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Supporting You at the Acronym Games

Any of you with teenagers fully understand that acronyms have replaced complete conversations in the lexicon of American youth. Yet a moment’s reflection reminds us adults that we are not so pristine in this game; indeed as medical professionals, we probably never were. Maybe our kids really do listen to us! So for this quarter’s ASRA Newsletter column let’s talk about all those barely decipherable abbreviations like CME, CPD, MOCA, SAM-PM, and UGRA – and consider how ASRA is helping you to play the acronym game while all the time earning valuable credits!

All physicians are familiar with continuing medical education (CME), that omnipresent requirement of licensing boards, hospital credentialing committees, and, increasingly, medical specialty boards. In fact, in the spirit of full disclosure, were it not for physicians’ needs to obtain CME credits, societies like ASRA would have one less reason to exist. In contrast to the universality of CME, fewer physicians may recognize CPD (continuing professional development). This perhaps unfamiliar acronym is not just a different way of proving that you devote some portion of your professional time to keeping up with medical advances; it reflects a much more fundamental shift in how physicians are expected to demonstrate these qualities. Just as for the past few years residents have been judged on how well they fulfill the “six core competencies” – professionalism, systems-based practice, medical knowledge, interpersonal and communication skills, patient care, and practice-based learning – doctors are now expected to move beyond lecture-based learning that generates credit hours on a CME certificate to a more diverse, learner-based format that holds practicing physicians more accountable to the concept of core competencies. The goal is for physicians to prove that their continuing educational development is lifelong, outcome-related, comprehensive, and focused on their individual learning needs and self-assessment. As part of that process, agencies that require CPD no longer base their assessment solely on your attendance at CME meetings or passing a cognitive examination. Rather, you are now (or soon will be) asked to verify your professional standing with licensing boards, document lifelong learning activities, and provide evidence that you have not only assessed your practice performance and improvements, but have solicited feedback from your patients and colleagues. Pretty heady stuff, you may say, but what does this have to do with ASRA? Well, your favorite acronym-of-a-society is tailoring its educational efforts to help you gain the credentials that you need to maintain your board certification or hospital privileging – not just by attesting to completion of general CME hours, but by offering programs, portfolios, and topic-specific lectures that satisfy those myriad requirements.

We at ASRA are proud to be the first sub-specialty society to offer specific programmatic topics that comply with The American Board of Anesthesiology’s (ABA) Maintenance of Certification in Anesthesiology Program® (MOCA®). Over the course of a 10-year MOCA cycle, the ABA requires 20 hours of ABA-approved patient safety CME. Two lectures at the upcoming fall pain meeting in Phoenix – “Risk Mitigation” and “Anticoagulation and Interventional Pain Procedures” – will each satisfy up to 2 hours credit for MOCA Part II. The Society will note these hours specifically on your CME certificate and will transfer the credits electronically if you provide us with your ABA identification number. Future ABA-approved patient safety credits are planned for upcoming annual meetings. Moreover, of the 250 Category 1 CME credit hours required for MOCA, at least 90 must fulfill the Part II self-assessment requirement. We are happy to announce that the ABA has approved for this purpose portions of the November 2nd-3rd “ASRA Cadaver Course for the ASRA-ASA Ultrasound-Guided Regional Anesthesia Education Portfolio.” Simulation training is another requirement for ABA diplomats enrolled in MOCA and an approved simulation course must be completed within the 10-year cycle. Although ASRA is not currently approved to offer MOCA simulation credits, its nevertheless added simulation programs to its spring 2013 and 2014 meetings so that registrants can hone their skills (and likely earn ABA-approved patient safety credits) by participating in simulations of regional anesthesia emergencies.

Pain medicine specialists have a unique opportunity to qualify for 30 hours of Category 1 CME credits by completing the Self-Assessment Module in Pain Medicine (SAM-PM), which also fulfills Part II self-assessment requirements. This self-study product consists of 100 questions that are answered by the participant and immediately followed by revelation of the correct answer, rationale for the answer, and suggested references. The modules questions are specific to pain medicine and were developed by an editorial team led by ASRA board members Kumar Buvanendran, MD, and Samer Naroouz, MD, in conjunction with the American Society of Anesthesiologists (ASA). Access to SAM-PM can be obtained via either the ASRA or the ASA websites; ASRA members are eligible for a discounted enrollment fee.

A recent survey of ASA members revealed that some practitioners felt having credentials in ultrasound-guided regional anesthesia (UGRA) would be valuable to them. Although ASRA has taken a stance against any form of certification in ultrasound, we nevertheless have partnered again with the ASA to create a portfolio...
in UGRA that participants can use as a credential that suits their individual needs. This portfolio is based on standard components of CPD, including participation in 10 hours of specific didactic content related to UGRA, 6 hours of practical workshop experience, a 50 question examination, and self-reporting of ultrasound-guided regional anesthetics provided to your patients. This product should be available on the ASRA or ASA websites by the time you read this column. Recent ASRA and ASA CME programs, and some from other qualifying CME providers, can be used to satisfy the portfolio’s didactic and workshop requirements, but an easy way to attain all the pertinent credits in a single sitting is to attend the “ASRA Cadaver Course for the ASRA-ASA Ultrasound-Guided Regional Anesthesia Education Portfolio” in Chicago on November 2nd-3rd, 2013. Similar workshops will likely be offered in 2014. As noted earlier, much of this course also satisfies Part II MOCA requirements for self-assessment CME. Similar to SAM-PM, ASRA members are eligible for a discounted fee when enrolling in the portfolio process. In conjunction with ASA education specialists, several ASRA members developed this program under the leadership of Jim Hebl, MD, Brian Sites, MD, and Joe Neal, MD. The ASRA Board of Directors is considering the development of a similar program for ultrasound in pain medicine.

I hope the preceding information helps you navigate the acronym games and garner some appreciation for ASRA’s role in supporting your recertification and credentialing needs, as well as for the Society’s leadership in developing these national programs. To this end, I would be remiss if I did not close by acknowledging the incredible work and leadership in these regards from ASRA’s CME/CPD Manager, Julie Simper, and ASRA CME Committee Chair, Terre Horlocker, MD, and her team of seven other hard-working ASRA members.

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The Inadequacies of Pain Management and Palliative Care in the Developing World

As advancements in medicine and technology progressively emerge at the dawn of the 21st century, the developing world continues to face significant challenges due to unequal health care resources. Pain management remains a significant public health concern on a global scale. While ten major industrial countries consume 87% of the world’s morphine, the rest of the world shares the remainder, with this disparity continually widening.

During Semester at Sea, a study abroad program, I circumnavigated the world on a ship for five months. During my journey to China, Vietnam, India, South Africa, Kenya, Brazil, and Venezuela, I witnessed firsthand the detrimental consequences associated with a lack of pain management. My encounters with medicine abroad entailed hearing children crying from pain from undiagnosed and inadequately treated malignancies, pregnant women screaming while enduring labor pain without epidural analgesia, and elderly patients groaning in agony. I recognized that the vast disparities in pain management across the world are deeply rooted in the complex and multifactorial elements of medicine, ethics, and law. We, as anesthesiologists and pain medicine physicians, should acknowledge and effectively combat these global impediments and strive for a better future.

The inadequacy of pain management and palliative care in other parts of the world is of pandemic proportions. In fact, 50% of patients with life-threatening diseases have moderate to severe pain during their last days of life. Additionally, only 6% of worldwide palliative care services are located in Asia and Africa, regions where the majority of the world’s population lives and dies. There is a dire need for palliative care – to “give those who are to leave life, the elderly, the terminally ill, those dying slowly of AIDS and cancer the same care and attention that we give to those who enter life [the newborn].”

Furthermore, global research has indicated a discrepancy between our advanced knowledge of the pathophysiology of pain and the pervasive inadequacy of effective treatment. Studies conducted in Nigeria illustrate that only 50% of emergency department patients who experience pain receive any analgesia; only 40% of women receive analgesia during labor; and only 33% of patients suffer moderate to unbearable pain 24 hours postoperatively. This lack of pain management produces major physiological, psychological, economic, and social difficulties for patients, families, and society.

According to a World Health Organization (WHO) study, individuals with chronic pain are four times more likely than those without...
pain to suffer from depression or anxiety. Pain worsens immobility, prolongs recovery, and increases cardiovascular, respiratory and gastrointestinal complications.

Developing nations differ vastly in culture, policies, religion, population, and healthcare systems. However, their individual dilemmas share many common derivatives. With almost half the world’s population living on less than $2 USD a day, the global incongruence with pain management is predominantly due to insufficient resources. Moreover, opioid drugs are ten times more expensive in the developing world than in the industrial world, after adjustment for differences in gross domestic product. Although high costs, lack of resources, and inappropriate infrastructure are apparent hindrances in the pursuit of adequate pain management, overpopulation, cultural doctrine, governmental regulation, priorities in health care, and the lack of education/training all contribute.

Many governmental policies restrict opioid importation, distribution, and prescription in fear of diversion, abuse, and addiction. For instance, the Narcotic Substances and Psychotropic Substances Act in India restricted the availability of opioids for medical purposes and led to a 97% decrease in the consumption of morphine over a span of 12 years. If barriers to accessing morphine in the developing world were abolished, the WHO estimates a decrease in the cost of morphine to one US cent per milligram. Furthermore, cultural attitudes with regard to pain and its treatment differ worldwide and shape health care practices. Common myths depict pain as an inevitable part of the human condition and consider “good patients” to be those who do not complain or challenge health care professionals. Further, patients with chronic pain can be seen as malingerers or simply suffering from psychological problems. These cultural perspectives limit the use of scarce resources and exemplify the complex interface between pain management and social behavior.

These legislative policies and dismissive societal beliefs suggest that the lack of appropriate education for patients and policymakers coupled with insufficient training for health care providers is a fundamental obstacle that may potentially be overcome. Although efforts to ameliorate global economic structure stretches beyond the reasonable scope of many health care providers, education and awareness may serve as an effective catalyst for change. For instance, the WHO “analgesic ladder” delineates a straightforward algorithm using minimal resources to reduce cancer pain, which represents an essential breakthrough in the developing world. Uganda has developed an effective low-resource hospice care model that facilitates home care, which is mostly delivered by relatives supported by a specially trained palliative care team.

International organizations have established grant programs to encourage “bottom-up” development of pain education courses in developing countries. Many clinicians have traveled to these countries to mentor students and health care providers while highlighting the effectiveness of basic pain management techniques and the importance of patient safety. These noble contributions deserve the utmost appreciation for their efforts in diminishing the global disparities of pain management that I have observed on my journeys abroad. Nevertheless, cooperative programs must be fortified to increase awareness, devise low-cost solutions, and support international healthcare organizations striving to heal the outcries of the millions echoing in our ears.

References
3. The SUPPORT Principal Investigators. A controlled trial to improve care for seriously ill hospitalized patients. JAMA, 1995;274.
Go to work, do cases, and return home… day after day, year after year. At times, we all need to refresh our outlook; humanitarian missions can re-ignite that passion we once had for providing outstanding care and teaching others. The Vanderbilt International Anesthesia (VIA) program in partnership with Kijabe Hospital in Kenya (Fig. 1) continues to thrive today through the on-site leadership of Dr Mark Newton. Dr. Newton started Kenya’s first anesthetist training in 2006 based on the identified lack of adequate perioperative and trauma analgesia. The relatively high risk of anesthesia throughout Sub-Saharan Africa remains one of the major challenges for effective surgical services there.

Kijabe’s primary daily activities revolve around the 100-year-old mission hospital, the Bible College, and the Rift Valley Academy, a boarding school for missionary children throughout Africa. Kijabe Hospital is a highly respected 300-bed regional referral hospital in Kenya, to which patients travel from neighboring East African countries (e.g., Somali, Sudan, and Ethiopia) searching for better health care. In October 2010, Kijabe Hospital finished construction of a modern operating room (OR) which rivals those in the United States and doubles their number of 8 plus a dedicated Endoscopy Procedure Room. In addition to orthopedics, Kijabe surgeons perform a surprising amount of urologic and pediatric neurosurgical cases, along with gynecology/obstetrics, general, and plastic surgery cases. The 8 Kenyan staff anesthetists and 30 student anesthetists (15 students per year) certainly are enthusiastic to learn new modalities for anesthesia beyond general or spinal anesthesia.

In 2009, the VIA Regional Anesthesia and Acute Pain Initiative was formed with the goal of training the Kijabe anesthesia providers (Fig. 2) with safe and effective alternatives to general anesthesia and/or postoperative opioids. Vanderbilt anesthesia providers donated substantial funds to purchase a lightweight and highly functional portable ultrasound unit which is well-suited for humanitarian care. In addition, a number of private corporations, as well as the Nashville Surgery Center, donated equipment and supplies to the Kijabe Regional Anesthesia effort. Vanderbilt Anesthesiology residents, Regional Anesthesia fellows, and faculty also shipped over one thousand pounds of equipment and supplies to Kijabe.

In 2011, a group of anesthesiology residents, attending physicians and fellows from Vanderbilt visited Kijabe to provide both care to patients and training to the local anesthesia staff. Clinical care focused primarily on orthopedic patients and critical care medicine with time split evenly between the ORs and the ICU. Typical workdays were 12-14 hours in the OR plus ICU call responsibilities, typically every 2nd or 3rd night. In addition, Vanderbilt regional anesthesiologists spent considerable time in the conference room teaching student and staff anesthetists on a wide range of regional anesthesia and acute pain topics. Landmark, nerve stimulation, and ultrasound guidance techniques were emphasized for peripheral nerve blocks in order to provide options for those anesthesia providers transferring to locations outside of Kijabe in the future. An intrathecal morphine policy and orderset were drafted for Kijabe Hospital to ensure the

**Figure 1:** Front of Kijabe Hospital.
safe administration of this therapy on the wards. The Regional Anesthesia Initiative has continued to thrive, as nearly 500 regional anesthetic and analgesic blocks were placed during the first two years, for a wide variety of surgical procedures, with an overall success rate of approximately 94% (Table 1 and Fig. 3).

Although the majority of regional anesthesia procedures are single-injection peripheral nerve blocks, continuous peripheral nerve block (CPNB) and continuous epidural techniques have been introduced more recently. Catheters are maintained for 3-5 days either on the wards or in the ICU. Postoperative catheters can be challenging to manage in this environment; some catheters are bolused intermittently while others infuse continuously to the brachial plexus catheter, which was bolused once daily with bupivacaine for 5 days, the patient received scheduled acetaminophen and ibuprofen. He reported virtually no pain after this highly invasive operation and required minimal postoperative opioids. During our daily evaluations, he and his mother were constantly smiling and remained optimistic about the future. On a separate occasion, a young pregnant patient suffered from a horrific degloving injury of her upper limb. Thanks to the Regional Anesthesia Initiative, this patient successfully underwent an 8-hour procedure to transfer sural and peroneal nerves from her lower extremities to her upper extremity solely under regional anesthesia and light intravenous sedation.

Kijabe Hospital’s Regional Anesthesia and Acute Pain Management practice continues to mature and develop. Over 40 staff and student anesthetists have now received some training in advanced regional anesthesia and acute pain management techniques. Kijabe Hospital has become a “center of excellence” within East Africa that may hopefully serve to decrease perioperative morbidity, mortality, and needless suffering in that region. The success at Kijabe Hospital may serve as a model for advancing regional anesthesia and analgesia techniques in the developing world.

### Table 1: Regional anesthesia procedures performed 2011-13

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total Number of Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infraclavicular</td>
<td>29</td>
</tr>
<tr>
<td>Axillary</td>
<td>37</td>
</tr>
<tr>
<td>Supraclavicular</td>
<td>83</td>
</tr>
<tr>
<td>Interscalene</td>
<td>18</td>
</tr>
<tr>
<td>Femoral</td>
<td>120</td>
</tr>
<tr>
<td>Saphenous</td>
<td>20</td>
</tr>
<tr>
<td>Sciatic</td>
<td>21</td>
</tr>
<tr>
<td>Popliteal</td>
<td>62</td>
</tr>
<tr>
<td>Ankle</td>
<td>14</td>
</tr>
<tr>
<td>Spinal</td>
<td>38</td>
</tr>
<tr>
<td>Epidural</td>
<td>9</td>
</tr>
<tr>
<td>Truncal</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>22</td>
</tr>
<tr>
<td>CPNB</td>
<td>40</td>
</tr>
</tbody>
</table>

Figure 2: Future anesthetists with Dr Malchow.
Pudendal Nerve Entrapment Syndrome

Pudendal nerve entrapment syndrome (PNES) is a painful neurologic condition presenting as neuropathic pain (pudendal neuralgia) and possible motor dysfunction in the distribution of the pudendal nerve. The exact incidence is unknown, but it has been reported to occur in ≤1% of the population. Anatomical appreciation helps understand the symptoms caused by entrapment of the pudendal nerve. Derived from the ventral rami of sacral S2-S4 roots, it exits the pelvis through the greater sciatic foramen medial to the sciatic nerve deep to the piriformis. It passes medial to the ischial spine positioned between two ligaments; the sacrospinous ligament anteriorly and sacrotuberous ligament posteriorly (Figs. 1 and 2). Entering the pelvis again through the lesser sciatic foramen, it courses through the fascial layers of the medial attachment of the obturator internus, which form the pudendal canal as first described by Dr. Benjamin Alcock (Alcock’s canal), with an average length of 2.8 cm. The pudendal nerve is a mixed motor/sensory/autonomic nerve (20%, 50%, and 30%, respectively) with three branches: dorsal nerve of the penis/clitoris, perineal nerve, and inferior rectal nerve. It provides sensation to the genitals and perineal area as well as motor innervation to the urethral and rectal sphincters.

The diagnosis of PNES is a clinical one as there is no agreed-upon standard at this time. Attempts have been made to better define this clinical condition. For example, the Nantes criteria (Table 1) developed by a multidisciplinary working group in Nantes, France, defines inclusionary and exclusionary criteria reflecting symptoms in or outside the innervation of the pudendal nerve. Interestingly, it does not...
discuss a potentially striking clinical feature, incontinence. The typical presentation is unilateral or bilateral pain in the perineum, rectum or genitals that is worsened with sitting and improved with standing or sitting on a donut-shaped pillow or toilet seat. The associated symptoms are variable and represent the complex function of this nerve. These include constipation, painful bowel movements, urinary hesitancy, frequency, urgency, sexual dysfunction, and possibly urinary and/or fecal incontinence. In fact, in one retrospective analysis of 74 female patients, 55 and 46 had urinary and fecal incontinence, respectively. Gender is relevant, as 7 out of 10 patients with this condition are female. Common causes include labor, trauma, pelvic surgery, and cycling (the classic and first described cause). Chronic constipation as well as insertion of foreign objects into the rectum have also been reported as potential causes. Diagnosis is supported by response to fluoroscopic, ultrasound, or CT-guided pudendal nerve blocks. Neurophysiologic testing including electromyography (EMG) and pudendal nerve terminal motor latencies (PNTML) also contributes to diagnosis and treatment outcomes. Unfortunately, what is common for patients with this condition is a delay in diagnosis and misdiagnosis. Treatment usually begins with typical oral anti-neuropathic pain medications and a muscle relaxant, physical therapy focused on pelvic stretching and relaxation with or without myofascial trigger point manual release, or injections of local anesthetic followed by botulinum toxin. Pudendal nerve injection protocols differ. Hibner et al. describes beginning a series of three CT-guided injections with a combination of steroid and local anesthetic into the pudendal canal separated by six weeks each only if the aforementioned physical therapy and medication management is not beneficial. Any response, even partial or delayed, is confirmation of the diagnosis by meeting the fifth essential Nantes criterion. Popeney et al., in their series of 58 patients, use PNMLT or EMG as confirmation of diagnosis. If normal, they proceed to perform pudendal nerve blocks at the ischial spine first followed by Alcock’s canal. If responses to both are negative, the diagnosis of PNES is excluded; if beneficial, but not long-lasting, they proceed with surgery.

Three different surgical procedures have been described: transperineal, transgluteal, and transvaginal. Most case series report the transgluteal approach. The investigators who first described this procedure reported the findings on 400 patients who underwent surgical nerve release at the ischial spine and pudendal canal; at 4 year follow-up, the sustained symptomatic improvement rate was approximately 60% with the most prominent side effect being urinary retention in 5%. The same group published a 10 year follow-up study on 150 surgically-treated patients; 45% considered themselves

Table 1: Diagnostic Criteria for Pudendal Neuralgia by Pudendal Nerve Entrapment

<table>
<thead>
<tr>
<th>ESSENTIAL CRITERIA</th>
<th>EXCLUSION CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain in the territory of the pudendal nerve: from the anus to the penis or clitoris</td>
<td>Exclusively coccygeal, gluteal, pubic or hypogastric pain</td>
</tr>
<tr>
<td>Pain is predominantly experienced while sitting</td>
<td>Pruritus</td>
</tr>
<tr>
<td>The pain does not wake the patient at night</td>
<td>Exclusively paroxysmal pain</td>
</tr>
<tr>
<td>Pain with no objective sensory impairment</td>
<td>Imaging abnormalities able to account for the pain</td>
</tr>
<tr>
<td>Pain relieved by diagnostic pudendal nerve block</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPLEMENTARY DIAGNOSTIC CRITERIA</th>
<th>ASSOCIATED SIGNS NOT EXCLUDING THE DIAGNOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burning, shooting, stabbing pain, numbness</td>
<td>Buttock pain on sitting</td>
</tr>
<tr>
<td>Allodynia or hyperpathia</td>
<td>Referred sciatic pain</td>
</tr>
<tr>
<td>Rectal or vaginal foreign body sensation (sympathalgia)</td>
<td>Pain referred to the medial aspect of the thigh</td>
</tr>
<tr>
<td>Worsening of pain during the day</td>
<td>Suprapubic pain</td>
</tr>
<tr>
<td>Predominantly unilateral pain</td>
<td>Urinary frequency and/or pain on a full bladder</td>
</tr>
<tr>
<td>Pain triggered by defecation</td>
<td>Pain occurring after ejaculation</td>
</tr>
<tr>
<td>Presence of exquisite tenderness on palpation of the ischial spine</td>
<td>Dyspareunia and/or pain after sexual intercourse</td>
</tr>
<tr>
<td>Clinical neurophysiology findings in men or nulliparous women</td>
<td>Erectile dysfunction</td>
</tr>
<tr>
<td></td>
<td>Normal clinical neurophysiology</td>
</tr>
</tbody>
</table>
cured, 22% reported improvement, and 33% experienced no change. Robert et al. later performed a non-blinded randomized controlled trial, the only one published to date, involving two groups of 16 (male and female) who received surgery or conservative treatment. Success was defined by a reduction of visual analog scale (VAS) pain score by 30 mm or more, or 3 point reduction of a 6 point pain behavioral scale measured at 3 months, 1 and 4 years. At three months, 57% in the surgical group (8/14; two patients dropped out) achieved success versus 6.7% of controls. At one year, the success rate increased to 71% (10/14) in the surgical group vs 13% in the control groups but returned to 57% (8/14) in the surgical group by 4 years with 7 patients reporting VAS of 15 mm or less. No complications were noted. Popeney had similar results with a success rate of 60% (35/58) at 12 months but with some patients reporting numbness (12%), sacroiliac joint dysfunction (8.6%), and transient urinary incontinence (1.2%). Recently, a neurosurgeon prospectively examined 200 patients with PNES and introduced some novel diagnostic and therapeutic techniques as well as a classification of entrapment by location that guided surgical release. After history and physical exam, patients underwent magnetic resonance (MR) neurography, for which the author holds a patent, examining for associated signs of an entrapped nerve. This location was then used for open MR-guided injections. If injection benefits did not last >1 year, surgical release based on his classification system (class I-IV) was performed. Good to excellent response (>4 point reduction on 11 point VAS) was observed in 68% with fair to moderate response (2–3 point reduction) in 6.5% at 3 months. Positive results were sustained in 87% of responders at one year. Reported complications include 2 patients with increased pain and one hematoma requiring evacuation.

PNES is a complex syndrome based on the complexity of pudendal nerve function. Standardization of diagnosis and evidence for optimal treatment continues to emerge but is far from complete. To date, best care likely lies among centers with substantial experience and comprehensive treatment options, including surgical release.
References
In this issue of ASRA News, we feature two very special articles that touch on the common theme of global humanitarian aid and volunteerism. Our Resident Section Committee article by Dr. Anish Doshi provides us with an overview of the paucity of pain management and palliative care services in the developing world. As a new column for ASRA News, the Member Spotlight, we present the amazing work of Dr. Randy Malchow and his team in bringing regional anesthesia and perioperative pain management services and education to Kijabe Hospital in Kenya.

I should say that the contents of this editorial are my own opinions and do not necessarily represent the official views of ASRA. The subject of medical volunteerism and global humanitarian aid is important to me, having personally participated in multiple medical missions to underserved communities in the Philippines and Ecuador over the last decade. Many of our ASRA members have dedicated their time and resources to similar causes at home and abroad, and the American Society of Anesthesiologists (ASA) has its own Global Humanitarian Outreach (GHO) Program (http://www.asahq.org/GHO). The statistics related to anesthesia and pain management in the developing world are quite shocking. It is not uncommon for developing countries to have a ratio of less than 1 anesthesiologist for every 100,000 people! In the realm of pain management and palliative care, the article by Dr. Doshi is particularly eye-opening and should serve as a strong motivator for our members to get involved in helping the underserved.

What is the best way to do that?

The GHO offers a search engine for ASA members to look up volunteer opportunities abroad http://www.asahq.org/GHO/Volunteer.aspx. Not everyone can take weeks or months off work to travel to far-away places. I have been fortunate in that my wife and I have been able to volunteer together—that is, until recently when we started our latest adventure (parenting). In addition, although not naturally a cynic, I find myself questioning the real difference certain medical mission groups make. Even though the before and after photos look great, how much difference does it make to a community when a medical mission group swoops in, repairs some cleft lips, and leaves without every returning? Yes, I understand the social stigma associated with congenital deformities; I have seen it firsthand. However, I also know that there is a bigger picture to consider—patient education on nutrition, prenatal care, and health care maintenance; access to basic resources, including food, shelter, and transportation; and infrastructure improvements that are required to sustain change. Furthermore, does this paternalism actually do damage to future relationships with local health officials and governments within the countries in need, especially when late complications arise after the medical mission groups are long gone?

When you read Dr. Malchow’s article, one of the most impressive features of this program is its sustainability. Not only does this volunteer group provide medical and surgical services to patients in need—a critical part of its “mission” is education of local providers. Under the direction of Dr. Mark Newton, the Vanderbilt International Anesthesia (VIA) program is engaged in an ongoing relationship with Kijabe Hospital; and by training future generations of local anesthesia providers, VIA is raising the quality and safety of anesthesia and pain management services for the entire region. One of the most important messages in Dr. Malchow’s article is that you don’t have to fly to Kenya to make a difference. VIA would not be able to accomplish its goals without the countless people who have donated medical supplies and money for equipment and shipping.

I have been very fortunate to have joined medical mission groups that generally return to the same communities year after year. One of the most rewarding aspects of participating, in my experience, has been developing relationships—with team members, local physicians and nurses, students and residents, government officials, and patients and families. Although we can congratulate ourselves on what we have accomplished so far, there is still so much work left to do.
To the Editor:

Recently the article “Regional Anesthesia in the Patient at Risk for Acute Compartment Syndrome,” was featured in the May 2013 ASRA Newsletter. This topic has remained controversial due to the lack of data supporting the relationship between regional anesthesia and risk for acute compartment syndrome (ACS). However, the risk still remains, and it is of extreme importance that early diagnosis and treatment (within 6 hours) occur to prevent limb loss and improved outcomes. More emphasis needs to be placed on vigilance and education on this harmful condition, particularly for residents and fellows, as their role is vital for early diagnosis.

Anesthesiology residents and fellows rotating through the acute pain management service at their respective institutions will encounter patients with a regional anesthetic block who are at risk of developing ACS. Taking into account the clinical manifestations, the severity of disease progression, and the importance of rapid surgical intervention, residents and fellows are on the forefront to quickly evaluate and diagnose impending ACS and prevent the development of its devastating consequences.

Tibial fractures are most commonly associated with ACS; however, other significant perioperative causes include intramedullary nailing, lithotomy position, prolonged limb compression (e.g., casts), arterial pathology resulting in ischemia-reperfusion injury, and intracompartmental hemorrhage.

The clinical features associated with ACS are a result of the ischemia, inflammation, and edema that develops from the increased pressure transmitted to structures within the compartment. The classic signs and symptoms are known as the 6 P’s: pain out of proportion to injury and pain with passive stretch, pallor, pressure, paresthesia, paralysis, and pulselessness. However, these clinical findings are unreliable as early diagnostic indicators. Measuring compartment pressures in isolation without associated clinical findings are non-predictive as well.

ACS remains a clinical diagnosis based on specific signs and symptoms, in addition to a high index of suspicion for patients at increased risk. As tiresome as it can be to respond to late night pain management issues, vigilance is crucial, particularly for higher-risk patients. We need to ask ourselves if this patient is suffering from recurring breakthrough pain, are there focal neurological deficits, are the symptoms outside the expected distribution of neural blockade, and has the analgesic consumption changed over the past few hours? In addition, it is imperative that a focused physical examination be performed, especially visual inspection with a thorough neurological exam directed at the affected extremity. If there is a cast or occlusive dressing on the limb, it may be appropriate to remove it in order to release the transmitted pressure, as this is a risk factor for ACS. Although there may be frequent neurovascular checks performed by the nursing staff, it is beneficial to perform your own Doppler pulse check as arterial pathology can result in similar symptomology or even cause ACS due to ischemic injury. In addition, it is important to bear in mind that distal pulses may be preserved, even in the presence of ACS. If there is even the slightest concern for ACS, always contact the appropriate surgical service for rapid evaluation. It is equally important that nurses and patients are appropriately educated in this debilitating condition, as they will be the ones relaying the information to you.

The topic of regional anesthesia and delayed diagnosis of ACS will likely continue to remain controversial due to literature limited to level III evidence. At teaching hospitals, residents and fellows are critical to the early evaluation of impending ACS. Overall, vigilance and education remain keys to early recognition and diagnosis, which generally result in favorable outcomes.

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In Memory of Dag Selander, MD, PhD

Dag Selander, MD, PhD, died on July 4th, 2013, after a brave struggle with motor neuron disease. He was involved in many aspects of regional anesthesia, but perhaps his major contributions all stemmed from his early studies of the pathophysiology of peripheral nerve injury (Acta Anaesthesiologica Scandinavica 1977; 21: 182-8). This article remains the starting point for any consideration of the subject.

Dag was born on July 2nd, 1939, and spent most of his life in Gothenburg, Sweden, obtaining his primary medical degree there in 1967. However, before attending University, he had travelled extensively, gaining experiences (e.g., working on cruise ships or with archaeological expeditions) that gave him an excellent command of the English language, a broad education, and a fund of entertaining stories. Military service (including submarine hunting) was to have preceded a career in surgery, but preliminary exposure to anesthesia and intensive care persuaded him that this clinical application of physiology and pharmacology was a more attractive career option.

He trained in anesthesiology at Sahlgren’s University Hospital in Gothenburg under Prof. Karl-Gustaf Dhunér who encouraged his interest in regional anesthesia and the study of its complications. He presented his thesis, Neural complications of Regional Block, in 1978. From 1979 Dag headed the anesthesia service at W. Frölunda Specialist Hospital, being appointed Associate Professor in Anesthesiology and Intensive Care at the University of Gothenberg in 1981. He spent a year (1985-6) as visiting professor with Dr Alon Winnie in Chicago, and a short time in Melbourne, Australia, in 1989 before returning to Sahlgren’s University Hospital. Then in 1992 he became a medical advisor with Astra Pain Control, working primarily on the introduction of the new local anesthetic, ropivacaine (Naropin®).

Throughout his career, and into retirement, Dag published widely and was a frequent attendee at, and contributor to, the meetings of ASRA, ESRA (Scandinavian Board member 1991-4), and other societies. Ever willing to share his knowledge at such events, he could make thoughtful presentations of his views and ask perceptive questions of other speakers. He was as ready to contribute to informal sessions (and on many topics besides regional anesthesia) so that, for his many friends around the world, a regional anesthesia conference was never quite complete without a chat with Dag and a tune or two on his penny whistle!

It is inevitable that such contributions are recognized formally, but Dag Selander is a member of that small group of people who have received both the Labat (ASRA 2006) and Koller (ESRA 2008) Awards, the two most prestigious academic awards in our subspecialty. So regional anesthesia has lost a major figure, but his wife, Lena, and his family have lost much more, and to them we offer our sincerest and heartfelt condolences.

Dag, you will be sorely missed....

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American Society of Regional Anesthesia and Pain Medicine

2013
Ultrasound-guided Interventions for Calcific Tendinosis of the Rotator Cuff

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INTRODUCTION

Many treatment options have been advocated for calcific tendinosis. Conservative measures such as rest, non-steroidal anti-inflammatory drugs, and physical therapy, have limited benefit and are usually reserved for mild symptoms.\(^1\) For temporary relief, subacromial bursa injection with local anesthetic and steroid is commonly performed.\(^2\) Results from iontophoresis are similar to those from physiotherapy or placebo.\(^3\) Whereas extracorporeal shock wave treatment has demonstrated success in about 60% of patients, this treatment is expensive, painful, and may require multiple treatments.\(^4\) While arthroscopic debridement has demonstrated excellent results, it is associated with greater cost, prolonged recovery, and possible complications such as infection, adhesive capsulitis, and tendon tears.\(^5-7\) Hence, surgery is reserved for patient who have failed conservative treatment.

Minimally invasive treatments, fenestration, barbotage and subacromial bursa steroid injection, have demonstrated efficacy.\(^8-14\) Fenestration refers to repeated puncturing or percutaneous needling of degenerative tendon that promotes inflammation and the subsequent healing response. By decompressing the calcium deposit, fenestration reduces the pressure within the tendon and relieves pain.\(^15\) Barbotage refers to repeated alternating injection and aspiration of fluid with a syringe, lavage and aspiration. The technique for fenestration, barbotage and steroid injection for calcific supraspinatus tendinosis has been well described in the literature.\(^16-20\) The following article summarizes the authors’ preferred technique.

PATIENT PREPARATION

The authors prefer the semi-reclined position with a small towel placed behind the shoulder positioned in the modified Crass position (hand is placed on the ipsilateral hip and elbow against the body).\(^21\) A linear array ultrasound transducer (6-13 MHz) is positioned to show the long axis of the supraspinatus tendon and its insertion onto the greater tuberosity. To better appreciate the size, consistency and shape of the supraspinatus tendon, at least two orthogonal planes (long and short axis) should be viewed.

With the ultrasound showing the long axis of supraspinatus tendon, lidocaine is injected in-plane to infiltrate the subcutaneous tissue, deltoid muscle and subacromial bursa using a 25 gauge needle. To preserve the peripheral calcific parameter, Sconfienza et al\(^16\) recommend injecting around the calcific deposit, not directly into the calcium deposit.

FENESTRATION

A. Single Needle Technique

A 16 or 18 gauge Tuohy needle is advanced in-plane to fenestrate the calcium deposit (Fig. 1A, Video 1; http://www.asra.com/publications-newsletters.php). Initially, the physician may encounter stiff resistance as the needle fractures the dense calcium. With multiple “passes” (Fig. 1B) throughout the deposit, the resistance will diminish as the deposit is fractured into smaller pieces. Rotating the needle will enhance fenestration (Fig. 2, Video 2; http://www.asra.com/publications-newsletters.php). To better assess needle tip placement within the calcium deposit, turn the transducer to visualize in the short plane of the supraspinatus tendon and continue fenestration (Fig. 3, Video 3; http://www.asra.com/publications-newsletters.php).

B. Double Needle Technique

With the bevel of the needle facing the SA bursa and positioned near the near the posterior side of the calcium deposit, a second Tuohy needle is advanced with its bevel facing the bevel of the lower needle (Fig. 4, Video 4; http://www.asra.com/publications-newsletters.php). Like the lower needle, the second needle may also be used for fenestration. As the two Tuohy needles make an acute angle, the transducer must be oriented so that the ultrasound beam is perpendicular to the needle for needle visualization (in-plane approach).
BARBOTAGE

A. Single Needle Technique
Using a single needle positioned within the calcific deposit, the author uses a control syringe to inject (Fig. 5A) and aspirate (Fig. 5B) the fractured calcium particles. Please note the rotation of the Tuohy needle tip and injection saline (Video 5; http://www.asra.com/publications-newsletters.php). As aspirated particles may obstruct the lumen of the needle, the needle can be withdrawn and flushed with normal saline.

B. Double Needle Technique
With the bevel turned toward the bursa, the Tuohy needle is positioned in the dependent part of the calcium deposit (Fig. 6). A second Tuohy needle is then advanced superficial to the first needle. The bevel of the second needle is turned to face toward the bevel of the first needle so the 2 bevels facing each other. As sterile saline is injected via the superficial needle, the physician aspirates that fluid from the lower needle (Video 6; http://www.asra.com/publications-newsletters.php).

The author has noted, in the formative and resting phases that contain dense calcium deposits, fenestrated calcium particles may plug the barrel of the Tuohy needle, thereby preventing barbotage. However, in the resorptive phase which is associated with severe pain, the calcium nodule is softer, consistent with the density of toothpaste, and easier to barbotage.

Zhu et al\textsuperscript{22} et al have reported excellent results after fenestration without aspiration of the calcium deposit. However Rizzello et al\textsuperscript{23} and Yoo et al\textsuperscript{24} note better results with its removal.

SUBACROMINAL (SA) BURSA INJECTION
After barbotage or aspiration, the needle is directed into the subacrominal bursa for injection of steroid (triamcinolone acetonide 40 mg or methylprednisolone acetate 80 mg) diluted in 3-5 ml lidocaine 1\% (Fig. 7, Video 7; http://www.asra.com/publications-newsletters.php). After withdrawing the needle, an occlusive dressing and cold compress, as needed, are applied over the injection site. The shoulder is placed in a sling for support prior to discharge.
POST-PROCEDURE CARE AND INSTRUCTIONS

The patient is advised to avoid heavy lifting and overhead movement for about two weeks. For post-procedure pain, a cold compress over the shoulder that is supported by a sling can be prescribed. Analgesics, including a combination of acetaminophen and non-steroidal anti-inflammatory drugs, should be considered. As post-procedure bursitis may occur in 15% of patients and within two months, additional steroid subacromial bursa injection may be needed.

Appendix

Equipment and Medications
1. Ultrasound machine and linear array transducer (4 cm footprint)
2. Syringes: one 5 ml, two 10 ml
3. Bowl to collect irrigation fluid
4. Cold compress
5. Shoulder sling
6. Needles:
   a. One 22 gauge (8 cm) spinal needle
   b. Two 16-18 gauge Tuohy needles
7. Medication:
   a. Local anesthetic: Lidocaine 1%
   b. Sterile saline solution: 100-200 ml
   c. Steroid: Triamcinolone acetonide 40 mg/ml or Methylprednisolone acetate 80 mg/ml.

References


Adductor Canal Block: Does it Provide Analgesia for Total Knee Arthroplasty?

INTRODUCTION
When conservative treatment fails for knee osteoarthritis, total joint replacement is an elective surgical option that can provide significant pain relief and improved function. Total knee arthroplasty (TKA) is major surgery, and severe post-operative pain can be present for 48-72 hours. Effective pain control improves recovery, and rehabilitation and decreases length of hospital stay. Methods of providing effective analgesia for TKA have varied from epidural analgesia and parental opioids to peripheral nerve blocks and local infiltration. Parenteral opioids provide inadequate pain relief, and the use of epidural analgesia is limited by adverse effects. Femoral nerve block (FNB), both single injection and continuous infusion, has been shown to improve pain scores after TKA especially when used as part of a multimodal regimen. Despite good analgesia, FNB can cause significant motor blockade of the quadriceps muscles. This reduction in strength, which can be up to 80%, may hinder rehabilitation and increase the rate of falls. The limitations of FNB have led to a search for a more distal site of local anesthetic administration, with the aim of preserving motor function while still providing analgesia for TKA.

ADDUCTOR CANAL BLOCK - ANATOMY AND PRELIMINARY CLINICAL EXPERIENCE
The adductor canal is an aponeurotic pyramid-shaped tunnel in the middle one-third of the thigh. It is limited by the vastoadductor membrane and sartorius muscle antero-medially, the vastus medialis muscle antero-laterally, and adductor magnus and longus muscles posteriorly (Fig. 1). The adductor canal contains the femoral artery, femoral vein, the saphenous nerve, and the nerve to vastus medialis, two branches of the femoral nerve that course along the adductor canal longitudinally in close proximity to the femoral vessels (Figs. 1 and 2).

The first description of Adductor Canal Block (ACB) dates back to 1993 when van der Wal blocked the saphenous nerve in this compartment using a landmark-based technique to provide analgesia to the medial aspect of the ankle. Several authors have used ultrasound guidance to successfully block the saphenous nerve in the adductor canal, again mostly intended for ankle analgesia.

In addition to the saphenous nerve, other peripheral nerve branches may be found in or around the adductor canal. These reportedly include: the medial femoral cutaneous nerve (supplying the pre-patellar plexus, which in turns continues to the lateral aspect of the knee), the anterior branch of the obturator nerve (supplying inferomedial aspect of the thigh), and the medial retinacular nerve (supplying the superomedial aspect of the knee).

It has been recently suggested that injecting a large volume of local anesthetic (20-30 mL) into the adductor canal results in blockade of these additional nerves, possibly providing analgesia to the knee joint. However, proving this assumption is not so simple. Aside from the saphenous nerve, most of these small nerves do not provide consistent innervation to a large skin territory, and they are responsible for limited motor function. Several of these nerves are partially involved in the innervation of internal structures of the knee joint such as bone and capsule which makes evaluation of block effectiveness or success rather challenging beyond analgesic effect itself. The lack of motor effect of ACB has been well-documented. In a cross-over volunteer study, Jaeger et al. reported an 8% reduction in quadriceps strength from baseline following ACB with 30 mL of 0.1% ropivacaine, compared to a 49% reduction following FNB. Similarly, Kwofie et al. reported preserved voluntary isometric contraction of the quadriceps (knee extension) to a greater extent following ACB vs. FNB in healthy volunteers. They also observed that there was no impairment of the Berg Balance Scale (BBS).
Adductor Canal Block: Does it Provide Analgesia for Total Knee Arthroplasty? continued...

Due to its motor sparing properties there is growing interest in evaluating the possible analgesic effect of ACB for a variety of knee surgical procedures. Some preliminary reports suggest a reduction in opioid consumption compared to placebo when the ACB is used alone or in combination with local infiltration analgesia (LIA) following TKA. Other clinical studies have suggested an improvement in early ambulation benchmarks. LIA has been mostly described in the orthopedic literature as systematic infiltration of the structures subject to trauma during TKA, most commonly using high volume (100-150 mL) 0.2% ropivacaine with 30 mg of ketorolac and 600 ug of epinephrine.

LIA has been shown to reduce pain and morphine consumption after TKA in the setting of general anesthesia or spinal anesthesia with no intrathecal morphine, and in the absence of peripheral nerve blocks. Affas and colleagues reported LIA is associated with similar opioid consumption as compared to femoral nerve block with 15 ml intermittent boluses of ropivacaine 0.2% within a 24-hour period.

Anderson and colleagues found that when continuous ACB was combined with LIA it provided greater pain relief than LIA alone on the day of surgery following TKA. A retrospective review of 300 patients suggested that the addition of ACB to LIA may enhance early ambulation and increase patients’ ability to be discharged to a home environment rather than a rehabilitation facility. However, most data on ACB to date are preliminary in nature, mostly based on observational and retrospective studies. In most reports, ACB has been compared with placebo in the setting of either general anesthesia or spinal anesthesia without intrathecal morphine. Therefore, more prospective clinical studies are required to better establish the incremental benefit of ACB, either for improved analgesia or improved early ambulation following TKA in the setting of multimodal analgesia.

Technique:
Under ultrasound guidance, the femoral vessels can be imaged in the adductor canal in the mid third of the thigh, at roughly...
equal distance from the anterior superior iliac spine and the patella. The saphenous nerve is the most consistently imaged neural structure in the canal, lying anteromedial or anterolateral to the femoral artery and deep to the sartorius muscle. A high frequency linear ultrasound transducer is adequate for imaging in most cases while a curved array low frequency transducer may be required in very large patients. A 50-80 mm insulated stimulating needle is advanced in plane in either a lateral to medial or medial to lateral orientation to penetrate through the posterior fascia of the sartorius muscle. The local anesthetic is deposited to surround the saphenous nerve, expanding the immediate peri-vascular space. Most reports use 30 mL of concentrated local anesthetic, such as 0.75% ropivacaine. It has been shown that 30 mL of solution can fill the mid portion of the canal without significant proximal spread. Other authors have reported low doses of local anesthetic (15 mL of 0.75% or 20 mL of 0.5% ropivacaine) when ACB is used in combination with LIA, to supposedly prevent toxic plasma concentrations.

CONCLUSION:
There is significant interest in evaluating the possible efficacy of ACB to provide analgesia for TKA as a more distal alternative to FNB that spares quadriceps muscle function. It has been well established that ACB is associated with very minimal motor deficits. However, efficacy data is currently limited to observational or retrospective studies. Some challenges to properly establishing its efficacy are the lack of clear sensory and motor endpoints and the fact that analgesia (if present) would be limited to the anterior, medial and lateral aspects of the knee at best, but would spare the posterior aspect of the joint. Further anatomical studies to determine the relative contribution of distal nerves to knee joint innervation and their course in or around the adductor canal are required. More robust prospective randomized trials are also needed to better determine the incremental contribution of ACB to postoperative knee analgesia and rehabilitation benchmarks, especially in the setting of multimodal analgesia, and in the context of other commonly used modalities such as intrathecal morphine and LIA.

References:
Adductor Canal Block: Does it Provide Analgesia for Total Knee Arthroplasty? continued...

INTRODUCTION
Pain following shoulder surgery can be severe and has traditionally been controlled using an interscalene nerve block (ISB). This technique is associated with well-documented adverse effects, including unwelcome arm paralysis, and intolerance of hemidiaphragm paralysis. ISB is also associated with more frequent long-term neurological deficits compared to other nerve blocks and must be performed in proximity to important anatomical structures (e.g., vertebral artery). Thus an alternative to ISB may be advantageous and has been described, whereby terminal nerves supplying the shoulder joint are blocked rather than the entire brachial plexus. Combined suprascapular and axillary nerve block (CSANB) appears to be an effective alternative to ISB for pain relief following shoulder surgery, with the advantages of minimal side effects, reduced potential for serious complications, and less reported pain during block resolution.

ANATOMY
Five nerves innervate the shoulder joint and associated structures. The suprascapular nerve (SN) carries the most extensive supply; a lesser amount travels via the axillary nerve (AN) (Fig. 1). The lateral pectoral, musculocutaneous and subscapular nerves are responsible for only minor contributions (Fig. 1).

HISTORY
While searching for an alternative to ISB, I reasoned that a minimum requirement was blockade of the suprascapular nerve (SNB). The question to be answered was whether the addition of AN blockade (ANB) would result in better analgesia than SNB alone. I initially developed a landmark-based technique (with or without nerve stimulation) using Meier’s SNB and my own description of ANB. It has proven to be quick and reliable to perform, as both nerves are blocked where they run across bone: SN on the lateral floor of supraspinous fossa (LFSF) and AN on the posterior surface of the humerus (PSH).

RELEVANT SONOANATOMY
The SN and AN are both narrow and lie deep to large muscles, which make them difficult to locate with US. To enhance my understanding of the sonoanatomy, I studied ultrasound (US) images of the SN and the AN in 50 volunteers. Each nerve was imaged in three separate regions in both short axis (SAX) and long axis (LAX); the structure most reliably visualized was bone, followed by artery and then nerve. In addition, a radiologist at my institution reviewed 37 routine shoulder MRIs, determining how frequently the SN lies on the LFSF, beneath supraspinatus, and the AN lies beneath deltoid on the PSH. For both nerves, the result was 100%; thus, as for the “blind” landmark technique, locating bone appears to be the key to a quick and reliable US-guided approach to CSANB.

The best images of the SN and the suprascapular artery (SA) are found in the LFSF, in the LAX of the fossa (Fig. 2). This region is superior to imaging in either the suprascapular notch and or the greater scapular (spinoglenoid) notch. The best images of the AN and the circumflex artery (CA) are found on PSH in LAX of the humerus (Fig. 3). This region is superior to imaging in either the quadrilateral space (QS) or the lateral aspect of the humerus.

SUPRASCAPULAR NERVE BLOCK (SNB)
Imaging the supraspinous fossa is critical to locating the SN; you may also image the SA, as they travel together in a neurovascular bundle (NVB). If the NVB is not visible (33% of cases in the above study), directing the needle onto the LFSF and injecting 10 to 15 ml of LA under supraspinatus will reliably block the SN. Technically, this is easiest to perform in the LAX of the fossa with the needle in-plane (Fig. 2A and 2B). The floor of the fossa has a characteristic “ice hockey stick” pattern in this view; the tip should be aiming at the most lateral part (Figs. 2B and 2C).

AXILLARY NERVE BLOCK (ANB)
Likewise, imaging the humerus is critical to locating the AN. Imaging the PSH may permit location of the CA, which travels with the AN in a NVB beneath posterior deltoid. If the NVB is not visible (5-10% of cases in the above study), directing the needle onto the PSH, and imaging LA spread under deltoid will result in ANB. The posterior shoulder capsule (PSC) can assist in determining the correct point on the PSH to inject LA. In LAX, the PSC causes the periosteum to become fuzzy; LA is injected 1-2 cm below the PSC. It can also be seen in short axis of the humerus, by scanning superiorly until the circular periosteal image becomes blurred.
The most logical approach would appear to be in LAX of the PSH; the CA and AN appear in cross-section, and successful ANB has been described with this approach. However, the PSH is difficult to keep in view, as small probe movements result in loss of a clear image. In contrast, the SAX view of the humerus is more stable, and this is my preferred technique despite the AN and CA being imaged longitudinally (Figs. 3A and 3B). Placing the probe slightly lateral reduces the distance from skin to PSH and permits needle passage in-plane from a similar insertion point as with the landmark technique (Fig. 3C).

Even if imaging the NVB is impossible, locating the shoulder capsule as detailed above will allow successful ANB if LA fills the space under deltoid on the PSH (Fig. 3B). This is reinforced by imaging contrast-enhanced LA spread with fluoroscopy during shoulder block (Fig. 3D); a potential space exists, limited laterally by entry of the AN into the deltoid, and medially by the QS. I use 5-7 ml of LA, as 10 ml or greater is associated with higher rates of spread to the posterior cord via the QS, resulting in radial nerve blockade.

**PRACTICAL TIPS:**

1. **Indications:** CSANB is limited to providing analgesia, rather than full surgical anesthesia, but can be effective for arthroscopic or open shoulder surgery.

2. **Perioperative opioid:** CSANB requires additional systemic opioid analgesia, and can have varying degrees of anterior shoulder discomfort on emergence.

3. **Position:** I do most of these blocks with the patient seated. Another option is lateral decubitus position, which may make it easier to block the AN but harder to perform SNB.

---

**Figure 1:** Innervation of the ventral and dorsal shoulder joint and capsule.
CONCLUSION

CSANB is an effective alternative to ISB for analgesia following shoulder surgery and can be performed using US despite the nerves being small and relatively deep. As with the landmark-based technique, locating bone (PSH and LFSF) makes performance of these blocks quick, safe, and reliable.

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Figure 3: Imaging (A), relevant anatomy (B), positioning (C), and contrast-enhanced spread of local anesthetic (D) for ultrasound-guided axillary nerve block in short-axis; D = deltoit, N = needle, CA = circumflex artery, LA = local anaesthetic, AN = axillary nerve, PSH = posterior surface of humerus.

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