In this Issue

President's Message	Inside front cover
Pain Fellow's Perspective	page 1
Opinion Editorial	page 1
Pro & Con	page 2
Medications for the Lactating Patient	page 4
Editor to Editor	page 4
Literature Review	Inside back cover
Best of Meeting Abstract - Spring 2003	Inside back cover
Memoriam – Richard Rosenblatt, MD	Back cover

On the Web

CME Needs Assessment

2003 Fall Pain Meeting Photos

Upcoming Meetings:
- 2004 Spring Meeting & Workshops, Orlando, FL
- 2004 Fall Pain Meeting, Phoenix, AZ

Consensus Statement

Pain / Regional Fellowships

Resident Section Scholarship Winners

Carl Koller Memorial Research Grant

ACGME Duty Hours Standards Now in Effect for All Residency Programs

Complete References to Newsletter Articles

ASRA NEWS is a publication of the American Society of Regional Anesthesia & Pain Medicine.

Editor: James E. Heavner, DVM, PhD

FEBRUARY 2004

ASRA News

A PUBLICATION OF THE AMERICAN SOCIETY OF REGIONAL ANESTHESIA AND PAIN MEDICINE

President's Message

No Pain, No Gain: ASRA's Dedication to Clinical Practice, Research, and Education in Pain Medicine

Terese T. Horlocker, MD
President

ASRA emphasized the importance of blocks in chronic pain management early in its inception. In 1937, ASRA President Emery Rovenstine stated, "ASRA is more or less exclusively concerned with advancing regional anesthesia and the therapeutic block." This long-term commitment was "formalized" in 1998 when the name of the society was expanded to the American Society of Regional Anesthesia and Pain Medicine and the official publication was accordingly re-named *Regional Anesthesia and Pain Medicine*. The ASRA logo depicts the core of the Society's mission and contains a triangle to represent the three interconnected functions of education, research, and pain control (clinical practice). The following paragraphs demonstrate ASRA's ongoing dedication to this mission within the field of pain medicine.

Annual Fall Pain Meeting and Workshops

Continued divergence in the practices of regional anesthesia and pain necessitated additional training requirements. The establishment of the Comprehensive Pain Management Review Course by F. Michael Ferrante in 1994 provided a venue for clinicians to update their knowledge and technical skills in the fields of chronic, acute and cancer pain. The eight-year success of the review course demonstrated the ongoing need for evidence based discussion, as well as hands-on experience in pain techniques.

It was the vision of James C. Eisenach, as ASRA Education Committee Chair, to convene two distinct annual meetings, one devoted to perioperative aspects of regional anesthesia and analgesia and the other to the field of pain medicine. Importantly, the fall Pain Meeting would be of similar format to the spring Regional Meeting, and would bring clinicians and basic scientists together in a single forum to discuss current understanding of the basic and clinical science of pain medicine. Recognizing the multidisciplinary aspect of pain medicine, an international faculty with experts in anesthesiology, neurology, orthopedic surgery, physiology and neurobiology was assembled. The same experts served as faculty for the small group sessions to facilitate close interaction between speakers and participants. Finally, the program included Scientific Poster Sessions for discussion of research from ongoing clinical and laboratory investigation. The first Annual Fall Pain Meeting and Workshops was held in 2002 during Dr. Eisenach's term as ASRA President. The meeting was a resounding success.

The 2003 Fall Program built on the strengths of the original program and added cadaver-based workshops. Registration increased by 10% from the previous year and all small group sessions (Master Class, Problem Based Learning, Workshops) sold out well in advance. A CME eligible interactive CD-ROM was derived from a live symposium "*Interactive Review of Pain Medicine"* held during the meeting.

The expanded CD-ROM will be mailed to the 2003 Fall Pain Meeting registrants, ASRA members in the U.S., and Pain Fellowship Program Directors. CME credit will be awarded upon completion of the self-test and evaluation.

The 2004 Annual Fall Pain Meeting and Workshops (November 11-14, 2004 at the Pointe Hilton at Squaw Peak, Phoenix, AZ) will inaugurate an Intensive Workshop on the Evaluation and Management of the Patient with Low Back Pain (similar to the Upper and Lower Extremity Comprehensive Workshops presented at the Spring Regional Meetings). The workshop will be jointly conducted by members of ASRA and the International Spinal Injection Society (ISIS). The number of interactive sessions, including cadaver and fluoroscopy workshops, has been increased in 2004 due to overwhelming support and request.

Residency and Fellowship Education

There are nearly 100 accredited Pain Medicine Training Programs within the United States. Practitioners from the parent disciplines of neurology, physical medicine & rehabilitation, and psychiatry now commonly go on to seek subspecialty training in pain medicine.

For the second year, ASRA will award a $1,000 stipend to five residents or pain fellows to facilitate attendance at the Fall Pain Meeting and Workshops. (This *Resident Research Award* is also available to five residents and/or fellows to attend the Spring Meeting). The intention of this scholarship is to stimulate academic activity through attendance and interaction with program faculty, as well as encourage publication of completed work in *Regional Anesthesia and Pain Medicine.*

Research Sponsorship

The American Society of Regional Anesthesia and Pain Medicine supports research related to any aspect of local anesthetics and regional anesthesia and their application to surgery, obstetrics and pain control. Research efforts are sponsored through three programs. The Carl Koller Memorial Research Grant and Resident Research Award are completely ASRA-funded.

The ASRA Carl Koller Memorial Research Fund has been increased to a total of $50,000 biennially to support research related to any aspect of local anesthetics and regional anesthesia and their application to surgery, obstetrics and pain control. The purpose of the grant is to encourage anesthesiologists and other researchers who are interested in this field. Application deadline is April 1, 2004, with the award starting July 1, 2004. Details are available on the Society website: asra.com.

ASRA also co-sponsors with the Foundation for Anesthesia Education Research (FAER) relevant Research Starter Grants. Currently, the two grants with ASRA co-sponsorship are both related to the field of pain medicine and involve investigations in the areas of acute tolerance to opioid induced analgesia and anesthetic preconditioning.

Publications in the Field of Pain Medicine

Publications in the field of pain medicine in all of the leading anesthesia journals continues to rise. *Regional Anesthesia and Pain Medicine* experienced a 33% increase in the number of total submissions in 2003. Approximately half of the journal's articles, reviews and case reports are related to acute or chronic pain.

Thus, half of ASRA's efforts and resources in research, education and clinical practice are truly dedicated to pain medicine. In other words, "No pain, no gain."

Pain Fellow's Perspective

Hemant Yagnick, MD

The recently concluded ASRA fall meeting on November 13-16, 2003 in San Diego was a resounding success. The meeting highlighted several important updates in basic science and clinical aspects of regional anesthesia and pain medicine. Among other educational opportunities there were a number of refresher courses, problem based learning discussions, poster presentations and hands on workshop. One of the highlights was an Interactive Review of Pain Medicine moderated by Drs. Rathmell, Irving and de Leon-Casasola. It featured several multiple choice questions, audience participation by a wireless voting gadget, analysis of the results in seconds and their subsequent explanation including references to the particular article or abstract. The workshops in interventional pain medicine were comprehensive and well organized. If you participated as an anesthesia resident with an interest in regional anesthesia and pain medicine this must be particularly exciting for you.

Why Pain Medicine?

One of the most interesting things about pain, is that it remains to a large extent, an enigma. It is the first symptom we learn to characterize in medical school and it remains one of the most common problems in the society. The National Institute of Health estimates that over 49 million Americans suffer from chronic pain. Several millions are limited in their daily activities because of pain. Millions more have pain each year in relation to trauma and surgery. In fact, many patients worry more about post operative pain than the surgery itself. Pain is a significant problem at the end of life, and uncontrolled pain drives many patients to consider assisted suicide. Considering how common pain is in society, it becomes obvious that of all of your skills, your pain management skills can be some of your best and most requested. As anesthesiologists, our training equips us with such needed skills both in the interventional and non-interventional arena. There is a satisfaction beyond measure that occurs when you are able to take away a patient's pain. Next time, watch the change in expression on your patient's face! Watch your patient in the labor ward begin to catch up on the missed rest or sleep after your intervention.

Starting early

During the years of residency you learn to take care of pain in acute care settings, e.g., in the O.R. and perioperative setting. You learn the basics and clinical sciences and also the pharmacophysiology relevant to anesthesia care. There are numerous peripheral nerve blocks, neuraxial techniques and other invasive procedures to learn to safely and expeditiously deliver care to our patients so they have little or no pain. I was lucky to train in a program which has advocated and continues to promote regional anesthesia techniques and its training to the residents. In the Acute Pain Service (APS) service rotation the residents have the opportunity to carry out various regional procedures. In coordination with the Pain Medicine faculty and fellow, the anesthesia residents plan and perform these procedures for perioperative pain control. As a CA-1 you learn the basic anatomy relevant to several blocks, and start with relatively simple blocks like axillary and popliteal block. A CA-2 graduates to putting continuous nerve block catheters, caudal and epidural catheters and administering appropriate pharmacological agents in adults, adolescents and pediatric patients. As a CA-3 you continue to perform, improve and reinforce your regional techniques as you help your junior colleagues in organ and do the blocks.

Choices you have

After residency, opportunities abound to practice as an anesthesiologist either in the academic or private practice settings. Residents looking for further training in one of the anesthesiology subspecialities have the choice of either pain medicine or critical care medicine fellowships. Unlike critical care medicine, the subspecialty of Pain Medicine has the largest proportion of practitioners with a background in anesthesia. This may be due to the familiarity of anesthesiologists with regional techniques and their application to caring for chronic pain patients. That said, pain medicine truly is a multidisciplinary specialty with contributions from various branches of medicine, for example, neurology, physical medicine and rehabilitation, radiology and psychiatry. Remember that pain has both subjective and emotional components. It is satisfying to be able to examine all of these facets in order to help a patient. That is why the concept of multimodal, multidisciplinary approach is in vogue today. Do you want to be able to combine interventional, rehabilitative and neuropsychological approaches to care at the same time? Then consider training in a pain medicine program to learn more about managing pain in a much wider context than anesthesia residency alone prepares you to do.

Hemant Yagnick, MD
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Opinion Editorial

Has the pendulum swung too far in post operative pain control? This title of a manuscript appearing in the American Journal of Surgery (186:2003; 472-475) caught my attention just after a telephone conversation during which I was told of the terrible post operative pain suffered by a family member of a physician who has devoted most of his career to treating pain and teaching others how to do it. The "pendulum" article concluded that some patients receiving patient controlled analgesia for post operative pain control may be reaching dangerous levels of sedation, putting them at increased risk for respiratory depression.

How far the pendulum swings (in either direction) with respect to post op pain control is a function of how good our science is, how it is applied and how good our training programs are, as well as who partakes of the training and who pays for optimal care. Good science, good teaching, good application and reasonable reimbursement work together to dampen pendulum swings. When in harmony, they keep the pendulum dead center on optimal patient care. Clearly more work needs to be done to provide the best post operative analgesia care to all patients.

James E. Heavner, DVM, PhD
Editor

PRO&CON PRO&CON PRO&CON

The Benefits of Using the Infraclavicular Approach

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The infraclavicular and axillary approaches to the brachial plexus are both suited for surgery at or below the elbow. While both approaches offer a relatively high success rate,[1-3] the infraclavicular approach offers some benefits over its axillary counterpart. Techniques involving a one-time local anesthetic injection "single-shot blocks" as well as a catheter insertion for postoperative analgesia are discussed below.

Block Placement. The infraclavicular *coracoid technique* is certainly as simple to learn as any of the multiple axillary block techniques.[4;5] Unlike for an axillary block, the patient's arm does not need to be *abducted*[6] nor does pressure need to be applied for >5 minutes following block placement to minimize hematoma formation (trans-arterial technique).[7] *Time* for block placement is shorter using the infraclavicular approach,[3] although block onset and duration for the two techniques are similar.[8]

Number of Injections. The axillary block is placed at the level of the terminal nerves, necessitating 2-5 separate injections to provide complete anesthesia to the hand and arm, depending on the technique used.[9-12] The anatomical basis for this derives from the musculocutaneous and axillary terminal nerves exiting the brachial plexus at the level of the brachial plexus cords, proximal to the level at which the axillary technique may be performed. In addition, septa comprised of connective tissue have been described in both cadavers[13] and living volunteers,[9] further limiting local anesthetic spread from any single injection.[14] Conversely, the infraclavicular block requires a single injection,[1;15] although multiple-injection techniques have been described.[16] The single injection may result in a higher degree of comfort for patients during block placement, even though 2-6 cm of muscle (pectoralis major and minor) must be traversed.[5]

Complications. Both techniques share some potential complications including intravascular local anesthetic injection, infection, and hematoma formation. However, with the trans-arterial axillary technique, several potentially-devestating complications have been described, such as pseudoaneurysm formation[17] and obliteration of the artery.[18] Axillary artery aneurysms have led to permanent neural injury.[19] While no large, prospective studies are available to provide a definitive answer to the question of neural injury, orthopedic surgeons at our institution have noted a dramatic cessation of transient postoperative paresthesias following our switch from primarily trans-arterial axillary to infraclavicular blocks.[20] Finally, multiple *pneumothoracies* have been reported using the *"vertical"* infraclavicular technique,[21-23] with its needle entry point just caudad to the midpoint of the clavicle.[24] However, no reports of pneumothoacies associated with the coracoid approach have been published, probably owing to the fact that the needle entry point for this technique is quite lateral, providing a greater distance between the needle tip and ipsilateral lung. The originator of the coracoid technique reported that even with deliberate attempts to penetrate the thoracic cavity in cadavers, it proved impossible to enter the lung using this approach.[4]

Perineural Catheter. A percutaneous perineural brachial plexus catheter may be placed via the infracalivicular approach to introduce a surgical block[25] or provide postoperative analgesia.[26;27] Unlike axillary placement, the initial nerve block and postoperative infusion reliably provide anesthesia and analgesia to the musculocutaneous nerve with a single injection and catheter.[8;28;28] This theoretically results from the catheter tip being reliably placed at the level of the brachial plexus cords using the *coracoid* technique,[5] unlike with the axillary approach.[29] Finally, catheters in the infraclavicular location are more comfortable for patients and resistant to dislodgement compared with an axillary placement.[30;31]

Caveat. One published study found the axillary approach superior to the infraclavicular approach for multiple outcome variables.[32] Readers should be cautioned that only 30 mL of local anesthetic was used for infraclavicular blocks. As has been noted previously,[33] local anesthetic *volume* is critical for a infraclavicular block if electrical stimulation does not reach all three cords of the brachial plexus, as the cords at the level of the coracoid process surround the axillary artery. Therefore, regardless of the cord(s) initially localized by the stimulating needle, the local anesthetic must extend around the axillary artery to contact all three cords, and thus the entire brachial plexus. Evidence for this may be found in a recent article which reported a "doughnut sign" seen by ultrasound when local anesthetic spread around the axillary artery during injection.[34] Although a dose-response study has yet to be published, this theoretically suggests that an inadequate volume of local anesthetic to "surround" the axillary artery may result in a high failure rate. In contrast, the three-stimulation technique deposits local anesthetic adjacent to each of the three cords, thus theoretically decreasing the total minimum local anesthetic volume required for a successful block.[16] This concept has been demonstrated for femoral nerve blocks involving single- versus multiple-stimulation techniques.[35]

In addition, the authors of the axillary vs. infraclavicular study accepted biceps motion as an endpoint.[32] Because the musculocutaneous nerve innervates the biceps muscle, and this nerve exits the brachial plexus at the level of the cords, it is possible to stimulate the nerve distal to the remainder of the plexus. Any local anesthetic injection may therefore provide a selective block of this one nerve, while sparing the rest of the plexus.[36] In fact, a 56% failure rate has been noted when any stimulated twich proximal to the digits is accepted as an endpoint.[26] For these two reasons (volume and musculocutaneous stimulation), the protocol of this flawed study minimized the effectiveness of the infraclavicular block, and any conclusions drawn from its results should take this into consideration.

Complete references available at www.asra.com

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Axillary Block: The Quintessential Peripheral Nerve Block

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The axillary approach to the brachial plexus is the "Quintessential" peripheral nerve block. For nearly one hundred years, it has been a fundamental part of anesthesia practice, since pioneers like Hirschel (1911) and Pitkin (1927) developed its use. Clinically it offers the advantage of a superficial perivascular site for a single injection to provide both anesthesia and pain relief for hand, forearm and elbow surgery. More importantly, the technique utilizes a simple, reproducible landmark that is applicable in a wide range of patients: the axillary artery. The technique is easy to learn and produces a high degree of success with a low complication rate.[1] These attributes have made this approach the most commonly used peripheral nerve block. In a survey of members of the American Society of Anesthesiologists and American Society of Regional Anesthesia, Hadzic and colleagues[2] documented that 88% of anesthesiologists' utilized axillary blocks; by far the most prevalent peripheral approach.

This popularity is due to the frequency of hand surgery and the simplicity of the technique. As Alon Winnie eloquently noted "Regional anesthesia is simply an exercise in applied anatomy".[3] As the brachial plexus reaches the axilla it has divided into terminal nerves that surround the axillary artery and are enveloped by a dense fascial covering or "sheath"[3] Local anesthetic deposited within the sheath via either a single injection or multiple injections surrounds the individual nerves producing a block of all three. At this level the only necessary landmark is the palpation of the axillary artery. The axillary block is one of the few approaches that does not require the identification or triangulation from bony or soft tissue structures. In addition, the axilla's peripheral location provides the ability to compress an intentional or accidental vascular puncture and avoids the chance of a pneumothorax, compared with more proximal inserted techniques. With either an insulated needle or simply a needle and extension tubing, an injection can be made using nerve stimulation or the paresthesia technique. Alternatively, the transarterial technique (unique to the axilla) provides a third, and equally effective approach, using readily available equipment. The development of these three successful perivascular techniques, which are straightforward, easily taught, with definitive end-points have undoubtedly strengthened the axillary blocks appeal. This popularity and success has engendered strong advocates for each technique (paresthesia, nerve stimulation, and transarterial), each one promoting potential advantages. In spite of this controversy, proponents of these insertion techniques have most importantly demonstrated that each one works, illustrated by excellent success rates (above 90%), that can be achieved consistently in trained hands.

Perhaps the greatest disadvantages of the axillary approach are the long duration of onset time and the potential for individual nerve sparing with single injection techniques. This can be a difficult obstacle when performing any regional technique in a busy practice. While single injection techniques are usually sufficient, Thompson and Rorie[4] provided one possible explanation, for nerve sparing after axillary block, by demonstrating the presence of septa within the fascia surrounding the brachial plexus. In their study, these septa limited the diffusion of local anesthetic in some patients. The impact of this problem is reflected in the large number of studies and strategies designed to speed the onset of blocks with different solutions. To hasten the onset of neural blockade and limit "patchy" blocks numerous investigators have advocated performing multiple stimulation/injection techniques. In one representative study by Koscielniak-Nielsen and colleagues,[5] they demonstrated the effectiveness of this approach. Using 1% mepivacaine with epinephrine 5 µg/ml they compared multiple nerve stimulation and injection of all four terminal branches (10 ml on each) with a transarterial technique (depositing 20 ml deep and 20 ml superficial to the artery). They found that the mean time to perform multiple injections was slightly longer (10 ± 2 min) compared with the transarterial group (7 ± 2 min), however the latency of the initial block was shorter when multiple stimulations where performed (17 vs. 25 min).

Extending the duration of a single injection axillary block, for prolonged pain management for injuries and trauma to the hand and forearm, has been another focus of investigators. Axillary catheters and the continuous delivery of local anesthetic are an ideal solution to achieve this. Because of the dense fascial sheath covering the brachial plexus a catheter placed here can be used to repeatedly deliver local anesthetic in a confined area. First described by Ansbro[6] in 1946, and later refined by Selander[7] in 1977, a catheter placed using the axillary approach can provide analgesia for a few days or as long as several weeks.[8] Numerous studies and case reports have documented the efficacy and safety of this technique. For example, continuous axillary anesthesia has been used for treating postoperative pain, chronic pain, traumatic hand injuries,[9] vasospastic and chronic neuromuscular disorders,[8] treatment of accidental intra-arterial injections resulting in vascular insufficiency,[10] post-amputation pain,[11] facilitating continuous passive range of motion after elbow arthroplasty[12] and more recently to provide ambulatory infusions at home.[13]

In short, the axillary approach to the brachial plexus is a fundamental technique of regional anesthesia practice, that embodies the concept of "applied anatomy". It is a time proven technique that utilizes a consistent landmark and simple equipment to yield outstanding results. Its utility for single injection and continuous applications to treat a wide range of upper extremity injuries will continue to make it the "quintessential" peripheral nerve block.

Complete references available at www.asra.com

Medications in the Lactating Patient

Many of the same physical and chemical properties that impact transplacental transfer of medications also plays a role in drug transfer to breast milk. High lipid solubility, low molecular weight, minimal protein binding, and the un-ionized state all facilitate secretion of drugs into breast milk (Table 1). For most medications, the neonatal dose obtained through breast-feeding is 1 to 2% of the amount ingested by the mother.[1] Once consumed by the infant, factors that modify the nature and degree of drug effect include gastrointestinal absorption, detoxification or conjugation in the infant's liver, and the rate at which the infant metabolizes and excretes the drug. Although the amount of medication exposure via breast milk is usually modest, the possibility of neonatal drug allergy as well as slower metabolism of most medications in infants must be considered.[2]

Despite the use of multiple medications during parturition, there is little risk to the infant in early breast-feeding. Since minimal amounts of colostrum are secreted during the first few postpartum days, infants are exposed to an extremely small fraction of these medications.[3,4] Of much greater importance is transplacental transfer of medications administered before birth.

Most breast milk is synthesized and excreted during and the first 30 minutes immediately following breast-feeding. Breast milk drug concentration closely reflects serum drug concentration during this period of intense milk production. Some general recommendations (Table 2) for minimizing the amount of medication that is passed via breast milk to the newborn include avoiding taking medications during or immediately after breast-feeding, avoiding long-acting medications, and taking medications during times when the infant has the longest interval between feedings[5].

In a manner similar to the FDA categorization of the safety of medications during pregnancy, the American Academy of Pediatrics has categorized medications in relation to the safety of maternal ingestion during the period of lactation[6] (Table 3).

Specific Medications During Breast-Feeding:

1. NSAIDS: Aspirin should only be used occasionally for short-term use, as neonates slowly eliminate salicylates [7]. Maternal ibuprofen appears safe. Maternal ingestion of indomethacin reportedly is associated with neonatal seizures and nephrotoxicity [8]. Acetaminophen appears safe, and may be adequate alone or used to lower other analgesic needs.
2. Opioid analgesics: In the mother taking long-term opioids, such as methadone, breast feeding will protect the neonate from opioid withdrawal. If bottle-feeding is to be used, slow weaning of opioids in the neonate must be considered to avoid neonatal withdrawal. Common dose ranges of Tylenol with codeine appear well tolerated by the breast-feeding neonate.
3. Ergot alkaloids are seldom used to treat migraine headaches, but are still commonly used to treat uterine atony at delivery. Although neonates have a number of adverse reactions to ergots[9], administration of ergots to mothers at delivery does not contraindicate breast-feeding the baby, as there is minimal colostrum production for the first two postpartum days.
4. Antidepressants: These medications are inadequately studied to give guidance. They are considered class 2 during lactation.
5. Sumatriptan appears to be minimally transferred to breast milk, with less than 1/1000 of the maternal drug bioavailable to the neonate. This small amount could be further reduced by discarding breast milk for 8 hours after exposure.[10]
6. Caffeine is often used in the management of vascular headaches and dural puncture headaches. Caffeine consumption of less than 200 mg/day (about 2 strong cups of coffee) appears to have no neonatal effects during lactation. Greater than this amount is associated with increased wakefulness and irritability in the breast-feeding neonate.[11]

Table 1: Maternal Drug Transfer to Breast Milk Facilitated by:

* high lipid solubility
* low molecular weight
* minimal protein binding
* un-ionized state

Table 2: Recommendations for Mediations During Lactation

Eighty percent of breast milk production during and first 30 minutes after breast-feeding, therefore:

- avoid taking medications from one hour prior to breast-feeding until 30 minutes following breast-feeding.
- avoid long-acting medications.

Table 3: American Academy of Pediatrics Classification of Maternal Medication use During Lactation

Category	Comment	Examples
1	Should not be consumed during lactation; serious adverse effects on the infant are likely with ingestion of these medications during lactation	Ergotamine
2	Infant effects in humans are unknown, caution is urged	Imipramine Amitriptyline
3	Compatible with breast-feeding	Phenytoin Carbamazepine Valproic acid Propranolol Codeine Morphine Lidocaine Ibuprofen

(Adapted from the Committee on Drugs, American Academy of Pediatrics[6].)

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Complete references available at www.asra.com

Editor to Editor - Hats Off to Mark Lema

For many anesthesiologists, Mark Lema stimulated much interest in the ASA Newsletter. His VENTILATIONS were read by all, detested by some and loved by others. Many readers were provoked to write to the editor (Mark) to protest or praise. Mark is no longer editor of the ASA Newsletter. I will miss his VENTILATIONS. Any time Mark wants a forum for his thoughts about regional anesthesia and pain medicine, I would be happy to print them in the ASRA Newsletter under the heading INFUSIONS/ INJECTIONS by Mark Lema.

JEH

Literature Review

The Site of Action of Epidural Fentanyl in Humans: The Difference Between Infusion and Bolus Administration.

Yehuda Ginosar, BSc, MBBS; Edward T. Riley, MD, Martin S. Angst, MD. *Anesthesia and Analgesia* 2003;97:1428-38.

The benefits of lipophilic opioids such as fentanyl for epidural administration have come into question based on the finding of similar plasma levels of drug between epidural and intravenous infusions. Ginosar, et al. compared the predominant site of action of analgesia from epidural fentanyl when given as a bolus versus a continuous infusion.

Methods: Ten healthy volunteers were consented for this randomized, double-blinded, cross-over study. An 18 ga epidural catheter was inserted at the L2-3 or L3-4 interspace and advanced 4 cm. Each individual received both the infusion and bolus in random order, at least two days apart. A bolus of 0.03 mg fentanyl in 0.67 ml was given, then a bolus of 0.1 mg in 2 ml, 210 minutes later. For the infusion arm, 0.003 mg/ml fentanyl was given at 10 ml/hr. The concentration was then increased to 0.01 mg/ml after 210 min., and continued for 200 min. A thermal sensory analyzer was used to assess heat pain at the thigh and cheek, and a constant current device was used to assess electrical pain at the thigh and ear. Side effects were assessed. Additionally, fentanyl plasma concentration and blood gas analysis was performed. At 410 min. after the first drug administration, naloxone 0.4 mg IV was given to confirm that any effects measured was opioid related.

Results: Plasma fentanyl Cmax for the bolus arm was 0.21 (small dose) and 0.47 (large dose) ng/ml, versus 0.26 and 0.80 for the infusion arm. The respective mean Tmax values were 120 min and 45 min for the bolus arm (small dose and then large dose), and 180 min. for both infusion rates. In the bolus arm, there was a significant difference in heat tolerance from baseline at both doses in the leg, and not at the head. In regard to electrical pain, a significant difference from baseline only occurred with the large bolus. These results suggest a segmental effect in the bolus arm. In the infusion arm, as the study progressed, there was a corresponding increase in heat tolerance at both sites, with no separation between the leg and head, and this was seen in the electrical pain tests as well. These results supported a supraspinal effect in the infusion arm. No significant change in vital signs occurred in either arm. Sedation, pruritis, and nausea occurred in 5, 7, and 1 subjects in the bolus arm, versus 5, 5, and 1 subjects respectively in the infusion arm. The side effect data points were not statistically different from baseline at any time for either arm.

Comments: This well-designed study is the first to frame the question of site of action of analgesia of epidural fentanyl as one of a predominant effect as opposed to an all or none phenomenon. Increased tolerance to noxious stimuli in the leg after bolus administration, while sparing the face (and having low plasma levels of drug) is strong evidence that a segmental effect can be achieved with bolus delivery at low doses of fentanyl. Even though the infusion arm resulted in delivery of three times as much drug, any increase in analgesia occurred only as plama levels increased over time, and pain tolerance improved at both sites in the same time frame. This supports that the systemic effect was mostly responsible for the observed changes in this mode of delivery. However, this study cannot answer if the predominance of a spinal effect will hold true if a patient requires larger boluses, or repeated boluses over time. The authors should be commended for a rigorous study design, and contributing to our understanding of neuraxial analgesia. This study will have significant implications on our interpretation of previous studies, as well as influence study design for future acute pain investigations.

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Best of Meeting Abstract Spring 2003

Small dose ketamine 0.5mg/kg produces a peripheral preventive analgesic effect when added to interscalene block for major shoulder surgery.

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Introduction: Ketamine is a novel anesthetic agent and NMDA antagonist which has been shown to have local anesthetic properties (1). Tverskoy et al (2) showed in humans that the enhancement of the local anesthetic and analgesic effects of bupivacaine cannot be explained by a central action of ketamine, and therefore this effect is most likely peripheral in its origin.

This randomized double-blind study was performed to examine the potential peripheral analgesic action of ketamine when given with ropivacaine for interscalene brachial plexus block (ISBPB) before major shoulder surgery. The potential central or peripherally mediated preventive analgesic effect of ketamine was also evaluated.

Methods: After REB approval and informed consent 30 patients were recruited and randomized to either interscalene block with ropivacaine 25mg (ISC) +ketamine 0.5mg/kg + placebo i.v. injection (group 1), ISC+IV ketamine 0.5mg/kg (group 2) or ISC +IV saline (group 3). Patients were then anesthetized using a standardised technique for open shoulder surgery.

Pain (VAS), time to first analgesic request and analgesic consumption (PCA morphine) were monitored until 9am on the first postoperative day.

Statistical analysis was performed using SPSS version 10.0. Categorical data were analyzed using Chi Squared test and continuous data was analyzed by Mann-Whitney test or ANOVA followed by Scheffe's post-hoc test. $P < 0.05$ is considered statistically significant. Data are presented as mean ± sd.

Results: There were 10 subjects in each group. There was no significant difference among the groups in terms of age, sex, weight, ASA status, surgical procedure or surgical time. There was no significant differences among groups in terms of intraoperative medications such as midazolam, fentanyl or rocuronium. Propofol consumption was significantly lower ($p < 0.05$) in group 1 (165 ± 43 mg) compared with group 2 (201 ± 3 mg) and group 3 (204 ± 27mg). There were no significant differences in postoperative VAS scores at rest or on movement, time to first analgesia or ketamine related adverse effects. PCA morphine consumption between arrival in PACU and 8h postoperatively did not differ significantly among the groups. However, ANOVA showed that PCA morphine consumption from 8h postoperatively to the following morning at 09:00 was significantly ($p < 0.02$) lower in group 1 (10.6 ± 10.0 mg) compared with group 3 (27.1 ±14.7 mg) but not group 2 (16.1 ± 11.9 mg).

Conclusions: The results of this study confirm the suggestion that ketamine has a peripheral preventive analgesic effect since adding ketamine to interscalene ropivacaine (group 1) resulted in significantly less morphine consumption in the late postoperative period compared with the placebo group (group 3). In contrast, morphine consumption in the intravenous group (group 2) did not differ significantly from that of the placebo group or the interscalene group. The preventive effect is demonstrated by the finding of a PCA morphine-sparing effect that became evident only after the effects of the ketamine had worn off (i.e., after between 8h postoperatively and the following morning).

Complete references available at www.asra.com

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Richard Rosenblatt, MD

In Memoriam

Dr. Richard Rosenblatt of Beverly Hills, prominent physician and civic activist passed away at the age of 56. He was born March 16, 1947 in Los Angeles. He earned his M.D. degree in the Charter Class at University of California, San Diego Medical School in 1972, and served his residency at Harvard University Massachusetts General Hospital in Anesthesia and Intensive Care. He was the founder and Physician Director of the Acute Pain Service at Cedars Sinai Medical Center from 1987 to 1995.

He belonged to the many prominent societies. Some of them include American Society of Anesthesiologists, American Society of Regional Anesthesia and Pain Medicine, International Anesthesia Research Society and International Association for the Study of Pain. His professional career included tours at University of California, Los Angeles, 1985-1991, Ohio State University, Columbus, Ohio College of Medicine; as Associate Chairman for Academic Affairs, 1982-1984, University of California, Davis, California, School of Medicine, and Sacrament Medical Center, Director, Pain Board, 1978-1981.

He was honored and received many awards. Notable awards include the Silver Prize (1991), an Annual Industrial Arts Design Competition, Sponsored by *Business Week* Magazine and "The Best Doctors in Town" recognition by the *Los Angeles Magazine*, 1991.

He was a prolific professional writer. Some of the publications included: "Dynamics of local anesthetic compounds in regional anesthesia", "Experience with continuous epidural anesthesia", "The air test for regional anesthesia", "A pain clinic model applicable to community practice", "Continuous femoral anesthesia for lower extremity surgery", "Volumetric infusion pumps in surgery, and the design and function of a regional anesthesia block room".

Richard was one-of-a-kind, an exciting and stimulating mind, a caring physician, a proud and devoted father and husband, a social liberal and a political conservative, a unique mixture, a unique man. He will be missed but he will be remembered for the good that he did, for the pain he relieved, and for the man that he was.

Richard Rosenblatt, MD, enriched the lives of all that had the pleasure and privilege to have been associated with him. He leaves behind fond recollections and numerous contributions to his family; to medicine and to the communities in which he lived.

P. Prithvi Raj