ASRA NEWS

May 2009

A publication of the American Society of Regional Anesthesia and Pain Medicine

Editorial

Colin McCartney, M.B., F.R.C.A.
Editor, ASRA News

This is my first newsletter as editor, and it is both a pleasure and an honour to hold this position for the next three years. In my experience, ASRA has been a wonderful society in which to learn, discuss, investigate and enjoy all aspects of regional anesthesia and pain medicine, and it will be a pleasure to help disseminate some of the significant news occurring within and outside the society in the next few years. In doing so, I hope I can maintain and improve upon the significant successes of past newsletter editors.

The newsletter is first and foremost a means of communication, and I would therefore be grateful if you would let me know about your significant news wherever you are working. I will try to include as much as possible in the confined space of the newsletter. Other important announcements can be submitted to the e-news section of the ASRA Web site.

The other aim of the newsletter is to stimulate thought and discussion, and I will be aiming to publish articles that do just that. However, the society becomes a poorer place without the opinions of the membership, and I therefore would be very grateful if you are willing to share your opinion with the society in the form of letters to the editor. I can be contacted through e-mail at **asranewsletter@asahq.org**. I will attempt to publish every well written letter either in the print or the Web edition of the newsletter.

In this issue we are fortunate to have the opinions of a number of well known protagonists and "rising stars" of the regional anesthesia and pain world. Andre Boezaart discusses the question of "What Is It That We Really Do?" and our pro:con section from Jacques Chelly, Steve Orebaugh and Jeff Swenson debates whether resident regional anesthesia training should be conducted only with ultrasound. Francis Salinas tells us "How to Do Ultrasound-guided TAP Blocks," and Jeff Gadsden discusses evidence-base for new monitoring devices in regional anesthesia. All-in-all, a full edition with articles from several leaders in the field.

The next (August) edition of the newsletter will be devoted to resident articles. This idea was inspired by the recent President's Message from Dr. Michael Ferrante highlighting the important role of residents in the present and future of our society. Dr. Sandra Kopp, our resident section editor, has kindly agreed to co-edit this edition with me and has already organized several excellent articles from resident colleagues. Please share this news with all your residents and encourage them to read the August edition and to join our excellent society.

With this edition, we have three new members of the newsletter editorial team, including Ricky Brull from the University of Toronto, Samer Narouze from the Cleveland Clinic, Dr. Chris Spevak from Georgetown University, and Ed Mariano from the University of California, San Diego. Each brings with them both an expertise in regional anesthesia and pain medicine and significant writing skills. I would like to welcome them and thank them for their future contributions to the newsletter.

Finally, I would like to thank Dr. Brian Ilfeld for his support and leadership both in his role as editor and in helping me to take over the helm of the newsletter in the last year. I couldn't have asked for a more friendly, diligent and supportive colleague to help me in this process. With that firm foundation in place, I look forward to educating and hopefully entertaining you in the next few years.

Yours sincerely,
Colin McCartney, M.B., F.R.C.A.
Editor, *ASRA News*

President's Message

New President Looks to Uphold Tradition of Excellence

This is the first newsletter in which I address you as president of ASRA. I am truly honored and thankful for the opportunity to serve the premier Society for clinicians, scientists and other health professionals dedicated to advancing the knowledge and practice of regional anesthesia and pain management. I am mindful of the many duties and responsibilities that come with this position. With your help and participation, I am eager to guide our Society for the next two years.

The Board of Directors and I are committed to upholding ASRA's tradition of academic excellence and financial well-being, and we take seriously the trust you have shown in us. Over the years, the ASRA Board has become smaller, more functional and more inclusive. The current group of 11 members is of diverse ethnic background, gender and institutional representation, yet strikes a good balance of interest in regional anesthesia and pain. Nevertheless, the Society is always on the lookout for anyone who wishes to serve our membership: any active member with a good track record of sustained service and continual committee involvement within ASRA can potentially be nominated to serve on the Board of Directors.

As with any "new" administration, it is important to develop a strategic plan, identify priorities and define a number of achievable goals. With that in mind, the three main goals I wish to pursue are: transparency and openness, enhanced member-society interaction and continued membership value. You may have your own ideas about the Society's direction, and I am happy to listen to your suggestions along the way. Please do not hesitate to share with me your ideas, concerns and constructive comments.

I would like to see ASRA further enhance its transparency in the coming years. As such, we will be adding an information session to our 2009 fall meeting in which treasurer and committee reports will be presented. I hope you will attend these sessions.

Given the current economic downturn, I know that many members wish to learn more about ASRA's finances. Let me reassure you that our Society is financially sound, thanks to past presidents and treasurers. For example, our Carl Koller research fund is projected to reach the self-sustaining $2-million milestone in the next few years. Each year, up to 50 percent of surplus funds are invested in the Carl Koller research fund, and the remainder is allocated for support of other educational projects.

The second item on my priority list is to create a stronger link between the Society and its members. I believe ASRA can play a more significant role in the lives and practice of our members beyond two meetings and a few satellite workshops each year. For example, the ASRA Web site can be more effective and convenient in providing clinical resources and continuing professional development. I'd like to see the Web site become your first choice for accessing a wide range of continuing medical educational opportunities, practice guidelines and timely news for upcoming educational events. To this end, Christopher L. Wu, M.D. (chair) and the rest of the members of the Committee on Communications have been asked to apply their creativity and talents to revamping the Web site in the coming year. Drs. Nori Benzon, Asokumar Buvanendran and Samer Narouze have also agreed to contribute educational materials to the chronic pain section. The ASRA anticoagulation and neuraxial anesthesia practice guideline is being revised and a new ultrasound-guided regional anesthesia teaching manual being developed. Other online programs (e.g., "Feedback Corner," a message board and e-bulletin) will also be implemented to enhance member-Society interaction.

Vincent W.S. Chan, M.D., F.R.C.P.C.

My third priority is to enhance membership value. ASRA has long recognized that members are the most important asset of the Society, and our membership will only grow if we continue to offer good value and service. Therefore, in addition to our regular offerings, such as the Society's journal and meeting discounts, we shall continue to seek more benefits – both education-related and non-education-related – for our members. For example, long-time ASRA members will receive the recognition and VIP treatment they deserve when they attend the next ASRA meeting. Details of this program will be announced later. ASRA members will also enjoy registration discounts for several non-ASRA meetings, a list of which can be found on the ASRA Web site.

The ASRA leadership team will continue to work hard to build our Society, driven by our determination to be the world leader in regional anesthesia and pain medicine education and research. We are also committed to better serve members such as you. I encourage you to get involved, stay connected with the Society and be part of this evolution. Together, with your input and partnership, ASRA is well positioned for continued progress and growth in the years to come.

Op Ed

What Is It That We Are Really Doing?

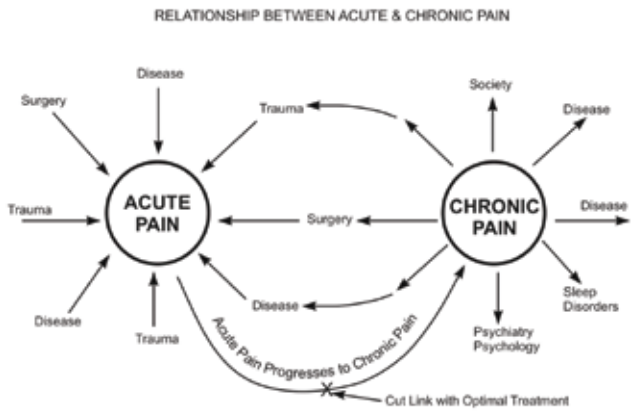
André P. Boezaart, M.D., Ph.D.
Professor of Anesthesiology and Orthopaedic Surgery
Chief, Acute Pain Medicine and Regional Anesthesia Division
University of Florida
College of Medicine
Gainesville, Florida

In recent years, we have confused our clients (patients and surgeons) by not being clear on (or not even knowing ourselves) what it is that we are really doing. Numerous textbooks have been written on (and practiced based upon) "Regional Anesthesia," "Regional Block," "Conduction Anesthesia," "Pain Management," Peripheral Nerve Blocks," etc., and we are frequently (deservedly) viewed by our colleagues as "Block Jocks" and "Needle Jockeys." We are not respected and regarded as we wish to or should be. Could this be because we name our subspecialty inappropriately-and act accordingly?

Regional anesthesia (RA) refers to powerful anesthesiology *techniques* that we use. It can be likened to total intravenous anesthesia (TIVA). Just as it makes no sense to have a TIVA subspecialty, it makes little sense to have a subspecialty of RA. In times gone by, when general anesthesia (GA) was dangerous, RA existed happily as a subspecialty, and practitioners with RA skills were few and enjoyed enormous status. Mortality due to GA improved from 1:1,000 in the 1960s to 1:10,000 in the 1980s, and it made sense to find some safer alternative. Today, in 2009, the mortality due to GA is 1:300,000–arguably even better than RA, per se. We can relax now; GA is safe, user-friendly and the preferred anesthetic for most surgical settings other than peripheral surgery (hands, feet and eyes, for example) and some exceptional medical situations. Even then, generous (and safe) sedation is used as most patients do not want to be awake during surgery. Effectively and safely removing surgical pain from the equation, and thus the unpleasant peri-operative opioids, is where RA now comes to its full right. But we do not need a subspecialty for peri-operative blocks; similar to arterial lines, every anesthesia provider should be able to perform these techniques.

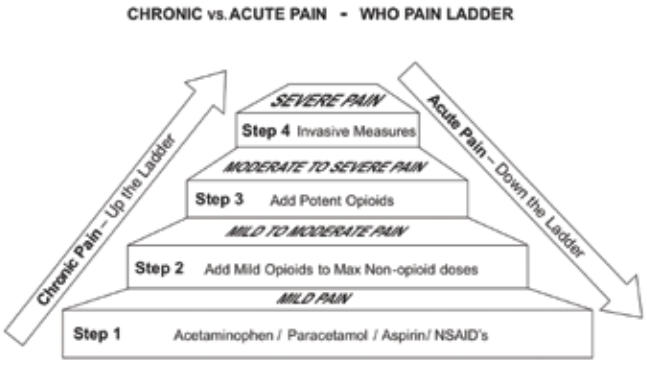
Regional anesthesia emphasizes the *block* and is, similar to other techniques we use, such as invasive monitoring, not a subspecialty. The emphasis on the block has led to the situation that we find ourselves in today where we have as many weird and wonderful blocks as humans have nerves. We now have to artificially manufacture applications for these blocks. To make our situation even worse, we can now "see" these nerves with ultrasound. Focusing on the procedure and not the patient has also led to the unacceptable situation where the equipment industry dictates to us how and what we should think and do. Prominent "regional anesthesiologists," like some prominent societies, frequently promote the products of the highest bidder. Examples of this can sadly be seen by surfing the Web sites of some well-known ultrasound companies.

Figure 1



The subspecialty can also not be *acute pain management*, as that emphasizes the *pain*. It is easy to manage pain if the patient does not matter. This typically leads to over-narcotized, hypoventilating, somnolent, miserable, itching and nauseated patients. We do not need a subspecialty for that. However, to treat patients rather than pain is totally different.

Figure 2



Modern *pain medicine* involves chronic pain, cancer pain, acute pain and addiction. This is very wide area, and most anesthesiologists, like most pain specialists, are not sufficiently equipped for this. Pain medicine therefore usually refers to office-based *chronic pain medicine,* and this subspecialty is frequently performed by physicians other than anesthesiologists, from neurologists to family physicians

and physical medicine and rehabilitation physicians.

Critical care medicine (CCM) is the common (sometimes final) pathway of a number of disease, trauma and surgical conditions, culminating in the critical care situation for which a specialist is required. *Acute pain medicine* is, similar to CCM, the common pathway of a number of disease, trauma or surgical conditions that requires an acute pain specialist to treat these patients [Figure 1]. It is also becoming clear that the proper treatment of the patient with acute pain may well prevent future chronic pain syndromes from developing [Figure 1]. The "Pain Ladder" from the World Health Organization for chronic and cancer pain starts with mild drugs and works up to invasive nerve block procedures for severe pain. Acute pain, on the other hand, starts with severe pain at the top, which requires invasive nerve block procedures and ends with mild analgesics at the bottom of the ladder for mild pain [Figure 2].

We should now realize that we do not need to contrast or compare GA with RA any longer, nor do we need to replace GA with RA. It is no longer an either/or situation because these two components of anesthesiology complement each other perfectly. It requires a physician to treat patients, yet anybody with a license to prescribe opioids can treat *pain*. To take ownership of our procedures and to emphasize and focus our efforts, research, and resources on the *patient* and not on the pain or the procedure, our subspecialty has to be *Acute Pain Medicine* - not *Pain Medicine*, *Acute Pain Management* or *Regional Anesthesia*.

A Surgeon's Perspective on Acute Pain Medicine

André asked me to proofread his editorial, and, as a surgeon and one of his "clients," I felt it appropriate to offer some comments – an outside view from a surgeon's perspective. I view myself as uniquely qualified to comment on this since I had the opportunity to observe firsthand the development of the new concept of acute pain medicine (APM) at our institution. What has been done at the University of Florida is to focus on the patient (not the block or the pain) from the beginning of his/her entrance into the system. After operative interventions, the APM team would round on the patients twice daily and then follows the patients' analgesic needs all the way to the time of discharge and beyond. This is a radical change from the way the anesthesiology teams have participated in the care of our patients in the past.

Our institution had the traditional model where the anesthesiologists performed regional blocks and occasionally participated in post-operative pain management. This caused much frustration and animosity among surgeons, as the care of nerve blocks is really not within our field of expertise. The new "patient-centric" model has the anesthesiologists working hand-in-hand with the surgeons. I believe that the further development of APM as a subspecialty will contribute to an increase in patient satisfaction and efficiency, not to mention anesthesiologist job satisfaction. My observations as the "client" and co-manager of orthopedic trauma patients suggest that the following changes instituted at our location were critical ingredients to the success of the program. They fall into three broad categories.

1. **Organizational:** Through networking, both vertically and horizontally, and through formal and informal means, collaboration was worked out between the surgical and the APM services. Collaboration has been used to develop co-management systems that optimized resources, facilitated overall efficiency and enhanced the care of patients.
2. **Service Delivery:** The entire APM team has been trained to perform their responsibilities and tasks as physicians and nurses, and not as proceduralists. By making this transformation and insisting that all parties in the APM service relate to patients and their families and their needs has had a major impact on a number of critical variables that my patients have identified. Such variables include ongoing management of all the interventions that were started preoperatively. Because they take ownership of their nerve block procedures, we do not see the "failed blocks" that we were so used to.

Kalia K. Sadasivan, M.D.
Professor of Orthopaedics and Rehabilitation Medicine
Chief, Orthopaedic Trauma Division
University of Florida College of Medicine

3. **Clinical:** The development of a shared understanding between the APM and the surgical services has certainly allowed us to maintain an ongoing dialog and feedback that is a critical ingredient in complete care of the patient.

I, for one – being an academic orthopedic surgeon for more than 25 years who was very skeptical at first and had to be convinced (often unsuccessfully) to allow blocks on my patients – am now the one trying to convince the APM team to do blocks on and get involved with my patients. We find it much easier and satisfactory to communicate with fellow physicians than to give orders to technicians.

I hope my observations and comments are useful to your membership.

How I Do It

Ultrasound-Guided Transversus Abdominus Plane (TAP) Block for Abdominal Surgery

Francis V. Salinas, M.D.
Staff Anesthesiologist
Virginia Mason Medical Center
Clinical Assistant Professor of Anesthesiology
University of Washington
Seattle, Washington

How I Do It Section Editor:
Edward R. Mariano, M.D.

Overview

The transversus abdominus plane (TAP) block delivers local anesthetic within the neurovascular plane located between the internal oblique (IO) and transversus abdominus (TA) muscles that contains the thoracolumbar nerves supplying sensation to the anterolateral abdominal wall. Originally described by Rafi, the landmark-based TAP block is performed within the iliolumbar triangle of Petit utilizing a *"double-loss of resistance"* technique to advance a blunt regional anesthesia needle through the external oblique (EO) and IO fascial layers and eventually arrive within the fascial layer between the IO and TA muscles.[1]

The postoperative analgesic efficacy of the TAP block has been demonstrated by a series of studies by McDonnell and colleagues for a variety of abdominal procedures, including radical retropubic prostatectomy, bowel resection, total abdominal hysterectomy and cesarean delivery. Three randomized controlled trials have shown that bilateral single-injection TAP blocks for patients undergoing various abdominal surgeries significantly decrease VAS pain scores in conjunction with 50-70-percent reductions in postoperative opioid requirements for 24-36 hours.[2-4]

Although the landmark-based technique as described has demonstrated impressive analgesic efficacy, I prefer the ultrasound-guided TAP block for several reasons. First, the borders of the iliolumbar triangle of Petit may be difficult to appreciate, especially in obese patients. Second, the external oblique muscle may actually cover the latissimus dorsi muscle, thus obscuring the anterior and posterior borders of the triangle.[5] Third, any blind technique utilizing loss of resistance has an inherent failure rate based on the skill and experience of the practitioner and carries associated risks such as liver and bowel trauma.[6-8] A recent study utilizing ultrasound to determine the location of local anesthetic placement after the performance of a traditional landmark-based ilioinguinal-iliohypogastric nerve block (essentially a TAP block targeting the L1 nerve) demonstrated that the local anesthetic was in the correct location only 15 percent of the time.[9]

Clinically Relevant Anatomy

The thoracolumbar nerves that supply the anterolateral abdominal wall are derived from the ventral rami of the T7-L1 spinal nerves. The thoracolumbar nerves, with their accompanying blood vessels, course through the lateral abdominal wall within the neurovascular TAP below a thin fascial layer between the IO and TA[10] [Figure 1].

Figure 1

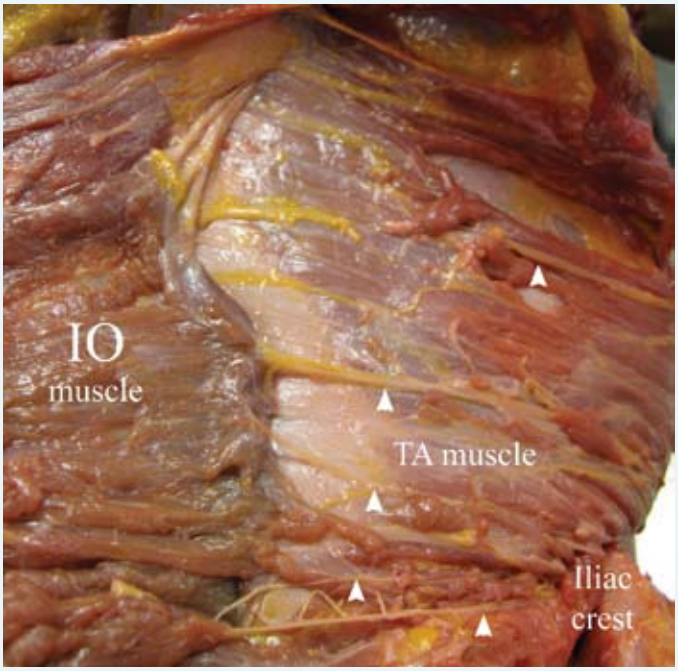


Figure 1: Fresh cadaver dissection demonstrating the thoracolumbar nerves lying superficial to the transversus abdominus (TA) muscle. The internal oblique (IO) muscle has been dissected and reflected medially. The thoracolumbar nerves are indicated by the arrowheads.

There is currently a difference in opinion in terms of the extent of the sensory spread with a bilateral TAP block. While McDonnell and colleagues assert that the extent of sensory analgesia with the TAP block via the iliolumbar triangle extends from T7 to L1, and thus provides effective analgesia for even upper abdominal procedures,[11] other groups utilizing an ultrasound-guided "posterior TAP block" approach describe more limited spread (only T10-L1).[12,13] Utilizing ultrasound guidance, a subcostal approach to TAP may potentially target the upper thoracolumbar nerves more effectively than the more caudad approach just above the iliac crest.[14]

The pertinent sonoanatomy of the TAP block is fairly straightforward with the three layers of the lateral abdominal wall from superficial to deep being EO, IO and TA [Figure 2]. Just deep to the TA is the transversalis fascia

Figure 2

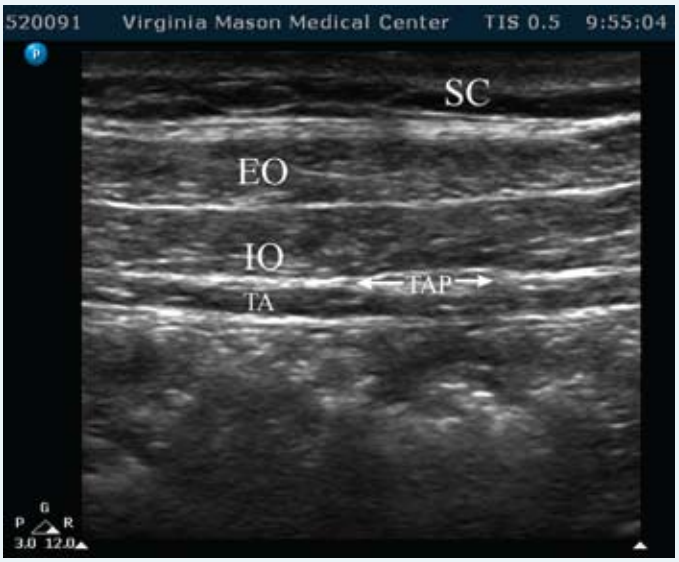


Figure 2: Sonoanatomy of the lateral abdominal wall. The anatomy from superificial to deep includes the subcutaneous tissue (SC), the external oblique (EO), internal oblique (IO), and the transversus abdominus (TA). The transversus abdominus plane (TAP) is located in between the IO and TA.

with the peritoneal cavity below. Bowel with active peristalsis is often visible within the peritoneal cavity. Like needles, fascial planes are "specular reflectors" of ultrasound and appear hyperechoic relative to the hypoechoic

Figure 3a

Figure 3a: The patient is supine with the ultrasound positioned along the axial plane of the lower abdomen just above the iliac crest. The needle insertion point is several centimeters from the medial edge of the ultrasound probe to allow a needle path parallel to the fascial planes, but perpendicular to the direction of the ultrasound beam. The needle is advanced "in-plane" in a posterior and lateral direction towards the TAP.

muscle they envelope, especially when ideally aligned to ultrasound beam.

Technique

Patient position: The patient is supine with the anterolateral abdominal walls exposed bilaterally from the iliac crests to the costal margins [Figure 3a].

Equipment: For single-injection techniques, either a 100 mm-21 gauge or a 150 mm-20 gauge needle is used. For efficiency, I typically use a single needle attached to a 60 mL syringe for both blocks. I use a high-frequency linear array ultrasound transducer probe (3-12 MHz) covered with a sterile plastic transducer sheath. Since this is a bilateral block, I place the ultrasound screen at the head of the bed so that I can block both sides without having to move the ultrasound machine.

Approach: After sterile skin cleansing of the abdomen,

Figure 3b

Figure 3b: Sonographic image of injection needle advancing in plane towards the TAP. The needle tip is located just below the fascial layer of the internal oblique (IO) muscle. The needle (arrowheads) is surrounded by local anesthetic (LA) within the TAP.

the transducer probe is positioned on the lateral abdominal wall just cephalad to the iliac crest along the anterior to midaxillary line [Figure 3a]. The sonographic image should display the EO, IO and TA with the underlying peritoneal cavity [Figure 2]. The image is optimized by utilizing varying degrees of pressure, alignment, rotation and tilting ("PART") movements of the probe while adjusting depth, frequency, overall gain and time-gain-compensation until the TAP is clearly visualized. After the selected needle insertion site is anesthetized, the block needle is advanced in-plane from its initial insertion point in a posterior and lateral direction until it penetrates the fascial layer between the IO and TA, often accompanied by a tactile and visible (on the ultrasound screen) "pop" [Figure 3b]. After aspiration, 1-2 mL of local anesthetic is injected to confirm correct placement within the TAP, fol-

Continued on page 8

Continued from page 7

lowed by incremental injection of the total local anesthetic dose. The correct local anesthetic distribution is characterized by accumulation of anechoic local anesthetic solution below the fascial layer of the IO muscle [Figure 3b]. Often, the local anesthetic will push the TA muscle deeper while dissecting anteriorly and posteriorly within the TAP. The process is repeated on the contralateral side.

For the subcostal approach, the ultrasound probe is placed just caudal to the costal margin, typically at the level of the anterior axillary line. At this level, the linea semilunaris can be imaged along the lateral margin of the confluence of the anterior and posterior rectus sheath. From this point, the probe is simply moved inferolateral parallel to the costal margin until the TAP is visualized. The same in-plane technique as described previously is used.

Local anesthetic selection: I typically use ropivacaine 0.5 percent with 1:400,000 epinephrine for the bilateral TAP with a volume of 20 mL for each side. This local anesthetic volume is consistent with the published literature to date.[2-4]

Clinical Pearls

With ultrasound guidance, the success rate of the TAP block in my experience is near 100 percent, with minimal patient discomfort or complications. I perform these blocks to provide postoperative analgesia for elective total abdominal hysterectomy with a low transverse incision and as a rescue technique in the PACU for planned laparoscopic procedures requiring extensive work of the abdominal wall (such as ventral or incisional hernia repairs with mesh) or for the occasional laparoscopic cholecystectomy that requires conversion to an open procedure. I have even placed ultrasound-guided TAP catheters for major abdominal surgery after failed thoracic epidural catheter placement attempts.

The TAP block is dynamic, and the field will move with patient respirations. I find that the combination of quiet breathing by the patient with a moderate amount of pressure on the probe minimizes abdominal wall movement and helps to keep the advancing needle "in plane."

Summary

The TAP block is a useful regional anesthesia technique that provides effective analgesia for patients requiring abdominal wall incisions. Unilateral TAP blocks may be used for procedures such as open cholecystectomy or appendectomy. Most often, a bilateral TAP is required for midline or transverse abdominal incisions. It has been unequivocally demonstrated to provide excellent analgesia compared to traditional opioid-based systemic analgesia after a variety of abdominal procedures for up to 24-36 hours. Placement of bilateral TAP catheters may further prolong the duration of analgesia,[15] but this technique has not yet been directly compared to thoracic epidural analgesia (TEA). Although TEA is the current gold standard for postoperative analgesia after major abdominal operations, the TAP block may be performed for outpatient surgeries and may be a useful alternative to epidural analgesia when contraindicated.

References:

1. Rafi AN. Abdominal field block: a new approach via the lumbar triangle. *Anaesthesia.* 2001; 56:1024-1026.
2. McDonnell JG, O'Donnell BD, Curley G, et al. The analgesic efficacy of the transversus abdominus plane block after abdominal surgery: A prospective randomized controlled trial. *Anesth Analg*. 2007; 104:193-197.
3. McDonnell JG, Curley G, Carney J, et al. The analgesic efficacy of the transversus abdominus plane block after cesarean delivery: A randomized controlled trial. *Anesth Analg*. 2008; 106:186-191.
4. Carney J, McDonnell JG, Ochana A, et al. The transversus abdominus plane block provides effective analgesia in patients undergoing total abdominal hysterectomy. *Anesth Analg*. 2008; 107:2056-2060
5. Loukas M, Tubbs RS, El-Sedfy A, et al. The clinical anatomy of the triangle of Petit. *Hernia.* 2007; 11:441-444.
6. Farrooq M, Carey M. A case of liver trauma with a blunt regional anesthesia needle while performing the transversus abdominus plane block. *Reg Anesth Pain Med.* 2008; 33:274-275.
7. Frigon C, Mai R, Valais-Gomez, Desparmet J. Bowel hematoma following an Ilioinguinal-Iliohypogastric nerve block. *Paed Anaesth.* 2006; 993-996.
8. Jankovic Z, Ahmad N, Ravishankar N, Archer F. Transversus abdominus plane block: How safe is it? *Anesth Analg*. 2008; 107:1758-1759.
9. Weintraud M. Marhofer P, Bosenberg A, et al. Ilioinguinal/iliohypogastric blocks in children: Where do we administer the local anesthetic without direct visualization? *Anesth Analg*. 2008; 106:89-93.
10. Rozen, WM, Tran TMN, Ashton MW, et al. Refining the course of the thoracolumbar nerve: A new understanding of the anterior abdominal wall. *Clin Anat.* 2008; 21:325-333.
11. McDonnell JG, O'Donnell BD, Farrell T, et al. Transversus abdominus plane block: A cadaveric and radiological evaluation. *Reg Anesth Pain Med.* 2007; 32:399-404.
12. Tran TMN, Ivanusic JJ, Hebbard P, Barrington MJ. Determination of the spread of injectate after ultrasound guided transversus abdominus plane block: A cadaveric study. *Br J Anaesth*. 2009; 102:123-127.
13. Shibata Y, Sata Y, Fujiwara Y, Komatsu T. Transversus abdominus plane block. *Anesth Analg.* 2007; 105:883-884.
14. Hebbard P. Subcostal transversus abdominus plane block under ultrasound guidance. *Anesth Analg.* 2008; 674-675.
15. Gucv G, Yasui GM, Chang TY, Lee J. Bilateral ultrasound-guided continuous ilioinguinal-iliohypogastric block for pain relief after cesarean delivery. *Anesth Analg.* 2008; 106:1220-1222.

Resident Section

100-Percent Growth!

The ASRA Resident Section is active, growing and proud to boast a 100-percent growth in resident membership over the last several years! The increasing interest in regional anesthesia and pain medicine among resident physicians has contributed to this growth as well as the fantastic support from the board of directors in providing the Resident Section committee with the means to develop and put on outstanding resident educational programs at the fall and spring meetings each year. The resident section is also very active throughout the year as well.

This past year ushered in exciting new learning opportunities for resident members attending the ASRA meetings. The 33rd Annual Regional Anesthesia Meeting and Workshops in spring 2008 was the first time that the Resident Section was able to offer a resident-only regional anesthesia workshop. This new tradition continued during the 2008 Annual Pain Medicine Meeting and Workshops with two resident-only fluoroscopic procedural workshops and one lecture focusing on fluoroscopic anatomy for interventional pain procedures. These workshops were very well received by resident participants, and we look forward to the opportunity to provide residents with more interactive learning activities such as these workshops in future meetings. In addition to the new resident-only workshops, every ASRA meeting features a comprehensive resident program, which includes a resident forum, a resident reception with fellowship directors, a resident PBLD luncheon and ASRA-sponsored social events. ASRA promotes resident educational and academic endeavors by awarding $1,000 scholarships for best resident poster presentations at each meeting. Further, the encouragement and support for resident involvement has led to the upcoming August newsletter being devoted mostly to resident articles. This "Resident Edition" will cover a broad range of topics, including the future of resident training, a pro/con discussion on ultrasound versus peripheral nerve stimulation from the resident's perspective, applying for fellowships, research during fellowship, humanitarian missions, and resident activities and involvement in ASRA.

The ASRA Resident Section committee works hard to develop the resident program for each meeting and to foster academic interest in regional anesthesia and pain medicine throughout the year. Recently, the Resident Section committee developed and now hosts a members-only message board through the ASRA Web site that allows open communication between residents nationwide on a wide range of topics related to regional anesthesia and pain medicine. In addition, residents can participate in a monthly online journal club. Topics covered in the journal club alternate between regional anesthesia and pain medicine on a monthly basis. All ASRA resident members are welcome and encouraged to join the message board and to participate in the journal club and other interesting posted topics. It is our hope that the message board will evolve into an active forum for residents across the country to share comments, ideas and concerns as related to fellowship selection, academic discussions and more.

The ASRA Resident Section committee consists of residents and fellows from programs across the nation who are interested in regional anesthesia and pain medicine. The members of the Resident Section serve as liaisons between ASRA and all other residents interested in regional anesthesia and pain medicine. If you would like to be more involved with ASRA or have suggestions or ideas on how to improve the resident activities at the ASRA meetings, please contact one of the committee members in your area. The ASRA resident committee is proud to introduce the new members of our committee:

Matthew Crooks, M.D., Chair
Rebecca Johnson, M.D., Chair-Elect
Members-at-large: Dr. Brandon Togioka, Dr. Hans Sviggum, Dr. Ashleigh Garza, Dr. Joseph Hung, Dr. Ryan LaVasseur, Dr. Andrew Gorlin, Dr. Sayeh Hamzehzedah, Dr. Amit Asopa, Dr. Sean Li, Dr. Matthew Hansen, Dr. Todd Hagle, Dr. Neal Shah, Dr. Arti Orti, Dr. James Fortman II, Dr. Halena Gazelka, Dr. Benjamin Salter, Dr. Irene Wu, Dr. Cyril Philip, Dr. Jennifer Potzman-Sandali.

We also welcome back the current committee members, whose names can be found on the ASRA Web site. We appreciate their valuable contributions and look forward to their ongoing participation in the coming year.

Thank you to all of the resident and fellow members of ASRA who help make the resident program at the ASRA meetings a great success. If you are not yet a member of ASRA, we encourage you to join our Society and to learn more about all of the opportunities available to resident members. Additional information is available on the ASRA Web site **www.asra.com**. We look forward to seeing you at a future meeting!

Ellen W. K. Carlson, M.D.
Associate
Department of Anesthesia
University of Iowa
Iowa City, Iowa

Resident Section Editor:
Sandra L. Kopp, M.D.

Jeffrey D. Swenson, M.D.
Professor of Anesthesiology
Director of Anesthesiology
University of Utah
Orthopaedic Center

PRO

As educators, we have the responsibility to recognize technology that improves performance and to teach it to the next generation of anesthesia providers. For this to happen, we must sometimes acknowledge that the techniques we *know* best may not be the techniques that *are* best. Some who stubbornly cling to nerve stimulation (NS) will argue that ultrasound (US) has not been validated as more effective or safer than the "gold standard" of NS. Others claim that it is too expensive or is not widely accessible. This attitude ignores the incredible advances in real-time imaging that have been made and incorporated into all medical specialties. Before we wrap ourselves in the flag of academia while awaiting the "absolute validation" of US techniques, why not take a closer look at past and present facts.

What about NS as the "gold standard" for regional anesthesia? An inconvenient truth about NS is that there are still no studies showing a consistent relationship between stimulating current and distance from the nerve. In fact, as recently as 2008, the authors of a carefully controlled study[1] addressing this subject concluded that "**Although monitoring a motor response during passage of current through the nerve block needle is a standard technique for guiding placement of the needle, there is minimal understanding of the final relation between needle and the nerve when using this method**." Even more concerning are studies showing the absence of motor response when the needle is positioned within or in contact with the nerve.[1-3] In other words, NS neither defines a specific distance between the needle and the nerve nor does it reliably indicate intra-neural needle placement. Where was our need for validation when we bequeathed the title of "gold standard" on NS techniques?

Visualizing anatomy is possibly the most appealing aspect of US-guided regional anesthesia. At last we can

Resident Training for Peripheral Nerve

CON

Steven L. Orebaugh, M.D.
Associate Professor of Anesthesiology and
Critical Care Medicine
Director of the Regional/Ambulatory Anesthesia
Resident Rotation
UPMC-Southside Hospital
Department of Anesthesiology
University of Pittsburgh School of Medicine

Jacques E. Chelly, M.D., Ph.D., M.B.A.
Professor of Anesthesiology (with Tenure) and Orthopedic Surgery
Vice Chair of Clinical Research
Director of the Division of Acute Interventional Perioperative Pain and Regional Anesthesia
Director of the Regional and Orthopedic Fellowships
Department of Anesthesiology
University of Pittsburgh Medical Center
Director of Orthopedic Anesthesia,
UPMC Shadyside Hospital
Director of Acute Interventional Perioperative Pain
UPMC Presbyterian-Shadyside Hospitals

The goal of our regional anesthesia teaching program is to train our residents to perform as many different types of blocks as possible in as many possible environments. This is best achieved by training residents using several techniques. Relying solely on the use of ultrasound for training assumes that this mode of guidance has supplanted peripheral nerve stimulation in terms of safety and effectiveness. At the present time, most randomized trials comparing the two techniques have shown a similar degree of effectiveness.[1-3] In trials where ultrasound techniques have been demonstrated to be superior, the comparison typically involved a multiple injection technique using ultrasound versus a single injection using nerve stimulation,[4,5] even though it is well established that the use of a multiple injection technique is associated with higher success rates than a single injection technique.[6-10] It is clear that a large, randomized, multicenter trial is neces-

see nerves, vessels and tissue planes. This facilitates new methods to deliver local anesthetic to target nerves without immediate proximity of the injecting needle.[4-6] Since needle trauma and intraneural injection are two preventable causes of nerve injury, why not make these advances immediately available to trainees? Those who persist in NS techniques are condemned to the old dogma of getting the needle as close as possible to the nerve. This is a technique may be nostalgically referred to as "poke and hope." Finally, those who are performing US on a regular basis are now familiar with such structures as the lateral circumflex femoral, transverse cervical and profunda femoris arteries. These structures, which may have caused hematomas and intravascular injections in the past, are now avoidable objects of anatomic interest.

For those of us who lived through the "pre-ultrasound years" of regional anesthesia, it is hard to believe that our specialty is not leaving the nerve stimulator as quickly as possible. Although "stimulophiles" may claim that measurable outcome differences between NS and US techniques are lacking, emerging data suggest otherwise. A review of studies comparing US with NS techniques confirms that US-guided blocks are performed more quickly, using fewer needle passes, and with lower local anesthetic doses when compared with NS techniques.[5] In addition, block duration is increased while the incidence of needle paresthesia and vessel puncture is decreased with US-guided techniques.[5] To date, there are no studies showing superiority of NS over US in any of these categories.

What about cost? Before we shudder at the initial investment of $30,000-40,000 dollars for a US machine, consider the alternative. At many institutions, US has completely eliminated the need for stimulating needles. For single injections, this decreases the cost from $7-$10 for a stimulating needle to approximately $0.45 for a simple 22G needle. Even more important is the difference between a stimulating Touhy needle (approximately $17) and a $0.95 thin-walled 18G needle. For hospitals performing even 1,000 catheters per year, this amounts to a cost savings of more than $16,000 per year. For those still using stimulating catheters ($60 each) the cost savings would be nearly $60,000 per year.

Can we train anesthesiology residents in regional anesthesia without NS? At the University of Utah, we stopped teaching NS more than five years ago. Our residents have successfully performed more than 7,000 peripheral nerve blocks using only US guidance. Far from being handicapped by the lack of NS skills, they have moved on to institutions that readily facilitated this 21st century technology. Someday, one of our residents will point up on the shelf to a dust-covered nerve stimulator and say, "I can't believe you used to poke a needle around all those structures without seeing where you are going!" My response will probably be, "Yeah, those were the bad old days."

Continued on page 16

Blockade Should Be Conducted Solely With Ultrasound

Pro/Con Section Editor:
Richard Brull, M.D.

sary to firmly establish the relative safety and efficacy of ultrasound guidance in comparison to neurostimulation. Such studies have not been performed and most likely will not be, as thousands of patients would need to be enrolled. This sentiment was recently echoed in an editorial in which it was stated that "the 'Trojan War' will not come to pass."[11]

Neurostimulation provides a functional understanding of which nerve is to be blocked, which can increase success rates when combined with ultrasound compared to ultrasound alone.[12] Functional confirmation is especially important when attempting to minimize the total amount of local anesthetic by selectively bathing only a specific target nerve. Moreover, a motor twitch confirming that the position of the needle tip is in close proximity to the target nerve as visualized on the ultrasound screen is a useful learning experience for anesthesia trainees.[13,14] The importance of functional confirmation is exemplified during axillary brachial plexus blockade, as it has been demonstrated that the disposition of nerves relative to the axillary artery is variable.[15,16]

It is important that residents be trained for the environment in which they will ultimately practice. Ultrasound machines are not always available either because they have not been purchased or because the available machine is broken or requires maintenance. In this case, existing expertise in neurostimualtion would allow the practitioner to continue to perform peripheral blocks. Although it is clear that the use of ultrasound is becoming more widespread, many small facilities regard the acquisition cost as a limitation, even if it is demonstrated that augmented procedure fees can pay for the machine relatively quickly.[17]

Ultrasound-guided techniques are only as good as the machines that we have available. Ultrasound's promise as the "ideal" method for nerve block guidance remains unfulfilled at this time. Patients with a large amount of adipose tissue, a distressingly common problem in North America, present formidable obstacles to adequate nerve imaging. Subcutaneous air has been reported as a limitation for the use of ultrasound-guided techniques, as has edema. "Deep" blocks, requiring an acute needle angle on insertion, make needle placement difficult, even in experienced hands. Intravascular injections with central nervous system toxicity[18-20] have been reported, likely because veins are readily collapsed by the ultrasound probe. Intraneural drug delivery may also occur[21] and may not be evident until after the local anesthetic injection has been initiated.

Lastly, there are still a number of ultrasound guided techniques that need to be developed. Although in the past few years an increasing number of approaches have been

Continued on page 16

2008 Fall Meeting Abstract Review

Samer N Narouze, M.D., M.Sc.
Program Director, Pain Medicine Fellowship
Pain Management Department, Anesthesiology Institute
Staff, Center for Neurological Restoration
Neurosurgery Department, Neurological Institute
Cleveland Clinic

Sixty five abstracts were presented at the ASRA 2008 Annual Pain Medicine Meeting and Workshops, covering different modalities for chronic pain management, including cutting-edge technology and innovative techniques.

A number of novel abstracts investigated the efficacy and safety of intrathecal (IT) infusion techniques. Chen et al.[1] presented a concentration-dependent erythrocyte hemolysis model for local membrane toxicity of intrathecal drugs. Preclinical studies show that intrathecal infusion of several agents, including amitriptyline, local anesthetics and memantine, produce local parenchymal toxicity. Also IT morphine at high concentrations can lead to granuloma formation. This suggests a need for a model to study the potential toxicity of such IT agents, and these initial results suggest that this hemolysis model may be useful as an assay to assess potential IT drug toxicity.

Westin et al. [2] assessed the effects of intrathecal morphine in the neonatal rat in a preclinical spinal safety model because there are no reports on the preclinical safety of neuraxial drugs in neonates. They showed that percutaneous IT delivery can be achieved with a high degree of success in neonatal rats, and the degree of spread is dependent upon volume. Also, IT morphine produced a robust antinociceptive action, and no obvious pathology was observed with histopathological examination.

Saidov et al. [3] in a retrospective study of 32 patients showed that an initial trial dose of morphine alone is not a good predictor for success in pain control via intrathecal infusion. The majority of patients will require changes in medication dose and/or adjuvant medication in the pump before technique effectiveness can be assessed.

A number of abstracts examined the stability and safety of intrathecal ziconotide. Nasr et al,[4] using mass spectrometry, demonstrated that the addition of baclofen, hydromorphone hydrochloride and bupivacaine to ziconotide did not alter its stability after 40 days in an intrathecal pump mixture, although specific concentrations were not specified. In a series of refractory cancer pain patients, Stearns et al. [5] demonstrated that intrathecal ziconotide combination therapy can be a viable treatment option for patients at the end of life. In addition, De Negri et al. [6] advocated the earlier use of low-dose ziconotide as an effective adjuvant to IT morphine when neuropathic pain represents a challenging problem in cancer patients.

Another common area of abstract submission concerned radiofrequency ablation (RFA) techniques. Provenzano et al.[7] studied the effect of fluid modulation on radiofrequency lesioning size. Compared to control RF lesions, they demonstrated statistically significant differences in specific lesion size parameters when 0.5 mL of sodium chloride, water or lidocaine was injected prior to lesioning. Also, the pre-injection of ionized solutions produced significantly larger lesions when compared to pre-injection of water alone. Possible explanations for these findings include: 1) utilization of higher power levels through tip cooling, 2) increased thermal conductivity and 3) improvement in electrical tissue conductivity with ionized fluids. An improvement in electrical conductivity assists in lowering tissue impedance translating to less resistive heating near the tip. This study demonstrates a simple method to increase lesion size with monopolar RF through alterations in thermal and electrical conductivity, which may lead to a higher success rate for incorporation of the target structure in the lesion.

Also, in an attempt to improve RFA outcomes, Mohajer et al.[8] described a gradual stepwise temperature increase technique for RF lesioning that provides an alternative way to reliably ablate cervical spinal nerves, improving safety and reducing patient discomfort.

Several abstracts presented data for the growing area of interest in peripheral nerve stimulation and peripheral nerve field stimulation. Readers are referred to the abstracts presented by Carlson et al.,[9] Dasgupta et al.,[10] and Mc Donnell et al.[11] (head and facial pain), Zepeda et al.[12] (thoracic pain) and Fortman et al.[13] (back pain).

Finally, the growing interest in ultrasonography in pain medicine (USPM) was in strong evidence with abstracts describing many new applications. Gofeld et al.[14] described the use of 3D ultrasonography in stellate ganglion block and claimed that the lateral in-plane approach may be safer than the more traditional out-of-plane technique. Adhikary et al.[15] presented 3D imaging of the thoracic and lumbar paravertebral region, demonstrating that 3D ultrasound in the paravertebral area could be clinically useful to assess both needle tip position and local anesthetic spread.

Shankar et al. [16] in a retrospective analysis of guidance techniques for suprascapular nerve steroid injections in chronic shoulder pain expressed concerns about potential for pneumothorax and intravascular injection with the landmark based technique and suggested that an ultrasound guided technique may avoid such complications.

Cheng et al.[17] extended the application of USPM to diagnostic neural sonography (sonopathology) and asked whether there is a role for pain physicians or anesthesiologists in the diagnosis of neuropathology with ultrasound.

Congratulations to the authors of the five "Best of Meeting" abstracts, including Drs Blackshear et al. (*Skaggs*

Community Health Center, Branson, Missouri), Gofeld et al. (Sunnybrook Health Sciences Centre, Toronto), Chen et al. (UCSD), Provenzano et al. (Ohio Valley General Hospital) and Viscusi et al. (Thomas Jefferson University).

Finally thanks are due to all presenters who accentuate the success of the Annual Pain Medicine Meeting and Workshops through their scientific curiosity, hard work and desire to improve patient outcomes in the specialty of pain medicine.

References:

1. Chen, et al. Concentration dependent erythrocyte hemolysis: A model for local membrane toxicity of spinal drugs. *Reg Anesth Pain Med*. 2008; 32:3.
2. Westin, et al. Validation of a preclinical spinal safety model: Effects of intrathecal morphine in the neonatal rat. *Reg Anesth Pain Med.* 2008; 32:4.
3. Saidov, et al. Role of trial dose of intrathecal narcotic as a predictor of outcome in intrathecal pain pumps. *Reg Anesth Pain Med.* 2008; 32:1.
4. Nasr, et al. Stability of Ziconotide with other medications including Hydromorphone Hydrochloride, Clonidine and Baclofen in intrathecal pumps in advanced Pancoast tumor. *Reg Anesth Pain Med.* 2008; 32:10.
5. Stearns et al. Intrathecal Ziconotide combination therapy for the management of refractory cancer pain in patients at the end of life: A case series. *Reg Anesth Pain Med*. 2008; 32:2.
6. De Negri, et al. Ziconotide as early adjuvant to intrathecal morphine for neuropathic pain treatment in cancer patients. *Reg Anesth Pain Med*. 2008; 32:10.
7. Provenzano, et al. The effect of fluid modulation on radiofrequency lesioning sze parameters. *Reg Anesth Pain Med*. 2008; 32:4.
8. Mohajer, et al. A gradual stepwise temperature increase technique for radiofrequency ablation of cervical spinal nerves for intractable cervicogenic headache. *Reg Anesth Pain Med*. 2008; 32:12.
9. Carlson, et al. Peripheral nerve stimulation in a patient with atypical facial pain secondary to post herpetic neuralgia: A case report. *Reg Anesth Pain Med*. 2008; 32:5.
10. Dasgupta, et al. Dual occipital and supraorbital stimulation for the treatment of holocranial refractory migraines. *Reg Anesth Pain Med*. 2008; 32:6.
11. Mc Donnell, et al. Treatment of trigeminal neuralgia peripheral stimulation of maxillary division. *Reg Anesth Pain Med*. 2008; 32:9.
12. Zepeda, et al. Benefits of peripheral nerve field stimulation (PNFS) for intractable thoracic radiculopathy: Case report. *Reg Anesth Pain Med*. 2008; 32:7.
13. Fortman, et al. Confined neuropathic pain: Peripheral field vs. spinal cord neurostimulation. *Reg Anesth Pain Med*. 2008; 32:1.
14. Gofeld, et al. Three-dimensional ultrasonography of the cervical sympathetic trunk and validation of a new ultrasound-guided technique. *Reg Anesth Pain Med*. 2008; 32:2.
15. Adhikary, et al. Three D imaging of thoracic and lumbar paravertebral region. *Reg Anesth Pain Med*. 2008; 32:6.
16. Shankar, et al. Prospective analysis of guidance techniques for suprascapular nerve steroid injections in chronic shoulder pain. *Reg Anesth Pain Med*. 2008; 32:15.
17. Cheng, et al. Diagnostic neural sonography (sonopathology): Is there a role for the anesthesiologists? *Reg Anesth Pain Med*. 2008; 32:9.

Carl Koller Research Grant Announcement

Timothy J. Brennan, Ph.D., M.D.
Chair, ASRA Committee on Research

The ASRA Committee on Research is pleased to announce the selection of two recipients for the Carl Koller research grants for 2008. The Koller award is the signature research grant of ASRA. The award total is $75,000, available on a biannual basis. The maximum amount made available for a single proposal was $50,000. Proposals for both clinical and basic science research on local anesthetics, pain and regional anesthesia were accepted. There is an emphasis on providing funds that will hopefully lead to continued research supported by other sources. The committee reviewed 10 proposals for the Koller award. The total funds requested for all of the grants exceeded $300,000. Based on the Committee evaluations, two proposals were recommended for funding.

Safety and Efficacy of Cervical Sympathetic Block in Patients With Cerebral Vasospasm Following Aneurysmal Subarachnoid Hemorrhage - *Pilot Study*
Mario Depinto, M.D., Department of Anesthesiology, University of Washington.

The Role of Eicosanoids, Cytokines and Nitric Oxide in Back Pain and Radiculopathy: A Translational Microdialysis Study in Humans
Christopher Bernards, M.D.

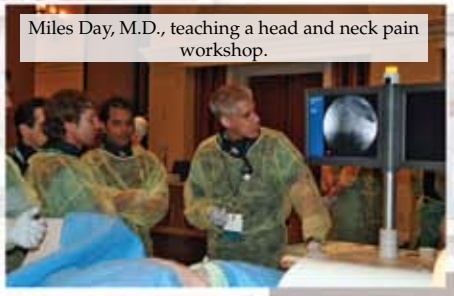
2008 Annual Pain Medicine Meeting and Workshops

President F. Michael Ferrante, M.D., on the Queen Mary.

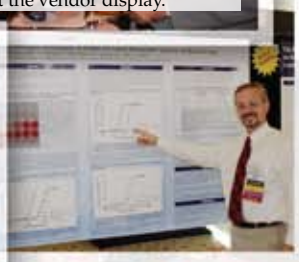
President-Elect Vincent Chan, M.D., and Farrin Candido (President's Reception).

Dr. Ferrante at the vendor display.

Jonathan Carlson, M.D., Rafael Justiz, M.D., and Kenneth Candido, M.D., in front of the Texas Tech prize-winning poster.



Miles Day, M.D., teaching a head and neck pain workshop.



Fernando Cervero, M.D., and Oscar De-Leon Casasola, M.D.. at the Labat Award Presentation.

Dr. Candido at the low-back pain workshop.

Honorio Benzon, M.D., at the SI joint workshop.

Dr. Ferrante and Roger Aoki (Vice President at Allergan).

Stephen Abram, M.D., Santhanam Suresh, M.D., Maunak Rana, M.D., and Richard Rosenquist, M.D., ASRA Past President.

Scott Fishman, M.D., and Eugene Viscusi, M.D.

Ellen Carlson, M.D., Christine Peeters-Asdourian, M.D., Margaret Ferrante, M.D., and Missy Ferrante.

Dr. Ferrante and Sandra Kopp, M.D., at the President's Reception.

Kenneth Candido, M.D., Honorio Benzon, M.D., Robert Hurley, M.D., Santhanam Suresh, M.D., Edward Mariano, M.D.

Kenneth Candido, M.D. and Brian Ilfeld, M.D.

Santhanam Suresh, M.D. and Margaret Miller, M.D.

John Rowlingson, M.D.

Monitoring During the Performance of Peripheral Nerve Blocks

General anesthesia has become remarkably safe in the last several decades due in large part to the wide array of intraoperative monitors such as capnography, electrocardiography and pulse oximetry. Just as performing a general anesthetic with endotracheal intubation carries a certain set of risks, the performance of peripheral nerve blocks is associated with its own array of adverse events. Examples include systemic toxicity from local anesthetics, inadvertent puncture of neighboring structures such as vessels or pleura, and injury to the nerve itself.

Unlike general anesthesia, regional anesthesia has, in the past, typically not employed objective monitors to warn against complications. Instead, we have relied on subjective impressions to guide prevention of adverse events: The perioral paresthesiae of a patient who has received an overdose of local anesthetic, the presence of a paresthesia on injection, or perceived resistance to injection that may warn of intraneural needle placement. Unfortunately, these have been proven to be inaccurate markers that rely on patient report or the "feel" of our thumb on the syringe plunger.[1,2] Alternatively, there are several *objective* monitors that may help to prevent complications during peripheral nerve blocks. These include electrical neurostimulation, ultrasonography and injection pressure monitoring, each of which has a specific role and which, when combined, may provide the basis for safer block performance.

Nerve Stimulation

Judging the distance from the needle tip to the nerve using stimulation has been shown to be inconsistent[3,4]; however, recent data have highlighted its possible utility in predicting intraneural needle placement. Voelckel et al. performed sciatic blocks on pigs and found that when a motor response was still obtained at < 0.2 mA, there were signs of inflammatory changes and perineural disruption in 50 percent of specimens, whereas no inflammation was seen in the pigs where the twitch disappeared between 0.3-0.5 mA.[5] This threshold has been adopted by some as a "cutoff point" for obtaining a twitch: If a motor response is still occurring at < 0.2 mA, the needle is withdrawn until a twitch is only apparent at 0.3-0.5 mA. Conversely, Chan et al.[6] performed a similar study in pigs and found motor responses in 66 percent of nerves at currents > 0.2 mA when the needle tip was deliberately placed intraneurally; moreover, 45 percent of nerves required currents in excess of 0.5 mA. Undoubtedly, the relationship between current and motor response is not straightforward. However, it may be prudent based on limited existing evidence to avoid injection at very low currents (i.e., < 0.2 mA).

Ultrasonography

The use of ultrasound-guided nerve blockade has many apparent benefits, with the most obvious being the ability to guide the needle under real time toward the target. Its use may also confer several safety advantages, chief among them the ability to decrease the amount of local anesthetic used to effect a successful block. This has recently been shown by Casati et al., who demonstrated in an up-and-down design that ultrasound guidance was able to reduce by 42 percent the minimum effective anesthetic volume required for a femoral block.[7] In an era where systemic toxicity from even "clinical doses" of local anesthetics are regularly published,[8] this is not an insignificant finding. In addition, not all of the volume reduction benefits are of a systemic nature. Riazi et al. compared the effect of performing ultrasound-guided interscalene blocks using 5 mL versus 20 mL of 0.5 percent ropivacaine on phrenic nerve palsy and found the incidence of diaphragmatic paralysis to be 45 percent and 100 percent respectively, while pain scores and analgesic consumption in the first 24 hours were identical.[9] Needless to say, this type of extreme volume reduction may be difficult without ultrasound guidance.

Jeff Gadsden, M.D., F.R.C.P.C., F.A.N.Z.C.A.
Director, Regional Anesthesia Fellowship Program
St. Luke's-Roosevelt Hospital Center
Assistant Professor of Clinical Anesthesiology
Columbia University College of Physicians and Surgeons
New York, New York

Another potentially beneficial aspect of ultrasonography is the ability to avoid vascular, pleural or nerve puncture. Unfortunately, conclusive large-scale data showing an advantage are still not available at the present time. As a corollary, good evidence *does* exist supporting the use of ultrasound for internal jugular venous cannulation, as the rate of carotid puncture appears to be reduced significantly.[10] For nerve blocks, however, examination of the literature reveals numerous reports of needle mishaps (i.e., vascular and neural impalement) despite the use of ultrasound,[11,12] suggesting that, for the time being, either the technology or the manner in which it is being used is not foolproof.

Injection Pressure Monitoring

Hadzic et al. showed that high pressures (> 25 psi) at the beginning of intraneural injections in dogs were associated with neurologic deficit and destruction of neural architecture.[13] This is likely due to the rupture of the fascicle after the expansion of these low-compliance spaces. In addition, anesthesiologists have been shown to be poor at judging the degree of force being exerted on the syringe plunger.[2] Therefore, the objective monitoring of injection pressure may be a useful modality. This can be achieved either through commercially available in-line devices or by the use of a "compressed air injection technique."[14] This technology is relatively new, and evidence has not yet accumulated showing a safety advantage; however, given the small cost and ease of use, the regular use of these precautions should be more widespread.

Continued on page 17

PRO: Resident Training for Peripheral Nerve Blockade Should Be Conducted Solely With Ultrasound

Continued from page 11

References:

1. Rigaug M, Filip P, Lirk P, et al. Guidance of block needle insertion by electrical nerve stimulation. *Anesthesiology*. 2008; 109:473-478.
2. Urmey WF, Stanton J. Inability to consistently elicit a motor response following sensory paresthesia during interscalene block administration. *Anesthesiology.* 2002; 96(3): 552-554.
3. Choyce A, Chan VW, Middleton WJ, et al. What is the relationship between paresthesia and nerve stimulation for axillary brachial plexus block? *Reg Anesth Pain Med.* 2001; 26(2):100-104.
4. Swenson JD, Davis JJ. Ultrasound guided regional anesthesia: Why can't we all just stay away from the nerve? Anesthesiology. 2008; 109:748-749.
5. Swenson JD, Bay N, Loose E, et al. Outpatient management of continuous peripheral nerve catheters placed using ultrasound guidance: An experience in 620 patients. *Anesth Analg.* 2006; 103:1436-1443.
6. Swenson JD, Davis JJ, Greis PE, Burks RT, Tashjian RZ. Interscalene block for postoperative analgesia using only ultrasound guidance: The outcome in 200 patients. *J Clin Anesth*. 2008 (in press).
7. Koscielniak-Nielsen Z. Ultrasound guided peripheral nerve blocks: What are the benefits? *Acta Anaesthesiol Scand*. 2008; 52:727-737.

CON: Resident Training for Peripheral Nerve Blockade Should Be Conducted Solely With Ultrasound

Continued from page 11

described using ultrasound, in most cases, ultrasound is still used to perform superficial upper- and lower-extremity blocks and blocks in the pediatric population, including neuraxial blocks. The performance of deeper blocks (e.g., lumbar plexus, proximal sciatic nerve) using ultrasound remain the domain of a limited pool of "experts."[22] Conservatively, it will take several years for most of these deeper blocks to be adequately described and performed using ultrasound guidance. In the interim, most of these blocks can be reliably performed using nerve stimulation and anatomical landmarks.

In conclusion, in the absence of evidence in favor of the exclusive use of an ultrasound-guided approach to perform peripheral and neuraxial blocks, it is our responsibility to provide a training program that allows our trainees to perform safe and effective blocks. In 2008, this includes the use of neurostimulation with ultrasound guidance, and in those cases in which ultrasound is not feasible or available, neurostimulation with landmark techniques.

References:

1. Chan VWS, Perlas A, McCartney CJL, et al. Ultrasound guidance improves success rate of axillary brachial plexus block. *Can J Anaesth.* 2007; 54:176-182.
2. Casati A, Danelli G, Baciarello M, et al. A prospective, randomized comparison between ultrasound and nerve stimulation guidance for multiple injection axillary brachial plexus block. *Anesthesiology.* 2007;106:992-996.
3. Williams S, Philippe C, Arcand G, et al. Ultrasound guidance speeds execution and improves the quality of supraclavicular block. *Anesth Analg.* 2003; 97:1518-1523.
4. Kapral S, Greher M, Huber G, et al. Ultrasonographic guidance improves the success rate of interscalene brachial plexus blockade. *Reg Anesth Pain Med.* 2008; 33:253-258.
5. Perlas A, Brull R, Chan VWS, et al. Ultrasound guidance improves the success of sciatic nerve block at the popliteal fossa. *Reg Anesth Pain Med.* 2008; 33:259-265.
6. Paqueron X, Bouaziz H, Macalou D, et al. The lateral approach to the sciatic nerve at the popliteal fossa: One or two injections? *Anesth Analg.* 1999; 89:1221.
7. Fanelli G, Casati A, Garancini P, Torri G. Nerve stimulator and multiple injection technique for upper and lower limb blockade: Failure rate, patient acceptance, and neurologic complications. *Anesth Analg.* 1999; 88:847.
8. Casati A, Fanelli G, Beccaria P, et al. The effects of single or multiple injections on the volume of 0.5% ropivacaine required for femoral nerve blockade. *Anesth Analg.* 2001; 93:183-186.
9. Rodríguez J, Bárcena M, Taboada-Muñiz M, Lagunilla J, Álvarez J. A comparison of single versus multiple injections on the extent of anesthesia with coracoid infraclavicular brachial plexus block. *Anesth Analg.* 2004; 99:1225-1230.
10. Handoll HGH, Koscielniak-Nielsen Z J. Single, double, or multiple injection techniques for axillary brachial plexus block for hand, wrist, or forearm surgery. *Anesth Analg*. 2006; 103:248.
11. Borgeat A, Capdevilla X. Neurostimulation and ultrasonography: The Trojan War will not take place. *Anesthesiology.* 2007; 106:896-898.
12. Dufour E, Quennesson P, Van Robais AL, et al. Combined ultrasound and neurostimulation guidance for popliteal sciatic nerve block: A prospective, randomized comparison with neurostimulation alone. *Anesth Analg.* 2008; 106:1553-1558.
13. Sites BD, Spence BC, Wiley CW, Bertrand ML, Blike GT. Characterizing novice behavior associated with learning ultrasound-guided peripheral regional anesthesia. *Reg Anesth Pain Med.* 2007; 32:107-115.
14. Orebaugh SL, Willams BA, Kentor ML. Ultrasound guidance with nerve stimulation reduces the time necessary for resident peripheral nerve blockade. *Reg Anesth Pain Med.* 2007; 32:448-454.
15. Partridge BK, Katz J, Berschke K. Functionnal anatomy of the brachial plexus sheaths: implications for anesthesia. *Anesthesiology.* 1987; 66:743-747.
16. Retzl G, Kapral S, Greher M, Mauritz W. Ultrasonographic findings of the axillary part of the brachial plexus. *Anesth Analg.*. 2001;92: 1271-1275.
17. Pearce-Smith BA, Hudson ME. Cost-Benefit Analyses of Adding Ultrasound Guided Nerve Blocks to an Existing Acute Pain Service. ASA, CD 2008.
18. Loubert C, Williams SR, Helie F, Arcand G. Complication during ultrasound-guided regional block: Accidental intravascular injection of local anesthetic. *Anesthesiology.*2008; 108:759-760.
19. Zetlaoui PJ, Labbe JP, Benhamou D. Ultrasound guidance for axillary plexus block does not prevent intravascular injection. *Anesthesiology.* 2008; 108:761.
20. Robards Ch, Clendenen S, Greengrass R. Intravascular injection during ultrasound-guided axillary block: Negative aspiration can be misleading. *Anesth Analg.* 2008; 107:1754-1755.
21. Bigeleisen P. Nerve puncture and apparent intraneural injection during ultrasound-guided axillary block does not invariably result in neurologic injury. *Anesthesiology*. 2006; 105:779-783.
22. Ben-Ari A, Joshi R, Uskova A, Chelly JE. Ultrasound-guided parasacral approach for sacral plexus nerve blocks. *Anesth Analg.* 2009 (in press).

American Society of Regional Anesthesia and Pain Medicine
520 N. Northwest Highway
Park Ridge, IL 60068-2573

Non-Profit Org.
U.S. Postage
PAID
Permit No. 453
Palatine P&DC

Monitoring During the Performance of Peripheral Nerve Blocks

Continued from page 15

Pressure monitoring has other useful applications; a recent study showed that bilateral spread during lumbar plexus block occurred in 60 percent of patients exposed to injection pressures > 20 psi compared with 0 percent in those with pressures < 15 psi.[15] One patient in the high-pressure group had an epidural block with a T4 sensory level, a situation that could prove dangerous in a vulnerable patient.

In summary, the use of novel technologies to prevent complications should never excuse the practitioner from elements of basic safety during nerve blocks: Watching the patient closely, intermittent aspiration, slow incremental injection, and the use of a marker such as epinephrine as a late indicator of I.V. injection. That said, each of these three quantifiable, objective monitors provides meaningful and recordable data to the regional anesthesiologist. While there will always be an element of "art" to regional anesthesia, we should strive to continue to advance the science, and these three techniques should hopefully translate into safer blocks for our patients.

References:

1. Sala-Blanch X, Pomes J, Matute P, et al. Intraneural injection during anterior approach for sciatic nerve block. *Anesthesiology.* 2004; 101:1027-1030.
2. Claudio R, Hadzic A, Shih H, et al. Injection pressures by anesthesiologists during simulated peripheral nerve block. *Reg Anesth Pain Med.* 2004; 29:201-205.
3. Perlas A, Niazi A, McCartney C, et al. The sensitivity of motor response to nerve stimulation and paresthesia for nerve localization as evaluated by ultrasound. *Reg Anesth Pain Med.* 2006; 31:445-450.
4. Tsai TP, Vuckovic I, Dilberovic F, et al. Intensity of the stimulating current may not be a reliable indicator of intraneural needle placement. *Reg Anesth Pain Med.* 2008; 33:207-210.
5. Voelckel WG, Klima G, Krismer AC, et al. Signs of inflammation after sciatic nerve block in pigs. *Anesth Analg.* 2005; 101:1844-1846.
6. Chan VWS, Brull R, McCartney CJL, et al. An ultrasonographic and histological study of intraneural and electrical stimulation in pigs. *Anesth Analg.* 2007; 104:1281-1284.
7. Casati A, Baciarello M, Di Cianni S, et al. Effects of ultrasound guidance on the minimum effective anaesthetic volume required to block the femoral nerve. *Br J Anaesth.* 2007; 98:823-827.
8. Dhir S, Ganapathy S, Lindsay P, Athwal GS. Case report: Ropivacaine neurotoxicity at clinical doses in interscalene brachial plexus block. *Can J Anesth.* 2007; 54:912-916.
9. Riazi S, Carmichael N, Awad I, et al. Effect of local anaesthetic volume (20 vs 5 ml) on the efficacy and respiratory consequences of ultrasound-guided interscalene brachial plexus block. *Br J Anaesth.* 2008; 101:549-556.
10. Hind D, Calvert N, McWilliams R, et al. Ultrasonic locating devices for central venous cannulation: Meta-analysis. *Br J Anaesth.* 2003; 327:361.
11. Loubert C, Williams SR, Helie F, Arcand G. Complication during ultrasound-guided regional block: Accidental intravascular injection of local anesthetic. *Anesthesiology.* 2008; 108:759-760.
12. Schafhalter-Zoppoth I, Zeitz ID, Gray AT. Inadvertent femoral nerve impalement and intraneural injection visualized by ultrasound. *Anesth Analg.* 2004; 99:627-628.
13. Hadzic A, Dilberovic F, Shah S, et al. Combination of intraneural injection and high injection pressure leads to fascicular injury and neurologic deficits in dogs. *Reg Anesth Pain Med.* 2004; 29:417-423.
14. Tsui BCH, Knezevich MP, Pillay JJ. Reduced injection pressures using a compressed air injection technique (CAIT): An in vitro study. *Reg Anesth Pain Med.* 2008; 33:168-173.
15. Gadsden JC, Lindenmuth DM, Hadzic AH, et al. Lumbar plexus block using high-pressure injection leads to contralateral and epidural spread. *Anesthesiology.* 2008; 109:683-688.