more information, please visit www.EXPARELpro.com or call 1-855-793-9727.