

An in-depth interview with Jacques E. Chelly, MD, renowned professor of anesthesiology and orthopedic surgery, on the importance of rapid return of motor function with regional anesthesia.



Jacques E. Chelly, MD, PhD, MBA

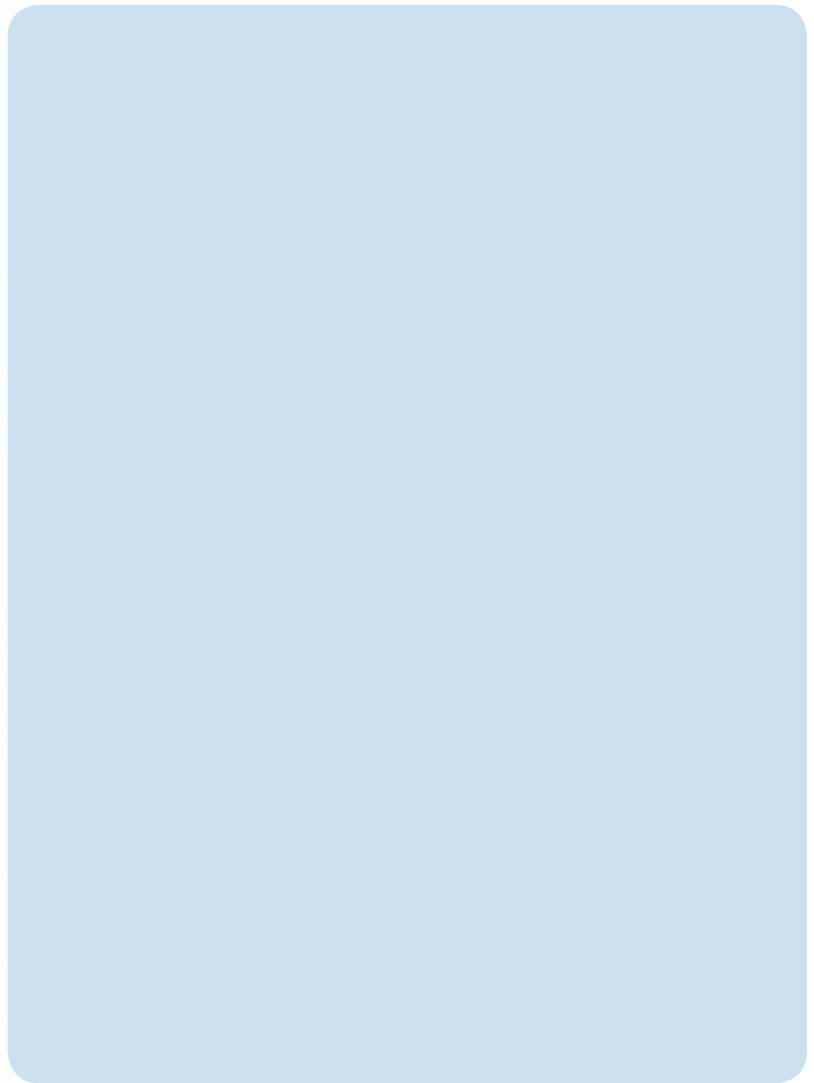
Returning Patients to Full Motor Function After Regional Anesthesia: Can We Do Better?

 **Naropin[®]**
(ropivacaine HCl) Injection

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An in-depth interview with Jacques E. Chelly, MD, renowned professor of anesthesiology and orthopedic surgery, on the importance of rapid return of motor function with regional anesthesia.

TOPIC I: Why is postoperative rapid return of motor function important?

Postoperative rapid return of motor function can benefit the patient, the surgeon, the anesthesiologist,

AND the hospital. It enables the patient to begin physical therapy shortly after surgery, allowing for more rapid discharge and shorter lengths of stay. This can translate into cost savings for the hospital, especially those with high occupancy rates and for ambulatory surgery centers where unplanned prolonged hospitalization represents an important concern. Rapid return of motor function enables the surgeon and the anesthesiologist to also detect and possibly treat a nerve injury including those related to a nerve compression. This gives both the patient and the surgeon peace of mind that the surgery was not associated with a complication and achieved the desired goal. Finally, faster return of motor function may significantly reduce the risk of complications associated with extended hospital stay, such as deep vein thrombosis and pulmonary embolisms.

Let me expand on each of these points.

Ability to begin physical therapy shortly after surgery

After procedures such as joint replacement, the patient may begin active physical therapy shortly after surgery. The regional anesthetic that these patients receive greatly influences how much motor function is affected. For example, it may take up to 24 hours for a motor block to wear off when bupivacaine is used.

Slower return of motor function can delay physical therapy and recovery. A precise understanding of the surgical procedure and the need to optimize recovery have led to orthopedic anesthesia becoming a subspecialty. Orthopedic anesthesiologists can provide the anesthetic and postoperative environment to optimize functional recovery, especially when patients come to the hospital with the mindset that they will do “whatever it takes” to quickly recover. Therefore, these anesthesiologists greatly contribute to the facilitation of the recovery and early discharge of patients.

Psychological reassurance to the patient

The inability to move a limb makes some patients very anxious. There is always the worry that something

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TOPIC I: Why is postoperative rapid return of motor function important? (continued)

might have gone wrong with the surgery. This is usually top of mind with patients since all patients are required to understand that both the surgery and the anesthesia may lead to rare, but sometimes permanent, nerve damage. Therefore, most patients welcome the ability to move as an early sign that everything is alright. If unable to regain motor function, some patients will become anxious and depressed, and this can also slow the recovery process.

Nerve Damage

Surgeons worry about nerve damage and are typically anxious to evaluate their patients as soon as possible postoperatively. Most bones are in close proximity to nerves, making the risk of nerve damage a possibility. Return of motor function reassures them that no nerve was damaged during surgery. The risk of nerve damage is small. However, if nerve damage does occur, sometimes there is only a very short window of opportunity to do something about it, such as in the case of a nerve compression. Usually after 8 hours, nerve damage becomes irreversible and can result in indefinite loss of sensation and/or motor function. Approximately 1% to 3% of orthopedic surgeries may result in irreversible nerve damage.

From a surgeon's, anesthesiologist's, and even hospital's standpoint, it is important to properly identify and immediately repair nerve damage, when possible, to decrease one's liability. Lawsuits may result in large settlements and damage the reputation of the physician and the hospital. They also increase the cost of malpractice insurance. Anesthesiologists tend to be more prone to nerve damage lawsuits than surgeons because they operate as a consultant to the surgeon

and therefore do not often have the time to establish a strong connection with their patients as compared to their surgeon colleagues. It tends to be easier for patients to sue a stranger.

Beyond nerve damage, surgeons also want to assess whether the surgery was a success. With certain long-acting regional anesthetics, it may take up to 24 hours for the motor block to recover, making range of motion and other types of assessment difficult. Like I mentioned, with ropivacaine HCl (NAROPIN®), time of return of motor function is significantly less.

Reducing the need to use potent anticoagulating agents to prevent pulmonary embolism and deep vein thrombosis

When patients are ambulatory sooner, pulmonary embolism and deep vein thrombosis are less of a concern, and surgeons increasingly switch to aspirin instead of more potent anticoagulating agents. This reduces the possibility of bleeds, a potential risk when using anticoagulating agents such as warfarin. Also, significant cost-savings accrue when patients are ambulatory sooner, since physicians do not have to use more expensive anticoagulating agents and can use inexpensive drugs such as aspirin instead. However, no studies have been conducted to accurately measure this effect.

TOPIC 2: For which procedures and/or settings is rapid return of motor function most important?

Types of Procedures:

Rapid return of motor function is important in joint replacement surgery. The length of stay for these patients is very much dependent on their ability to do physical therapy. Discharge criteria are highly variable from one institution to another, but in most cases they are dependent on the patient's ability to reach some landmark in terms of being able to move. In addition, with rehabilitation centers becoming less and less available to patients because of Medicare reimbursement issues, the burden is on hospitals to provide full physical therapy and return patients to preoperative conditions.

Motor function is also important in some upper extremity surgeries, especially hand surgery, such as carpal tunnel release. The surgeon needs to be able to assess range of motion not only after surgery, but also very often during surgery.

Rapid return of motor function is also important in trauma patients with a risk of compression syndrome.

Examples include high humerus fractures with a risk of radial compression or tibial plateau fractures with a risk of sciatic compression. In cases like these, anesthesiologists need to do a nerve block and infuse the patient at a very low rate with a very low concentration of long-acting regional anesthetic. They then wait and watch the patient for complaints of sharp pain with loss of motor function, which is an indication of nerve damage. Complete loss of sensation or motor function makes the identification of nerve damage impossible.

Setting:

As more and more orthopedic surgeries are performed on an outpatient basis in ambulatory centers, rapid return of motor function is becoming increasingly important. These facilities have to discharge patients at the end of the day because the staff goes home and the center closes for the day. A study by Pavlin showed that the top factors for delaying discharge of ambulatory patients are pain followed by emetic symptoms and drowsiness.¹

Anesthesiologists working in ambulatory centers want to use a long-acting local anesthetic that reliably has good sensory coverage without oral opioid supplements and little or no motor block.

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TOPIC 2: For which procedures and/or settings is rapid return of motor function most important? (continued)

Anesthesiologists working in ambulatory centers want to use a long-acting local anesthetic that reliably has good sensory coverage without oral opioid supplements and little or no motor block. This decreases the risk of discharge delays and will enable the center to open and close at set times without having to make their staff work overtime.

Another important attribute is the safety profile of the anesthetic. Anesthesiologists working in ambulatory surgery centers need to realize that they will not have all of the resources they need to put a patient on bypass if something were to go wrong and a patient were to experience a cardiac arrest. This will become a huge issue as they do not have direct access to an ICU.

Anesthesiologists working in ambulatory centers increasingly prefer ropivacaine HCl (NAROPIN®) over bupivacaine because of its better safety profile which is especially important in the case of freestanding ambulatory centers. The relative local anesthetic toxicity also becomes a liability issue when sending a patient home where they will not have the same access to care as in an inpatient setting. It is clear that most of us feel more comfortable discharging a patient who has been treated with ropivacaine than with bupivacaine.

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TOPIC 3: Are there institutional benefits to rapid return of motor function?

As we touched upon earlier in our discussion, rapid recovery of motor function can reduce length of stay, which may ultimately result in cost reductions at an institutional level. Very few institutions recognize this because of a “silo approach” to measuring cost. Pharmacies focus on drug acquisition cost solely without looking at overall cost, which includes factors such as operating room turnover, patient’s length of stay, nursing time/staff overtime, or time spent in physical therapy. In institutions with very high occupancy rates, rapid return of motor function can lead to faster recovery times, and hence, shorter lengths of stay. This translates to higher per-bed turnover and higher institutional throughput. Today, the recommendation to hospitals is to look at overall cost as opposed to drug acquisition cost when evaluating regional anesthesia agents.

An institution may be more likely to prefer one anesthetic over another if it recognizes that its selection has an impact on time to discharge, overall length of stay, and complications which ultimately represent the operational costs. When taking a global approach to cost, using a drug like ropivacaine, which is safer than bupivacaine and results in decreased length of stay, makes a huge difference on the bottom line. Unfortunately, an entire generation of anesthesiologists in the United States has not been trained in regional anesthesia, due in part to reimbursement issues, and does not necessarily recognize the benefits of regional anesthetics to an institution’s bottom line. The present generation is better trained, but it will continue to take some time for anesthesiologists to get to the level where regional anesthesia is optimized.

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TOPIC 4: To what degree is pain management a consideration when thinking about regional anesthesia?

When choosing to use regional anesthesia, rapid return of motor function is an important consideration. Equally important is pain management. The two CAN and DO happen at the same time. The more we effectively treat pain, the more we improve immediate and long-term recovery. A panel of physicians who perform fast-track surgeries recommends that anesthesiologists be involved in acute pain management using a multimodal approach, which includes regional anesthesia.² This multimodal approach consists of a regional anesthetic, spinal or epidural anesthesia, and the use of Cox-2 inhibitors, ketamine, an NMDA antagonist, pregabalin, steroids, and even preoperative local infiltration. Such an approach has been shown to provide optimum pain management, to decrease stress reaction related to the surgery, to optimize the immediate outcome of the patient, and to prevent chronic pain as a result of surgery. Such an approach also increases the well being of

the patient, increases patient satisfaction, and decreases length of stay. Focusing on acute pain management has allowed anesthesiologists to significantly improve the outcome of patients, something that anesthesiologists have previously been unable to do to this degree and magnitude.

A key benefit of this multimodal approach is the elimination of opioids. Gebhard has found that the risks and disadvantages of opioid use following orthopedic surgery outweigh the benefits.³ Patient outcomes are improved with limited use of opioids, since gastrointestinal side effects such as nausea, vomiting, and constipation, as well as urinary retention and pruritus, are avoided. This is especially important in older patients who may experience more significant adverse events. Every anesthesiologist and surgeon has personal experience with patients who remained in the hospital for longer periods of time because of opioid-related side effects. Evidence suggests that morphine also has some immunosuppressant effects that impact recovery time and time to discharge. Other side effects of opioids include PONV,

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itching, constipation, and increased risk of respiratory depression.

Studies comparing opioids, epidurals, and regional anesthesia for postoperative pain found that regional anesthesia provided optimal results. Recovery time was reduced and overall hospital stays decreased.⁴ When combined with multimodal, nonopioid analgesia, patients had more effective pain control during early mobility and rehabilitation.⁵ In addition, regional anesthesia provided the best combination of analgesia and side effects.^{4,6}

Why does NAROPIN provide faster return of motor function than bupivacaine?

A number of studies have shown that ropivacaine is a more sensory-selective agent than bupivacaine, with less of an impact on motor fibers. Borgeat et al, for example, demonstrated that open shoulder surgery patients having received an interscalene block with ropivacaine had less motor impairment as assessed by hand strength, but equivalent sensory blockade and pain relief than bupivacaine patients.⁷

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Jacques E. Chelly, MD, is professor of anesthesiology and orthopedic surgery, vice chair of clinical research, and director of the division of regional anesthesia and acute interventional perioperative pain at the University of Pittsburgh Medical Center (UPMC). He is also director of orthopedic anesthesia at UPMC Shadyside Hospital and director of acute interventional perioperative pain at UPMC Presbyterian-Shadyside and Magee Hospitals.

A graduate of the Necker-Enfants Malades Medical School, Paris, Dr Chelly completed his residency in anesthesiology and intensive care at Broussais Hospital, Paris. He earned a masters degree in pharmacology from Lariboisière-St. Louis Medical School, Paris, and both a PhD in pharmacology and an MBA from the University of Houston, Texas.

Dr Chelly's areas of interest include anesthesiology in orthopedic surgery and acute pain management. He is the editor of 3 text books on peripheral nerve block techniques. He is the author or coauthor of 13 book chapters, more than 180 peer-reviewed articles, and more than 250 abstracts. Dr Chelly is a frequent guest lecturer and invited speaker at national and international scientific conferences. A member of numerous professional organizations, he is president of the Orthopedic Anesthesia Pain and Rehabilitation Society. He serves as a reviewer for the *American Journal of Physiology*, *Anesthesiology*, the *Journal of Cardiovascular Pharmacology*, the *Journal of Hyperthermia*, and the *Journal of Pharmacology and Experimental Therapeutics*. Dr Chelly has been named a Top Physician by Consumers' Research Council of America. Since 2006, Dr Chelly has been the president elect of the Orthopedic Anesthesia Pain and Rehabilitation Society.

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Using NAROPIN® beyond recommended doses to increase motor block or duration of sensory block may negate its favorable cardiovascular advantages, in the event that an inadvertent intravascular injection occurs.

Like all amide-type local anesthetics, NAROPIN® may be associated with adverse reactions. In clinical trials, side effects were mild and transient and may reflect the procedures, patient health status, and/or other medications used. Adverse events reported at a rate of ≥5%: hypotension, nausea, vomiting, bradycardia, fever, pain, postoperative complications, anemia, paresthesia, headache, pruritus, and back pain.

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