NON-OPIOID
EXPAREL®
(bupivacaine liposome injectable suspension)

Administration Case Report: Posterior Instrumented Spinal Fusion for Adolescent Idiopathic Scoliosis

This case report represents the individual experience of Dr Peter O. Newton and is intended to demonstrate his methodology for using EXPAREL in patients undergoing posterior spinal instrumented fusion for adolescent idiopathic scoliosis.

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. When infiltrated in the fascial plane, it produces regional analgesia using regional techniques such as erector spinae plane (ESP) block, quadratus lumborum (QL) block, and transversus abdominis plane (TAP) block.

CASE INFORMATION

Physician	Peter O. Newton, MD
Affiliation	Orthopedic Spine Surgeon Rady Children's Hospital San Diego, CA
Surgical Case Performed	T2-L2 Posterior Instrumented Fusion for Adolescent Idiopathic Scoliosis
Site of Care	Inpatient

PATIENT CHARACTERISTICS

Gender	Male
Age	13 years
Weight	58 kg
Patient History and Characteristics	Otherwise healthy adolescent male with progressive thoracic scoliosis

PROCEDURAL DETAILS

Incision Size	45 cm
Incision Type	Midline posterior
Preoperative Analgesics Used	See Appendix for multimodal protocol
Patient/Parent Education Regarding Pain Management	Preoperatively, the scoliosis service nurse meets with the patient and family to review the standard course of recovery. The nurse details postsurgical care, being sure to explain the multimodal approach to pain management and listing the pain medications that will be used throughout the hospital stay and discharge. The pain service nurse then repeats this conversation with the family and patient in the presence of the nursing unit, to ensure the family is prepared and understands the plan of care throughout the patient's hospital stay. Also covered in these educational discussions are expectations for length of hospital stay and requirements for discharge.
Drains Used	1/8" Jackson Pratt drain superficial to fascia
Needle Size, Number of Syringes	3" 22-gauge spinal needle with 30 mL syringes (4) filled with EXPAREL injectate

The recommended dose of EXPAREL for 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.

PROCEDURAL DETAILS

Dosing and Administration	17.4 mL* of EXPAREL® (bupivacaine liposome injectable suspension) + 34.8 mL of 0.25% bupivacaine HCl† + 67.8 mL of normal saline = 120 mL injectate (divided into 4 aliquots of 30 mL each) ***See table below for equations and calculations.***

Determining Dosing	Dr Newton's Calculations
[Patient weight (kg) x 4 (mg/kg)] ÷ 0.89 mg/mL = **Maximum Total Volume** including EXPAREL, bupivacaine HCl and expansion of saline/lactated Ringer's solution	58 (kg) patient x 4 (mg/kg) ÷ 0.89 mg/mL = **261 mL Maximum Total Volume**
Patient weight (kg) x 4 (mg/kg) = **EXPAREL dose (mg)**	58 (kg) patient x 4 (mg/kg) = **232 mg of EXPAREL**
EXPAREL dose (mg) ÷ 13.3 (mg/mL) = **volume of EXPAREL (mL)**	232 (mg) ÷ 13.3 (mg/mL) = **17.4 mL of EXPAREL**
0.25% bupivacaine HCl dose if admixing [Patient weight (kg) x 4 (mg/kg)] x 0.5 = **bupivacaine HCl dose (mg)**	[58 (kg) x 4 (mg/kg)] x 0.5 = **116 mg of bupivacaine HCl**
[Bupivacaine HCl (mg) ÷ 0.89‡] ÷ 2.5 (mg/mL) = **volume of bupivacaine HCl (mL)**	[116 (mg) ÷ 0.89‡] ÷ 2.5 (mg/mL) = **52.1 mL of bupivacaine HCl** ***Dr Newton used only 34.8 mL of bupivacaine HCl***
Maximum total volume (mL) - volume of EXPAREL (mL) - volume of bupivacaine HCl (mL) if admixing = **volume of saline/lactated Ringer's solution (mL)**	261 mL - 17.4 mL of EXPAREL - 34.8 mL of 0.25% bupivacaine HCl = **208.8 mL of normal saline** ***Dr Newton used only 67.8 mL of normal saline***

*EXPAREL is available in 10 mL and 20 mL vials.
†Bupivacaine HCl is indicated for patients 12 years and older. The approach to using bupivacaine HCl for this patient and procedure represents the individual clinical judgment of Dr Newton.
‡The 0.89 ratio reflects that bupivacaine makes up 89% of the molecular weight of bupivacaine HCl (the other 11% is HCl).

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

A dual-site bilateral open ESP block is performed after the spinal deformity correction has been completed. A midline incision extending over the levels of planned instrumentation and fusion is performed from T2 to L2 (45 cm). Typical subperiosteal dissection is performed to the tips of the transverse processes as is common for posterior spinal surgery. Self-retaining retractors are placed to expose the spine, translating the paraspinal muscles laterally.

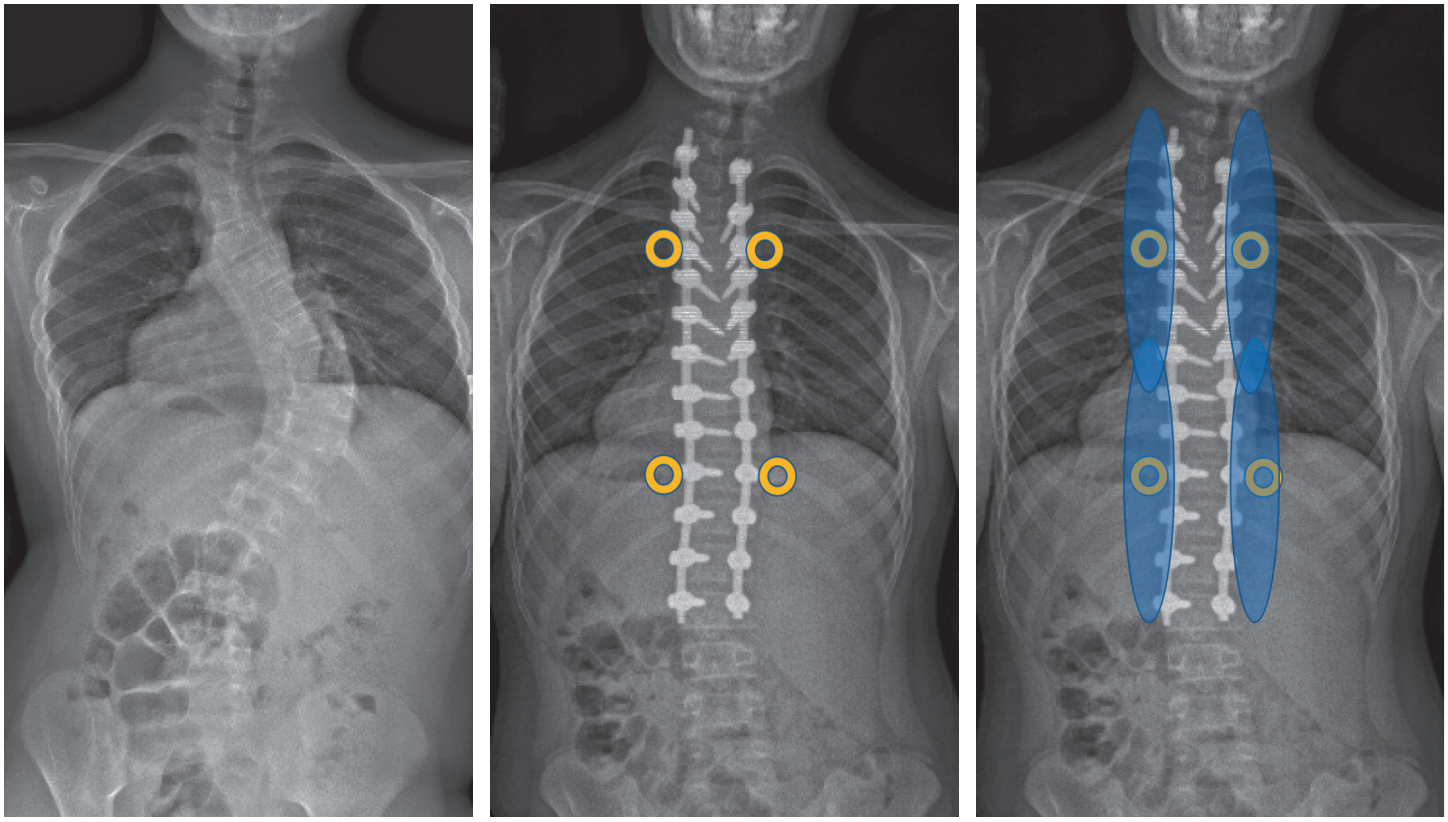
Following the scoliosis instrumentation and bone graft placement, but prior to initiation of wound closure, the EXPAREL injections are made.

The open ESP block is performed by injecting 30 mL in 4 locations (right T5, left T5, right T11, and left T11). A 22-gauge 3-inch spinal needle is placed through the paraspinal muscles from dorsal fascia, just lateral to the previously exposed portion of the transverse processes at the levels noted above. With a fingertip on the transverse process, the needle is directed through the muscle until the needle contacts the unexposed lateral aspect of the transverse process. The needle needs to be at the junction between the transverse process and the rib. Given that the wound is open and much of the transverse process is exposed, locating the needle tip approximately 5 to 10 mm more lateral is straightforward. Then 30 mL of injectate is placed at each of the 4 locations within the erector spinae plane. The dispersion of the injectate can be seen and palpated as it flows proximally and distally within the tissue plane.

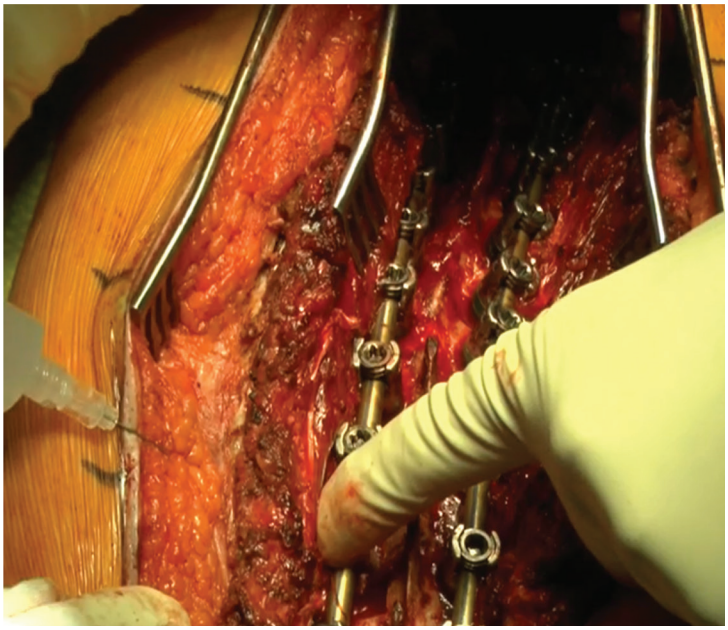
Occasionally, the initial dissection of the transverse process violates the ESP and the injectate can be seen leaking into the wound. This should be watched for as the injections are made. Moving the needle more laterally or to an adjacent level may eliminate the leaking into the wound. If these adjustments are not successful, a classic multisite injection with infiltration may be used instead of the ESP block.

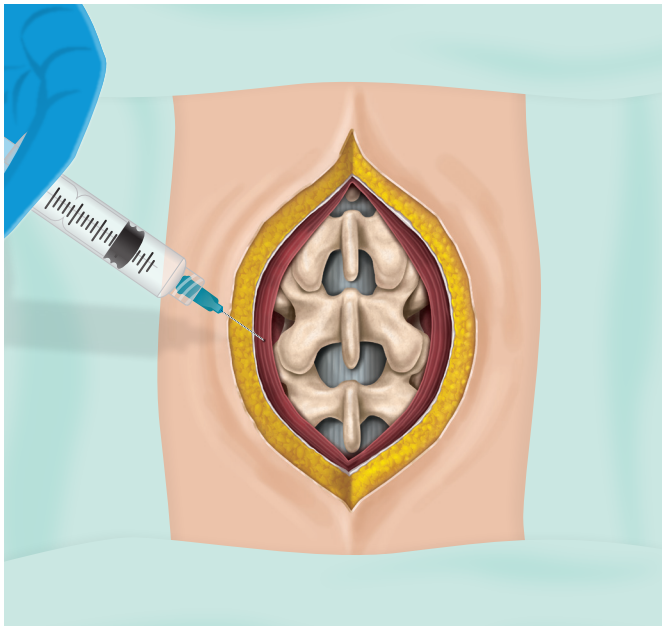
Preoperative and Postsurgical Posterior-anterior (PA) Radiographs

The ESP block injection sites are noted by the yellow circles. The injectate of 30 mL at each site flows proximally and distally through several levels to provide coverage of the entire area of the spinal exposure (blue shaded area).

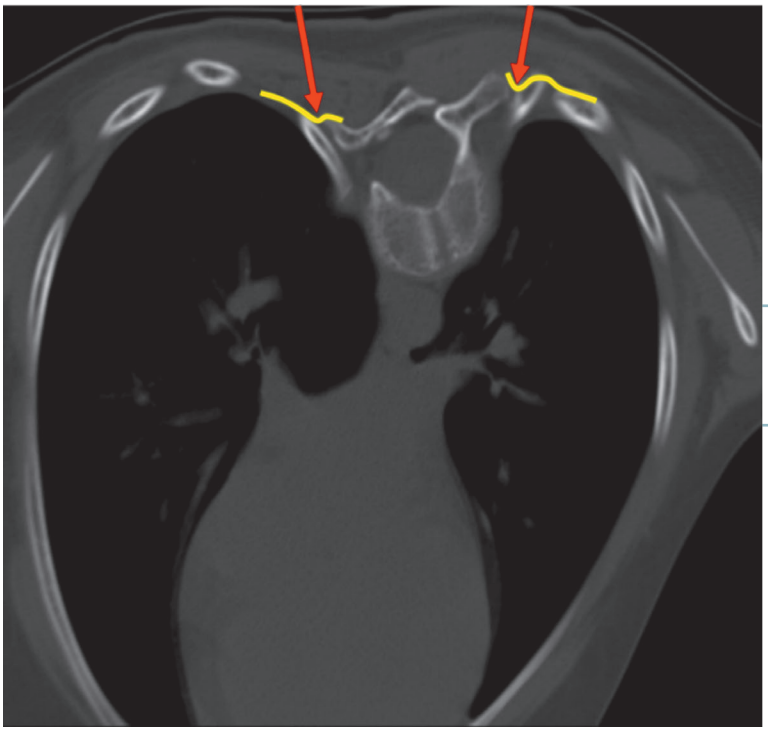


INFILTRATION NOTES (cont)





The right T5 injection site is shown representing the needle path to the lateral aspect of the T5 transverse process. The starting point for the needle should be lateral to the midline fascial incision and directed through the paraspinal muscle. Administer 30 mL of EXPAREL® (bupivacaine liposome injectable suspension) injectate in all 4 locations (right T5, left T5, right T11, and left T11).



MRI: Yellow highlighting shows the transverse processes where injections are made.

POSTSURGICAL INSTRUCTIONS INCLUDING PRESCRIPTIONS PROVIDED AND RECOVERY MILESTONES AND GOALS

POD #1 – patient out of bed, sits in chair, begins oral intake—can start on POD #0 if tolerable

POD #2 – drains removed, patient ambulates in room and out of room

POD #3 – patient showers, continues getting up out of bed and ambulating; discharge expected

PATIENT FOLLOW-UP

- Home on POD #3, on the same dosing of PO medications as last hospital day
  - Neurontin® (gabapentin) 300 mg HS x 2 weeks
  - Pepcid® (famotidine) 10 to 20 mg x 2 weeks
  - Acetaminophen 15 mg/kg Q6 hours x 2 weeks
  - Naproxen BID 5 to 10 mg/kg or ibuprofen 5 to 10 mg/kg Q8 hours x 2 weeks
  - Senna-S, MiraLAX® scheduled until off all narcotics
  - Dulcolax® suppository or MOM prn
  - Oxycodone 2.5 to 7.5 mg Q4 to 6 hours prn (20 doses)
  - Valium® (diazepam)/Ativan® (lorazepam) low dose (0.1-0.3 mg/kg) (10 doses) prn for anxiety or muscle spasm
- Bandages are removed week 2 at home
- Pain medications are discontinued week 2 at home
- 2 to 3 weeks back to school
- 4 weeks follow up in office
- 6 weeks jogging and swimming
- 3 months sport training
- 6 months unrestricted activity

BID=twice a day; HS=at bedtime; MOM=Phillips'® Milk of Magnesia; PO=by mouth; POD=postoperative day; prn=as needed; Q4=once every 4 hours; Q6=once every 6 hours; Q8=once every 8 hours.

APPENDIX: DR NEWTON'S MULTIMODAL PROTOCOL FOR IDIOPATHIC SCOLIOSIS

PRIOR TO SURGERY	INTRAOPERATIVE	EVENING OF SURGERY POD #0
Neurontin® (gabapentin) HS 300 mg	Consider ketamine 1 mg/kg IV or drip	PCA: Dilaudid® (hydromorphone) 3 mcg/kg/dose; PCA dose: 1 mcg/kg/hour continuous or morphine 0.015 mcg/kg/dose; PCA dose + 0.005 mcg/kg/hour continuous dose. Consider no continuous dose if small incision
CONSIDER Xanax® (alprazolam) HS prn	Volatile anesthetic + fentanyl for GA/neuromonitoring	Neurontin® (gabapentin) 300 mg HS (if able to take PO)
Colace®	Consider premedication	CONSIDER Valium® (diazepam)/Ativan® (lorazepam) prn for anxiety or muscle spasms
	Consider Decadron® (dexamethasone)	
	IV acetaminophen 15 mg/kg x 2 to 3 doses	
	EXPAREL® (bupivacaine liposome injectable suspension)	
		Senna S, MiraLAX®
		Foley

The third-party trademarks used herein are the trademarks of their respective owners. The specified medications used are based on Dr Newton's clinical judgment, some of which may be considered off-label for pediatric patients ages 6 and above.

AM=before noon; BID=twice daily; D/C=discharge discontinue; GA=general anesthesia; IV=intravenous; PCA=patient-controlled analgesia; Q4-6=once every 4 to 6 hours; RTC=return to clinic.

POD #1	POD #2	POD #3
D/C PCA dose AM POD 1	D/C PCA	
Neurontin® (gabapentin) 300 mg HS	Neurontin® (gabapentin) 300 mg HS	Neurontin® (gabapentin) 300 mg HS
Valium® (diazepam)/Ativan® (lorazepam) prn for anxiety or muscle spasm; low dose (0.1-0.3 mg/kg)	Valium® (diazepam)/Ativan® (lorazepam) prn for anxiety or muscle spasm; low dose (0.1-0.3 mg/kg)	Valium® (diazepam)/Ativan® (lorazepam) prn for anxiety or muscle spasm; low dose (0.1-0.3 mg/kg)
Oxycodone 2.5 to 7.5 mg Q4 hours schedule x 24 hours then prn	Oxycodone 2.5 to 7.5 mg Q4 hours prn	Oxycodone 2.5 to 7.5 mg Q4-6 hours prn
Acetaminophen 15 mg/kg Q6 hours RTC	Acetaminophen 15 mg/kg Q6 hours RTC	Acetaminophen 15 mg/kg Q6 hours RTC
Ketorolac 0.5 mg/kg Q6 hours	Ketorolac 0.5 mg/kg Q6 hours	Ketorolac 0.5 mg/kg Q6 hours x 6 doses then transition to PO naproxen BID 5 to 10 mg/kg or ibuprofen 5 to 10 mg/kg Q8 hours
Senna S, MiraLAX® scheduled, prn Dulcolax® suppository or MOM	Senna S, MiraLAX® scheduled, prn Dulcolax® suppository or MOM	Senna S, MiraLAX® scheduled, prn Dulcolax® suppository or MOM
Foley	D/C Foley	

Important Safety Information

EXPAREL® (bupivacaine liposome injectable suspension) 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 interscalene brachial plexus nerve block were nausea, pyrexia, 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.

If EXPAREL and other non-bupivacaine local anesthetics, including lidocaine, are administered at the same site, there may be an immediate release of bupivacaine from EXPAREL. Therefore, EXPAREL may be administered to the same site 20 minutes after injecting 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 interscalene brachial plexus nerve block, 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**, 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 Peter O. Newton is a paid consultant for Pacira BioSciences, Inc.

Full Prescribing Information is available at www.EXPAREL.com.

PP-EX-US-7113 11/21