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Looking forward to the

37th Annual Regional Anesthesia Meeting and Workshops

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March 15-18, 2012

The Hilton San Diego Bayfront
San Diego, California
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President's Message

The American Society of Regional Anesthesia and Pain Medicine Spring Meeting is scheduled next month at the beautiful Hilton San Diego Bayfront Hotel March 15-18, 2012. Program Chair Francis Salinas, MD, has planned a fantastic meeting with a wonderful selection of speakers and workshops. In addition to a great learning environment with Refresher Courses, Parallel Sessions, Problem Based Learning Discussions, Intensive Workshops, Nursing and Resident Programs, there are also some special social events planned. The Social schedule will include an evening aboard the Naval Aircraft Carrier USS Midway. The Midway set new standards of naval aviation in the latter half of the 20th century. A captured German V-2 rocket was launched off the Midway in 1947—the dawn of naval missiles. The USS Midway blazed new trails of sub-Arctic air operations off the coast of Greenland and was the first carrier home ported in a foreign country. The Midway was served by 225,000 Americans from the surrender of Japan in WWII, the Cold War, Vietnam, the era of détente and Desert Storm. The ship operated longer, survived more modernization projects, and was forward-deployed more than any other aircraft carrier. On Saturday evening, ASRA will enjoy use of the grand ship for our Presidential Reception. Finally, ASRA will honor two special awardees during this annual meeting. Denise Wedel, MD, will present the Labat lecture and receive the Gaston Labat Award. This award is presented annually at the ASRA Annual Regional Meeting and Workshops to an individual for his or her outstanding contributions to the development, teaching, and practice of regional anesthesia in the tradition of Gaston Labat. Jim Eisenach, MD, will receive the Distinguished Service Award. The DSA is presented annually to someone who has served the society in an innovative and significant way. I hope you can be in San Diego to help honor Dr. Wedel and Dr. Eisenach.

This particular annual meeting represents a transition for ASRA to a new management service—Kenes International. Kenes was founded in 1965 and is based in Geneva. Kenes’ main area of expertise is the organization of scientific and medical meetings. Kenes has organized over 2800 congresses in over 100 countries. ASRA is looking forward to working with this group to optimize the meeting and educational experience for all of our members, not only the Spring Meeting but also the Fall Pain Meeting and weekend Intensive Workshops. We are excited by the opportunities to evaluate and improve all the services for our members.

While ASRA is looking forward to the opportunity to improve the educational programs for our members by our association with Kenes, we plan to continue to work collaboratively with the American Society of Anesthesiologists to develop educational products to benefit its members as well. Two educational products on which ASA and ASRA are currently collaborating include the Maintenance of Certification for Pain Physicians and a Learning Portfolio for the use of Ultrasound for Regional Anesthesia. The Maintenance of Certification in Pain Medicine is in addition to the current continuing medical education program for anesthesiologists with additional training in pain medicine. This program is in early stages of development but will likely include both a written examination of knowledge and a simulation experience. The Learning Portfolio for Ultrasound in Regional Anesthesia is a project that is being led by the ASA Committee on Regional Anesthesia. This portfolio will allow anesthesiologists to document training in the use of Ultrasound for Regional Anesthesia when it is requested by their medical centers or practice groups. Both of these projects allow content experts from both the ASA and ASRA to join together to optimize the educational products and experiences for their respective members.
On behalf of the American Society of Regional Anesthesia and Pain Medicine and the 2012 Spring Program Committee, I would like to invite you to the beautiful Hilton Bayfront Hotel in sunny San Diego for the 37th Annual Regional Anesthesia Meeting and Workshops on March 15-18. The 2012 meeting will present the latest updates in the science, evidence-based outcomes, and innovations in approaches and techniques for regional anesthesia and acute perioperative pain medicine.

The Refresher Course lecture topics will include a review of the basic science and evidence-based outcomes of the possible beneficial effects of local anesthetics on the immune system-inflammatory response; regional anesthesia on surgical oncological and surgical-site infection outcomes; peripheral nerve anatomy; pharmacology of anticoagulation; evidence-based updates on the perioperative management of regional anesthesia and anticoagulation; ultrasound-guided regional anesthesia; continuous peripheral nerve blocks; and the role of ultrasound in the evolution of pediatric regional anesthesia. The General Sessions will provide the venue for the 2nd Journal-Sponsored Neurological Complications of Regional Anesthesia and Pain Medicine Practice Advisory, and the Parallel Sessions will focus on education in regional anesthesia, research methodology for the clinician, peripheral regional anesthesia-analgesia techniques for chest and abdominal surgery, and practical applications for ultrasound-guided regional anesthesia. Finally, the Problem-Based Learning Discussions will continue to provide the opportunity for small group discussions on various practical topics with experts in their respective fields.

The workshop sessions continue to be divided into 3 categories. Focused workshops are designed to provide an opportunity to review the indications, anatomy, approaches, and techniques (landmark-based and ultrasound-guided) for 1-2 specific nerve blocks. Hands-on ultrasound-based workshops provide the opportunity to practice the skills needed to identify and optimize neural and perineural sonoanatomy, and recognize common sonographic artifacts and pitfalls when performing upper extremity and lower extremity peripheral nerve blocks and peripheral nerve blocks in patients with challenging anatomy. Intensive workshops are four-hour hands-on sessions that provide a detailed overview of nerve blocks of a specific region of the body. Sessions will include didactic overviews and hands-on sessions that will review the anatomy, surface-landmarks, and different approaches and techniques for nerve localization. Based on feedback from the ASRA membership, a new truncal-paravertebral intensive workshop has been added to the traditional upper and lower extremity intensive workshops. In addition, each intensive workshop session will be provided at two different time slots to accommodate the increased demand for these workshops.

In addition to the program outline above, the 2012 spring meeting will once again provide an educational program for residents, fellows, and acute pain nurses. The meeting will also continue the tradition of moderated poster sessions and “best of meeting abstracts” to continue to foster research and academics in the field of regional anesthesia and pain medicine.

Lastly, the meeting provides an opportunity to see old friends and colleagues and make new friends. The President’s reception will be held on Wednesday evening, March 14. On Saturday evening, March 17, ASRA will host an evening of dining, drinks, and entertainment on the aircraft carrier Midway. The USS Midway museum has previously been rated an “event venue of the year” by a national poll of meeting planners, so do not miss this opportunity to see the numerous exhibits and dozens of restored aircraft in the flight museum. Other opportunities within easy walking or driving distance from the meeting site include the historic Gaslamp Quarter, Sea World, the San Diego Zoo, and Torrey Pines Reserve State Park. Finally, I am excited to announce a special guest lecture to be given after the conclusion of the Friday afternoon Parallel Session. Join us for what is sure to be an interesting and exciting lecture on the anesthesiologist’s role in caring for some very important patients at the world-famous San Diego Zoo. We look forward to seeing you in San Diego.
The ASRA 37th Annual Regional Anesthesia Meeting and Workshops will take place from March 15 to March 18, 2012, at the Hilton San Diego Bayfront Hotel in San Diego, California. The ASRA Board of Directors along with this year’s program director, Dr. Francis Salinas, and the ASRA Resident Section Committee has organized various activities specifically for residents and fellows attending the meeting.

The program will start with the resident abstract award presentation Friday evening. Following this session there will be an opportunity to mingle with regional anesthesiology and pain medicine fellowship directors at a wine and cheese reception. Come and meet your future fellowship program director in beautiful San Diego!

Don’t miss the regional anesthesiology boot camp, a workshop consisting of multiple focused sessions on regional anatomy in combination with hands-on practice of ultrasound-guided procedures. Learn in small groups featuring leaders in the field of regional anesthesiology. The program concludes with a resident forum entitled “The Past, Present, and Future of Regional Anesthesia Fellowships.” Highlights of this forum include: a discussion on research career options in regional anesthesia and how to get started in areas of investigation, updates on regional anesthesia and acute pain medicine fellowships, and current and future training options. This is sure to be a very informative venue!

As with years past, take advantage of the numerous educational sessions during the conference’s general sessions and social events, including the President’s Reception, open to all ASRA members and included in the discounted resident fee (registration required). Also, by popular request, we have condensed the resident and fellow program to allow you to take full advantage of sunny San Diego following the session. We also decided to start our program on Friday evening to minimize any interference with your clinical duties. You have spoken, and we are listening!

The 37th Annual Regional Anesthesia Meeting and Workshops will definitely be an exciting event. Please come and expand your knowledge, skills, and confidence in the area of regional anesthesia and acute pain medicine and meet renowned leaders in the field.

We look forward to seeing you in beautiful San Diego!
Should Emerging Knowledge of Regional Anesthesia-Related Nerve Injury Change My Practice? **One Person’s View**

Ultrasound-guidance has resulted in newfound interest in regional anesthesia amongst all levels of anesthesiologists – from longtime devotees, many of whom have largely abandoned their peripheral nerve stimulation (PNS) practice, to occasional practitioners who now feel sufficiently comfortable doing blocks because they can visualize the target nerve and surrounding tissues. Whether or not ultrasound-guided regional anesthesia (UGRA) is truly more effective or safer than the previous techniques of nerve localization is not entirely clear, although an evidence-based analysis suggests that real differences are modest at best. Without diminishing the remarkable sea change brought about by ultrasound-guidance, the nerd in me thinks that perhaps the greatest gift of ultrasound is what it has taught us about needle-to-nerve proximity; or more specifically, how ultrasound has brought into question all that we previously thought we knew about the pathophysiology of peripheral nerve injury.

Prior to ultrasound studies demanding this re-evaluation, regional anesthesiologists tended to believe two major axioms related to peripheral nerve injury. First, intraneural injection was to be avoided, because it represented breach of the nerve’s protective cover, thereby exposing fascicles and the neurons within to the potentially neurotoxic effects of local anesthetics. Second, anesthesiologists rarely inserted needles into the nerve because paresthesiae, or the leading current waves from stimulating needles, supposedly warned them that they were getting too close and that they should halt needle advancement. Then, along came ultrasound. Using this new research tool, investigators soon discovered that even with the needle clearly touching the nerve, the sensitivity of paresthesia is only 38%. Even more humbling, investigators have repeatedly shown that despite the formerly-accepted “reasonable endpoint” of 0.2 to 0.5mA stimulating current to indicate appropriate needle proximity to the nerve (not too close, not too far, but ‘just right’), needles are frequently placed intraneural (subpiaepheural) during peripheral nerve blockade. In fact, a recent study of popliteal sciatic nerve block determined the needle tip to be within the corpus of the nerve 94% of the time, when using a fixed stimulating current threshold to bring the needle into the desired location. For all those years we tried to avoid intraneural injections and believed that our nerve localization techniques prevented unintentional violation of the nerve, our needles were in fact probably within the nerve more often than we ever imagined. And yet, the overwhelming majority of our patients suffered no apparent ill effects from what we heretofore would have believed to be ‘substandard care.’ So what then is the reasonable anesthesiologist to make of this ultrasound-mandated challenge to our understanding of nerve injury pathophysiology? Shall we no longer be concerned about intraneural injection, or even intentionally seek intraneural needle placement because it may be safe and result in faster block onset? Shall we abandon our previously-held belief that needle trauma is an essential component of nerve injury, and instead ascribe to the belief that all regional anesthesia-related nerve injury is an idiosyncratic reaction to local anesthetic? The editors of the ASRA Newsletter have asked that I offer my opinion on these issues, which I do with the proviso that my opinions should not negatively reflect on the editors’ professional reputations or the deserved stature of ASRA. The likelihood that the coming years will prove my opinions wrong is much higher than the chance occurrence I will be proven correct.

If a nerd’s view of ultrasound-facilitated research is that it seriously calls into question our previous understanding of peripheral nerve injury, what then should the practicing clinician believe about the role of UGRA in modifying the occurrence of nerve injury? In short, preliminary data suggest that it does not seem to matter. The rarity of permanent or even long-lasting transient nerve injury (6 to 12 months) is such that we are unlikely to ever statistically prove UGRA to be a safer method of nerve localization as compared with PNS or paresthesia-seeking techniques. If one examines the frequency of transient neurologic symptoms (at best a surrogate marker of permanent injury) after peripheral nerve block, studies of reasonably-large numbers of patients from Barrington et al and Orebaugh et al suggest that there is no inherent difference between UGRA and PNS. Curiously, these investigators note an overall frequency of long-term neurologic symptoms remarkably similar to that reported over a decade ago by Auroy et al in the classic French surveillance studies, wherein PNS was the primary means of nerve localization. To further temper our hopes for increased safety, recent case reports reveal that nerves can be seriously injured despite the use of ultrasound-guidance. To recap, our PNS techniques result in needles frequently being intraneural. While most practitioners use ultrasound to identify and purposefully avoid intraneural needle placement, doing so does not appear to substantially alter the frequency of surrogate neurologic symptoms. Is it therefore time to become less...
concerned about intraneural needle placement (which we likely have some control over, at least with ultrasound-guidance) and more concerned about chemical neurotoxicity (which we probably have no control over)? I urge caution before accepting either premise.

Although we have learned much about needle-to-nerve proximity thanks to ‘ultrasound, the research tool,’ I view this as a welcome expansion of our knowledge continuum that mandates rethinking past knowledge, not necessarily abandoning it. The previous knowledge base, so assiduously assembled by the likes of Selander, Mackinnon, Gentili, Hadzic, and others, consistently notes that disruption of peripheral nerve integrity, particularly the perineurium, is associated with worse outcome than the simple application of local anesthetic to intact nerves. Our newfound ultrasound-based knowledge demands that we refine our definition of intraneural to recognize the difference between subepineurial but extrafascicular versus subepineurial and intrafascicular injection. Because most of the cross-sectional area of distal peripheral nerves is non-neural tissue,13 one explanation for the apparent ‘safety’ of previously unrecognized intraneural injections is that they are extrafascicular (within non-neural tissue) and therefore do not disrupt the perineurial integrity. Other protective factors may include the relative large size of block needles as compared to the fascicles, or perhaps a higher resistance of the perineurium to penetration as compared to the epineurium. While these explanations are reassuring, the skeptic in me is not entirely satisfied. If indeed we are penetrating the epineurium frequently, it stands to reason that, by the sheer number of blocks performed daily throughout the world, occasionally our needles breach the perineurium; yet permanent or even long-term transient injury rarely occurs. However, recall that short-term transient neurologic symptoms are incredibly common – up to 21% on day 1, and perhaps 3% at 1 month.12 Is it possible that some of these transient symptoms had their beginning in minor needle damage to the perineurium, with subsequent local anesthetic-induced neurotoxicity that eventually healed? Armed with the knowledge that the resolution of our current ultrasound transducers is insufficient to distinguish fascicles from non-neural tissue,13 I will continue to avoid placing a needle within a nerve.

What about the local anesthetics themselves? My opinion relies on both old and relatively-new knowledge. A foundational element of local anesthetic neurotoxicity is that concentration is directly linked to injury. If the concentration is high enough, local anesthetics kill nerves, even when they are intact. But normal clinical concentrations rarely damage intact nerves, at least in an irreversible manner.14 That said, investigators continue to uncover evidence of idiosyncratic inflammatory nerve disease. Whether this is mediated by local anesthetics and/or genetically determined is unclear. We may eventually come to understand that all regional anesthesia-related nerve injury is linked to chemical injury or inflammation, but anesthesiologists would be foolhardy to accept this futuristic explanation until hard science overturns previous evidence that links (most?) nerve injury to the dual insult of needle damage plus chemical insult. Avoiding needle-related trauma is the only part of this equation that I can currently control.

Thank you for the opportunity to express my opinion. The nerd in me is fascinated by what we have recently learned about needle-to-nerve proximity, which rightfully challenges long-held beliefs regarding the pathophysiology and subsequent avoidance of regional anesthesia-related nerve injury. The old (and growing) clinician in me finds none of this new knowledge so compelling as to change my current practice.

References

Laboratory data and clinical experience suggest that the inflammatory neuritis seen with intervertebral disc herniation (IDH) may play just as an important a role in pain production as mechanical compression. This is the logic behind corticosteroid therapy, which appears to exhibit anti-inflammatory activity through inhibition of prostaglandin and leukotriene production. Directly or indirectly, corticosteroids reduce interleukin-1, interleukin-6, tumor necrosis factor, platelet activating factor, and other mediators. Even very low doses of corticosteroid may produce adequate anti-inflammatory effects. A recent study suggests that doses as low as 10 mg of methylprednisolone per level injected are as effective as higher doses. Using a lower dose of corticosteroid may reduce risks of systemic toxicity, such as bone density loss, hyperglycemia, depression, and changes in fat distribution.

Using lower corticosteroid dose may diminish the risk of cumulative doses but would not be expected to reduce the risk of a rare but serious complication of transforaminal injection – central nervous system infarction. The mechanism for this complication has been postulated to be delivery of particulate into a radicular artery passing through the target foramen, causing embolic infarct. Concern has been highest with injections in the cervical spine, though procedure-related infarcts have been described in the lower lumbar spine as well. Dexamethasone, a non-particulate corticosteroid (i.e., comes as a solution), has not been implicated in permanent CNS injury. It has been compared to methylprednisolone in small clinical trials of both cervical and lumbar transforaminal epidural injection, with mixed results.

Truly novel epidural injection therapies for radicular pain due to IDH have been evaluated in recent randomized, controlled trials. Substances under study have included autologous conditioned serum (ACS), clonidine, and etanercept. All three of these injectables are currently available in the U.S., but since is the latter two are not FDA-approved for this indication, injection for IDH represents “off-label” use. Becker, et al. describe an approach to increase production of autologous interleukin-1 receptor antibody, which has the potential to inhibit the activity of the inflammatory cytokine interleukin-1. Becker drew venous blood and incubated the sample in a special environment of glass beads for 24 hours. The incubation appears to result in enrichment of interleukin-1 receptor antibody with minimal effect on other proteins. Investigators called the incubated sample “autologous conditioned serum” (ACS) and compared transforaminal epidural injection of ACS to triamcinolone (a particulate corticosteroid) in patients with either IDH or perineural granulation tissue as seen on MRI. Becker found that subjects receiving ACS had improvements in pain and function during follow-up, though there was no advantage relative to corticosteroid. Study subjects had low disability at baseline, making it difficult to compare the findings to patients with more impairment.

Like platelet rich plasma (PRP), an injectable also derived from the patient’s own blood, ACS is considered a “therapy,” rather than a device, pharmaceutical or blood transfusion, and is therefore not regulated by FDA. PRP and ACS are typically paid for out of pocket by patients, since payers view the therapies as investigational. Despite the cost to patients, demand has increased tremendously. For the most part, in clinical settings, these autologous, blood-derived products have been injected in and around joints, but it may only be a matter of time before Becker’s approach becomes more widely used.

Clonidine is another recently studied injectable for IDH. It is an alpha-2-adrenergic receptor agonist originally developed as an antihypertensive and is FDA-indicated for epidural administration in the treatment of cancer pain. Clonidine’s mechanism for analgesia may be two-fold: interaction with adrenergic receptors located in the central and peripheral nervous system and an anti-inflammatory effect that has been well-documented in animal models. Burgher, et al. compared transforaminal injection of clonidine to triamcinolone for patients with acute radicular pain due to IDH. Much like Becker’s results, patients in both the experimental and active control (corticosteroid) groups improved, showing an average of about 50% pain relief at 1 month. In addition, patients in the steroid group showed improvement relative to clonidine on a low back pain functional assessment.

Clonidine is an interesting potential alternative to corticosteroid for a couple of reasons. It has been used systemically and chronically to treat hypertension, with no apparent cumulative dose toxicity. Because of this, clonidine injections could potentially be administered safely in repeated doses, at regular intervals, and over long periods of time. Additionally, clonidine comes as a solution, rather than in particulate form, which means that CNS infarct due to embolism of a radicular artery should be unlikely. Whether transforaminal epidural injection of clonidine in humans could result in vasospasm or vascular accident via a different mechanism is not currently known. While the non-particulate nature of clonidine may improve its safety profile, Burgher, et al. speculated...
that efficacy would have been better if clonidine had been injected more frequently than once every 2 weeks or if it were available as a depot formulation. Unlike corticosteroid, clonidine’s pain-relieving effects in the setting of IDH are probably not very prominent without active drug present.

The third important and recently-investigated potential alternative to epidural steroid is etanercept. Etanercept is a tumor necrosis factor-alpha (TNF-alpha) inhibitor which has yielded mixed results when given systemically to treat IDH. Cohen, et al. compared etanercept to a saline placebo in a small number of patients with subacute radicular pain and IDH. Cohen, et al. found that subjects receiving active drug noted improvement during follow-up, but those in the saline group did not. Of primary importance was the issue of safety, since no clinical or experimental history of epidural injection of etanercept exists. This is in contrast to corticosteroids and clonidine and, some would argue, to ACS as well, since ACS is an autologous product comprised of enriched whole blood similar to an epidural blood patch which has an established safety record.

Like clonidine and dexamethasone, etanercept generally comes as a solution. However, etanercept may contain small aggregates of particles, even when stored properly. For etanercept, the biggest concern would be whether repeated injections resulted in immunosuppression – either a disruption in the local immunologic environment or systemic immunosuppression.

Despite lingering safety concerns and uncertainties surrounding etanercept, Cohen’s study is important in that it represents a growing interest in biologic rather than mechanical intervention for radicular pain. The suggestion of a biochemical etiology of pain with IDH has been around for some time. Large disc herniations may cause no symptoms while small herniations can cause disabling pain. Patients undergoing discectomy have reported significantly more pain with intraoperative and postoperative mechanical stimulation of the affected nerve root than with the same stimulation at an adjacent, unaffected level. Application of disc material or inflammatory mediators found in the disc nucleus can cause histopathologic changes in nerve roots in animal models, even in the absence of compression. Still, mechanical compression is important in the production of pain with radiculopathy, and reliable painful symptoms do not occur in either animals or humans without both compression and inflammation, suggesting a “2 hit” model representing the disease process.

Since the biochemical hit is the more promising one to moderate using minimally-invasive methods, we should expect increasing interest and an expanding literature base on the use of conditioned serum, clonidine, etanercept, or other, as yet unidentified molecules or admixtures. Biologics are already creeping into the treatment of discogenic pain – back pain emanating from the disc itself rather than due to irritation or compression of a nerve root. Current and future studies include injected thrombin, growth factors and stem cells. Clearly, the near future will be an exciting time for providers and investigators in the field, although it should be strongly emphasized that further studies are needed before these substances are considered safe clinical alternatives to corticosteroids.

References:
The Saphenous Nerve Block

Introduction

Saphenous nerve blocks are essential for almost all foot and ankle surgeries because the saphenous nerve provides sensory innervation to the medial leg and foot. These blocks are usually combined with blocks of the sciatic nerve. The saphenous nerve is the largest and longest branch of the femoral nerve. It is considered part of the posterior division of the femoral nerve. The adductor canal (canalis adductorius; Hunter’s canal) is an aponeurotic tunnel in the middle third of the thigh, extending from the apex of the femoral triangle to the opening in the adductor magnus. The vastoadductor membrane is a continuum of the aponeurotic roof of the adductor canal that covers the distal part of the canal. The thickness of this membrane varies greatly. The saphenous nerve usually exits the adductor canal at the distal end of the vastoadductor membrane or can pierce it.

After the saphenous nerve exits the adductor canal, it travels with the saphenous branch of the descending genicular artery just beneath the sartorius muscle from the anterior to the posterior edge of the muscle (Fig 1). This occurs where the femoral artery descends through the adductor hiatus into the popliteal fossa. At this point the saphenous nerve crosses over the tendon of the adductor magnus muscle that is interposed between the nerve and femoral artery as the nerve exits the canal (Fig 2).

The saphenous nerve can divide either in the adductor canal or distal to the adductor canal in the subsartorial fat. It gives off the infrapatellar branch and other cutaneous nerve branches that, in some individuals, anastomose with cutaneous branches from the obturator nerve and the medial cutaneous nerve of the thigh to form a subsartorial plexus. The infrapatellar branch can either run parallel to the saphenous nerve or pierce the distal part of the sartorius muscle. The saphenous nerve consistently emerges into the subcutaneous tissue between the tendons of the sartorius and gracilis muscles. The saphenous nerve will then join the undersurface of the saphenous vein in the proximal leg and follow its distal course. Medial crural cutaneous branches of the saphenous nerve will provide sensory innervation to the medial leg.

Figure 1.

Distal and medial to the adductor canal near the superior-most aspect of the patella. Saphenous nerve (N). Popliteal artery (A) and vein. Saphenous branch of the descending genicular artery (a). Tendon of the adductor magnus muscle (T).

Figure 2.

At the distal end of the adductor canal where the saphenous nerve (N) exits the canal crossing over the tendon of the adductor magnus muscle (T). Femoral artery (A) and vein. Descending genicular artery (a).
The posterior articular branch of the obturator nerve either enters the distal part of the adductor canal or penetrates the adductor magnus muscle on its way to the posterior knee capsule in the popliteal fossa. This nerve branch could potentially contribute to the analgesic effect of the adductor canal blockade after knee surgery. However, the description of the course of the nerve in the distal part of the thigh and its relation to the adductor canal varies greatly, and the nerve may not have any significant clinical role following saphenous nerve blocks in the thigh.

The medial branch of the nerve to vastus medialis travels with the saphenous nerve at the mid-thigh level under the sartorius muscle, anterolateral to the femoral artery, in the vastus medialis muscle or just under the muscle fascia. This nerve branch terminates in the knee capsule. Only a few of the nerves of the subsartorial plexus, namely the saphenous nerve and branches from the nerve to the vastus medialis muscle, can usually be identified with certainty by ultrasound imaging. Additionally, it is still uncertain to what extent all the plexus or just the saphenous nerve and its branches are involved in the saphenous nerve block in the adductor canal (Fig 3).

**Suggested Technique (1)**

Ultrasound imaging can be used to guide saphenous nerve block anywhere along its course, so the choice of approach is somewhat arbitrary. However, we typically do not choose the distal part of the adductor canal in order to minimize the risk of nerve puncture, paresthesia, or even nerve entrapment. This level is where the saphenous nerve is least mobile and to a variable degree fixed in the vastoadductor membrane. Furthermore, we have found the suggested techniques described here to be highly efficacious, safe, and robust within the broad spectrum of clinical practice.

Place the ultrasound machine on the opposite side of the bed so that the block site and display are both in front of the operator. Perform the saphenous nerve block with the sartorius muscle viewed in short axis while advancing the needle in the plane of imaging. The preferred direction is from the anterior side at the level of the mid-thigh just proximal to the take-off of the nerve and artery to the vastus medialis muscle. Because of the relatively-steep angle of insertion through the sartorius muscle an echogenic needle is typically selected with this approach.

The needle is placed through the sartorius muscle to enter the plane deep to the muscle (a trans-sartorial approach). There can be a loss-of-resistance as the needle tip crosses the vastoadductor membrane. Three to 5 mL of local anesthetic is injected within this plane, adjacent to the femoral artery. Initially the bevel of the needle faces the transducer to improve needle tip visibility. To extend the distribution under the sartorius muscle the needle can be rotated 180 degrees (bevel down) and then slowly advancing the needle towards the artery while lifting (retracting) the subsartorial fascia as gentle pressure is maintained on the injection syringe. The goal is to separate (or nearly separate) the femoral artery from the sartorius muscle.

The leg can be flexed at the knee and externally rotated to facilitate the sartorial coverage of the saphenous nerve and femoral artery, but this is not absolutely necessary and can be difficult in some patients, especially under postoperative circumstances. A similar effect can be achieved by performing the block more proximally.

**Suggested Technique (2)**

Another approach can be used that both provides excellent needle tip visibility and minimizes the risk of vascular puncture. An in-plane, short axis view approach almost parallel to the transducer can be used through the superficial part of the vastus medialis muscle in a lateral to medial direction overshooting the femoral artery deep to the sartorius muscle and the vastoadductor membrane (Fig 4). The advantage is that this needle track avoids directing the needle towards the femoral artery, and it improves needle tip visibility by pointing the needle tip posteriorly. Also, advancing through the fascia, coupled with loss of resistance as the needle bypasses the artery into the most superficial part of the adductor canal, may reduce the risk of puncturing the artery. The needle tip can then be placed next to the saphenous nerve. The optimal volume of injectate is currently unknown, but we recommend 15 mL within the canal.

**Figure 3.**

At mid-thigh level: Saphenous nerve and branches (N) in the adductor canal. Femoral artery (A) and vein (V). A nerve branch of the nerves to the vastus medialis muscle (n) lying in the muscle (top image) and just under the muscle fascia (bottom image).
Difficult. The placement of the catheter can sometimes be removed, to adjust the position of the catheter tip next to the saphenous nerve or femoral artery. Ensuring a free flow through the catheter while expanding the canal confirms catheter placement in the canal.

Complications
Because of the proximity of the saphenous nerve to the femoral artery, there is an inherent risk of vascular puncture when advancing the needle tip toward the nerve. Patients with failed or partially effective saphenous nerve blocks will often report postoperative pain localized to the medial ankle, even if the surgical procedure on the lower extremity did not involve a surgical incision on the medial leg. For this reason, many believe that the innervation of the saphenous nerve includes not only cutaneous branches but also articular branches to the ankle joint and related structures deep to the skin. The clinical observation is that the addition of a saphenous nerve block to the sciatic nerve block as a rescue after ankle surgery has a surprising effect that is difficult to justify by the cutaneous distribution alone. It is theoretically possible to place the needle tip through or into one or more nerve branches during saphenous nerve block in the mid-thigh.

Although nerves to the vastus medialis muscle lie within the subsartorial plane, studies have found no measurable motor block from saphenous nerve blocks performed in this location. A recent case series investigating the continuous saphenous nerve block after total knee arthroplasty (TKA) showed no clinically-apparent motor blockade while weight-bearing.

Additional Comments
Ultrasound identification of nerves and other anatomic structures are best illustrated under real time dynamic scanning. Videos of the saphenous nerve in the adductor canal and related structures can therefore be studied with great advantage; supplemental video material will be available on the ASRA website http://www.asra.com/publications-newsletters.php.

Assessment
There are several sonographic signs of successful saphenous nerve block in the adductor canal. The distribution around the saphenous nerve can be assessed in short and long axis views. The injectate should spread in a semilunar fashion on the anteromedial aspect of the femoral artery and saphenous nerve, with displacement of the femoral artery. If the sartorius muscle is lifted extensively, then the needle tip is probably not in the adductor canal and the needle should be repositioned. The nerve should appear brighter after the injection because of the acoustic enhancement from the surrounding injectate. The saphenous nerve can be seen to move from the side of the femoral artery to its top surface as the probe slides from proximal to distal. This is most clearly seen after injection of local anesthetic for regional block.

After most approaches to saphenous nerve block the medial leg and foot will show signs of cutaneous anesthesia. The distal boundary of sensory blockade often extends to the base of the great toe.

Catheter Placement
An indwelling catheter can be placed in the adductor canal after a bolus injection at the mid-thigh level. However, the abundant amount of connective tissue in the canal makes advancement of the catheter beyond a few centimeters difficult. The placement of the catheter can sometimes be visualized by ultrasound, after the needle has been removed, to adjust the position of the catheter tip next to the saphenous nerve or femoral artery. Ensuring a free flow through the catheter while expanding the canal confirms catheter placement in the canal.

References

Figure 4.
Needle approach at mid-thigh level: In this individual, the saphenous nerve (N) is positioned medial to the femoral artery (A) high in the adductor canal. Top image: The needle approach (arrowheads) is almost parallel to the transducer aiming over the artery. Bottom image: After penetration of the vastus medialis muscle fascia the needle (arrows) is placed at the desired position next to the saphenous nerve (N) and femoral artery (A) and the injectate (**) spreads in a semi-lunar fashion around the nerve and artery while displacing the femoral artery deeper in the adductor canal.
Changing of the Guard: Out with the old and in with the new

I have been a member of the newsletter committee since 2006 and editor of the newsletter since 2009. I have enjoyed working on every issue and have had the opportunity to work with some of the ‘best and brightest’ in the world of regional anesthesia and pain medicine—not just on the committee itself, but also in correspondence with the many authors of our articles.

As a best example of one of those individuals, it gives me great pleasure to hand over the editorial reins to Dr. Ed Mariano from May 2012. Ed has the rare skill of being both a talented teacher and scientist in the art of regional anesthesia. He is also a great leader and communicator and this combination of skills makes him an ideal candidate to take over the position of editor.

I hope you have enjoyed reading the newsletter over the last three years. We have tried to put together a collection of stimulating articles for each issue. New article types have been created in addition to keeping some of the old favorites. The role of the resident members of the committee has become increasingly important just as their role has continued to gain importance in the society at large. Ideas for new article types and suggestions for authors are always welcome, and I would strongly encourage any member who is interested in contributing either to the newsletter or the committee itself to contact Ed Mariano or myself directly.

The newsletter committee has traditionally consisted of members of both regional and pain expertise. Over a year ago I asked two of those members, Dr. Dave Provenzano and Dr. Steve Orebaugh to lead the pain and regional sections, respectively, and generate new ideas and author suggestions for newsletter content on an ongoing basis. They have been very successful in their efforts, and most of the credit for the quality of recent newsletters is due to their efforts and the efforts of the committee members who work closely with them. Finally, credit has to be given to the ASRA headquarters staff led by Julie Kahlfeldt who make sure that the newsletter articles are given the first class artistic rendering that we have come to expect in each issue. Roy Winkler has done an excellent job for a number of years and is very forgiving of my late submissions and last minute requests. Thank you both to Roy and Julie for their ongoing support of the newsletter.

As I read Francis Salinas’ description of the upcoming ASRA Spring Meeting I am reminded of why I so enjoy being a member of ASRA. From the first meeting I attended, not only was the education and science world class but the people delivering them were the most approachable and friendly I have met in any society. The San Diego meeting looks like another great opportunity both to update knowledge and meet friends, old and new, and I look forward to meeting you there.

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The decision to administer glucocorticoid antiinflammatory medications using an interventional pain management technique for treating radicular pain must take into consideration the relative efficacy and safety of the respective approaches. Lumbar epidural injections may be accomplished using one of three basic approaches—interlaminar (LESI), caudal, or transforaminal (TFESI). Injection therapy using these approaches seems more effective in treating radicular pain in the short-term compared to long-term with evidence for short-term use being strong for LESI, caudal ESI, and TFESI and moderate for TFESI in long-term pain management.1-6 Nevertheless, there appears to be ongoing conflict in the medical literature concerning the relative efficacy of LESI and other spinal pain treatments, with some authors noting insufficient evidence to support their use in general7,8 and others noting substantial benefit from some, but not all, therapies.9 Several review articles are available to discuss the relative merits of these treatments.10,11

If the basic premise of using glucocorticoids is to reduce inflammation in the short-term, while enabling a patient to return to a baseline level of functioning while disc “healing” runs its natural course, the question must be asked, “How can this be accomplished in the simplest, most straight-forward manner with the least likelihood of causing harm to that patient?” As most treatment strategies in medicine can be reduced to an assessment of “risk-benefit ratios,” it is my conclusion that using interlaminar approaches to treat radicular pain is the clear favorite over the transforaminal route for the following reasons:

The decision to participate in this debate was not an easy one. Being asked to take the “transforaminal” (TF) side in a debate about whether TF epidural steroid injections (ESI) are better than interlaminar (IL) ESI is analogous being asked to support the position that “Franklin Roosevelt was a better 20th Century President than Lyndon Johnson,” or that “Babe Ruth was a better hitter than Barry Bonds.” With the preponderance of evidence already supporting your position, the law of diminishing returns dictates that the room to fail is much greater than the room to advance further. It is the reason why lawyers are enthusiastic about defending the most infamous criminals, and why the Johnnie Cochrans of the world are more renowned than the Marcia Clarks. Basically, if one examines the evidence closely, all of it augurs for TFESIs being more effective than ILESIs. It is nearly indisputable in patients with unilateral radiculopathy. For patients with bilateral symptoms, whereas bilateral TFESI will similarly be more effective than a single midline ILESI, other issues such as cost and patient tolerability play into the decision. This discussion will therefore be limited to unilateral lower extremity radiculopathy.

Clinical Studies
Six randomized studies and 4 retrospective studies have directly compared the different approaches for ESIs.1-10 Seven of these 10 studies determined that TFESI were superior to interlaminar and/or caudal ESI, including the two largest randomized studies1,2. One study found that half the dose of steroids and less than half the volume of local anesthetic injected transforaminally pro-
1) **Ease of Application.** Interlaminar approaches to the epidural space are easily mastered and are taught to every anesthesiology trainee in the world. The anatomy is readily-identifiable, and the loss-of-resistance techniques using air or saline provide unmistakable evidence that the space has been negotiated. Furthermore, the addition of fluoroscopic guidance or ultrasound assistance as adjuncts to the verification process validates the successful attainment of the target. TFESI require greater skill and experience and the interpretation of contrast dispersion may be affected by the experience of the observer, however.\textsuperscript{11} **Factors: LESI.**

2) **Success at Attaining Ventral Epidural Spread.** It appears that the target of steroid injections is the interface of intervertebral disc pathology and the exiting spinal nerve root. This is based upon a theoretical construct that suggests that the disrupted or injured intervertebral disc is laden with chemical mediators of inflammation, and placing the “bolus” of antiinflammatory medication in the closest proximity to that inflammatory soup is somehow responsible for an enhanced outcome. The disc has a rich innervation primarily in its outer third of the annulus with contributions by the sinuvertebral nerve, gray rami communicantes, and lumbar ventral rami.\textsuperscript{13-16} Nerves in discs contain calcitonin-gene-related peptide (CGRP), vasoactive intestinal peptide (VIP), Substance P, prostaglandins (Phospholipase A2), histamine, lactate and potassium, each of which is involved in nociception.\textsuperscript{17-19} Even so, lavage of the epidural space in volunteers suffering with acute radicular pain did not reveal presence of the aforementioned mediators.\textsuperscript{20} Regardless of the above, accepting the premise that medication must reach the ventral epidural space does not detract from an interlaminar approach that uses an off-midline, or “parasagittal” approach (Figures 1a, 1b). An interlaminar parasagittal technique as shown in the figures has been found to reliably place medication into the ventral epidural space, while unilaterally spreading for multiple segments in the epidural space.\textsuperscript{21} Figure 1a demonstrates an interlaminar parasagittal injection at L5-S1 with ipsilateral nerve root contrast spreading along the L2, L3, L4, L5, S1 and S2 nerve roots. Figure 1b, the lateral fluoroscopic image from the same patient, shows the contrast abutting the posterior longitudinal ligament for multiple segments, which approximates the ventral epidural space. In the one study that examined an interlaminar parasagittal epidural injection compared with TFESI, attainment of ventral epidural spread was 100% in the parasagittal group and 75% in the TFESI group.\textsuperscript{21} As for specificity, with injected volumes ≥ 0.5 mL, there is no guarantee that TFESI are “selective” to a single specified nerve root level.\textsuperscript{22} Volumes

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**Systematic & Evidence-Informed Reviews**

Multiple reviews have been conducted evaluating ESI. Not surprisingly, those performed by non-interventionalists are more likely to conclude that ESI do not provide any long-term benefit than those performed by anesthesiologists and physiatrists. Some reviews do not address the question of which is the best approach, but amongst those that do, the large majority have concluded that TFESI are more effective than ILESI.\textsuperscript{12-14} Whereas a small minority conclude that the evidence is equivocal regarding which technique is superior,\textsuperscript{15} none suggest ILESI to be better.

**Indirect Evidence**

Since the sites of pathology for most cases of sciatica are the intervertebral discs and nerve roots, one can logically deduce that depositing medication directly over pain-generating structures (i.e., nerves and discs) would be more effective than a technique in which the medication fails to reach the source of symptoms. Clearly, since TFESI, unlike ILESI, deposit the steroid directly over the affected nerve root(s), one might reasonably conclude that the chances are higher for the medication reaching the target sites. Multiple studies have shown that contrast spread during ILESI is unpredictable and unreliable even in the same patient, and frequently remains unilateral.\textsuperscript{26,17} With respect to deposition into the ventral epidural space where the disc pathology and spinal nerve roots originate, several investigators have examined this. Among those investigators who directly compared the rate of ventral epidural spread between the interlaminar and transfemoral approaches, two of three found higher proportions occurred with the latter.\textsuperscript{13} In the only

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of ≥ 2 mL attain ventral epidural spread (i.e., “the target for nociception”) inconsistently between 75-100% of the time.23,24 **Favors: LESI.**

3) **Avoidance of Side Effects and Complications:** Intravascular injection of particulate glucocorticoids remains a serious threat when performing neuraxial injections. While attention has recently focused on the cervical transforaminal techniques, with an identified 63.4% incidence of vascular spread of contrast identified on fluoroscopy,24 it should not be forgotten that there is a 10% incidence of intravascular injection reported for lumbar TFESI.21,25 Case reports and medical legal cases have been well-publicized wherein individuals have become paralyzed from embolic phenomena following lumbar TFESI with injection into radicular arteries. These same concerns have not been an issue for interlaminar procedures. Other complications are more common with TFESI techniques as well. While intradiscal injection occurs following both TFESI and LESI,26-27 this occurs 12 times more commonly in the former case than the latter. Dural puncture and subdural injection occur following both LESI and TFESI, but are more common in the former than the latter.28 More serious complications include infections such as discitis, epidural abscess formation, and meningitis,29-37 intravascular injections from TFESI,38-39 epidural and subdural hematoma formation,40-44 cauda equina syndrome,45 and paralysis and death, primarily from TFESI.45-53 Almost without debate whatsoever, the risk of serious and permanent neurological sequelae following neuraxial techniques is higher with TFESI than with LESI. **Favors: LESI.**

**Conclusions:** While the success rates for reducing pain and improving functionality following the respective approaches to managing lumbar radicular pain are open to debate, there is an abundance of evidence which favors the selection of interlaminar techniques versus transforaminal techniques in terms of minimizing complications, both mundane as well as catastrophic, such as paralysis and death. Although relatively rare, paralysis and death should probably never occur following an elective procedure performed for symptomatic relief, if selection of one technique over another, similar technique minimizes these potential risks. For these reasons, as well as for the ease of performance, lumbar interlaminar epidural injections should be considered first-line therapy for managing unilateral radicular pain, and a parasagittal technique should be implemented when it is deemed essential to place antiinflammatory medication into the ventral epidural space, even if only for theoretical reasons.

**References:**


**Figure 1a, 1b.** Interlaminar Parasagittal Epidural Steroid Injection. The anterior-posterior film (Figure 1a) demonstrates ipsilateral spread on the right side from an L5-S1 needle placement and injection of 4 mL of iodi ne based, water soluble contrast with spread along the right L2, L3, L4, L5, S1 and S2 nerve roots (arrows). Figure 1b shows attainment of contrast spread for multiple segments along the posterior longitudinal ligament (arrows), a surrogate for the interface of the intervertebral disc and the exiting spinal nerve root.


study to find a higher rate of ventral epidural spread with the IL approach, Candido et al.\textsuperscript{18} systematically placed the needle tip in the posterior aspect of the foramina, making ventral spread less likely. Not surprisingly, a study by Desai et al.\textsuperscript{19} determined that advancing the needle into the anterior aspect of the foramen, which is generally done by experienced practitioners in the absence of a lateral disc herniation, virtually guarantees ventral epidural spread with the TF approach. No adjustment using an IL technique can guarantee the medication will reach the area of pathology.

Complications

As one can clearly see, based on the preponderance of available evidence, TFESI are probably more effective than ILESI for neuropathic spinal pain. The only possible reason one could propose for performing ILESI is that there may be a lower incidence of serious complications for ILESI. Whereas cervical TFESI are widely acknowledged to be associated with an increased risk of paraplegia and death from spinal cord infarct compared to ILESI, the relative risk for lumbar ESI is unknown because neither the numerator nor denominator for each category is available. Currently, a similar number of case reports documenting serious complications has been published for lumbar ILESI as there have been for lumbar TFESI.\textsuperscript{12,20,21} Yet even if there is a slightly higher risk for a catastrophic complication with TFESI, one would need to examine the absolute, rather than the relative, risk, to place this in context. If one considers the evidence that TFESI are more effective than ILESI, which likely translates into a smaller percentage of patients proceeding to surgery\textsuperscript{12} and requiring opioid medications, the overall risk is almost certainly much lower for TFESI.

Conclusions

In summary, it is becoming increasingly clear that TFESI afford superior results than ILESI, which almost certainly outweighs the questionable increased risk. If one were concerned about a possible increased risk of 1 in 10 or 20,000, then they need to put this in the context of better pain relief reducing the need for surgery and analgesic medications, which carry much greater risks than the injections themselves. The growing acknowledgment in the interventional pain management community that TFESI are the best approach for the delivery of epidural steroids is the reason why TFESI comprise the bulk of the increased utilization of ESI in general. The next major question we need to answer is how to identify the best candidates for ESI so they can be properly and safely utilized.

References

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<th>Study, Year</th>
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<td>Rados, 2011</td>
<td>Randomized, unblinded</td>
<td>64 Patients with chronic unilateral lumbar radiculopathy.</td>
<td>No difference between TF and IL through 6-months.</td>
<td>Half the steroid dose and &gt; 50% less LA injected in TF group.</td>
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<td>Smith, 2010</td>
<td>Retrospective, case-control</td>
<td>38 pts with radiculopathy 2° to SS</td>
<td>No difference between groups. Follow-up period not standardized.</td>
<td>Underpowered to detect between-group difference. Lower volume of LA used in IL group.</td>
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<td>Lee, 2009 (JBMR)</td>
<td>Retrospective</td>
<td>233 pts with radiculopathy 2° to SS or HNP</td>
<td>For satisfaction and pain scores, TF=IL &gt; caudal up to 2 mos. For function, TF &gt; IL &gt; caudal.</td>
<td>Functional benefits of TF more pronounced at 2 weeks. Inj ectate volumes not standardized.</td>
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<tr>
<td>Lee, 2009 (CJP)</td>
<td>Randomized, evaluator-blinded</td>
<td>192 pts with axial LBP 2° to HNP or SS</td>
<td>TF &gt; IL up to 4 mos.</td>
<td>For TF injections, half of the IL dose given on each side. Differences between groups greater for SS pts. Effect attributed to higher proportion of ventral epidural spread in TF group.</td>
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<td>Ackerman, 2007</td>
<td>Randomized, evaluator-blinded</td>
<td>90 pts with S1 radiculopathy from HNP</td>
<td>TF &gt; IL or caudal at 24 weeks.</td>
<td>Those with ventral epidural spread, more common in TF group, had better outcomes.</td>
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<td>Schaufele, 2006</td>
<td>Retrospective</td>
<td>40 pts with radiculopathy 2° to single-level HNP</td>
<td>TF &gt; IL. Follow-up period not standardized.</td>
<td>Lower volume of LA used in IL group. Higher baseline pain scores in IL group.</td>
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<tr>
<td>Thomas, 2003</td>
<td>Randomized, double-blind</td>
<td>31 pts with radiculopathy 2° to single-level HNP</td>
<td>TF &gt; IL through 6 mos.</td>
<td>IL injections performed without fluoroscopy.</td>
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<tr>
<td>Kolsi, 2000</td>
<td>Randomized, double-blind</td>
<td>35 pts with radiculopathy</td>
<td>No difference between groups up to 28 days.</td>
<td>No difference between groups up to 28 days.</td>
</tr>
<tr>
<td>Kraemer, 2000</td>
<td>Prospective, randomized</td>
<td>133 pts with unilateral radiculopathy</td>
<td>TF &gt; IL &gt; paravertebral local anesthetic.</td>
<td>A 2nd separate study in same paper found TFESI &gt; placebo. Details on IL injections not noted.</td>
</tr>
<tr>
<td>Manchikanti, 1999</td>
<td>Retrospective</td>
<td>225 patients with radiculopathy</td>
<td>TF &gt; caudal &gt; ILESI through 3-mos.</td>
<td>IL injections performed blindly.</td>
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SS- spinal stenosis; TF- transforaminal; ESI- epidural steroid injection; IL- interlaminar; HNP- herniated nucleus pulposus
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