
The Progression of Regional Anesthesia into Acute and Perioperative Pain Medicine

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Imagine a patient walking into a cardiologist's office who noticed some fluttering in his chest intermittently for the past week. The cardiologist runs a 12-lead electrocardiogram, tells him that he has atrial fibrillation with rapid ventricular response, zaps him with 50 J, and declares that all is fixed. His palpitations feel better for the moment, the cardiologist hands him a script for warfarin, and bids him a good day. On the way out the door, the clinic nurse gives him the phone number of his local cardiothoracic surgeon, and the patient wonders whether, or when, the fluttering will return.

Obviously, the above is a considerably illogical scenario. But change the cardiologist to anesthesiologist, fluttering to severe postoperative pain, the zap to a nerve block, warfarin to oxycodone, and cardiothoracic surgeon to an orthopedic surgeon. From the patient's point of view, this is shaping up into an all-too-familiar practice in modern anesthesiology. Patients in the modern surgical era expect more than just leaving the recovery room with a "regular pulse."

From the perspective of the patient suffering from severe acute perioperative pain, the anesthesiologist may unfortunately be nothing but a transient respite from a newly discovered agony. The large dose of opioids given in the postanesthesia care unit has worn off, and the local

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anesthetic given as part of an intraoperative nerve block, gone. The needle long-since removed from the skin, and no catheter left in its place. At no point was consideration given for initiating longer-acting pain relief. No attention paid to the recent diagnosis of cancer, with all of its emotional turmoil, making the established pain all the harder to cope with.

■ Have we Bred This Scenario?

Training programs offering regional anesthesia (RA) rotations for residents and fellowships today practice and teach RA as a part of the discipline of anesthesiology. According to this model, peripheral nerve blocks are placed immediately before, or even within, the operating room. These blocks are directed at managing intraoperative nociception and/or immediate postoperative pain. In some cases, they may even be used as a substitute for general anesthesia (GA). For such training programs, the designation of “RA” is correct, and is a perfectly appropriate title for practices focusing on nerve block needle placement.

The notion of perioperative pain medicine (PPM) or acute pain medicine encompasses not only the roots of its beginnings, in the placement of nerve blocks, but also the subsequent management of the patient who suffers from the acute pain crisis. In the past, it was critical for trainees to focus on RA training because of the relatively lower success rate of nerve blocks. The increased difficulty, and lower baseline success rate, demanded focused training in nerve block placement to make RA a reliable entity. With the advent of improved equipment and ultrasound-based techniques, even those interventions earlier deemed moderately difficult are suddenly well within the realm of standard resident training.

The antiquated argument of GA versus RA is no longer applicable, because both are now equally safe and equally user-friendly if properly applied. For example, in 1956, the death rate attributable to GA was 1:1500.¹ In 1960, it was 1:1000. This means that for every 1000 patients who receive GA—approximately 1 every 6 months in a very moderately busy anesthesia practice—1 patient would die and his/her death could be totally attributable to the GA.¹ In 1984, the number was 1:10,000, but now, in the early 21st century, the mortality of GA is 1:300,000.² General anesthesia, today, is safe and user-friendly, so why do we even need RA in modern anesthesiology practice? The answer is simple; it removes nociception (and therefore the reflexes evoked by it) from the surgical equation.

The role of RA within the practice of anesthesiology is, therefore, well and widely accepted to be extremely valuable. However, similar to other valuable anesthesiology procedures, RA is essentially nothing but a collection of techniques that is on a par with, for example, invasive monitor placement or total intravenous anesthesia. It is for this reason

that the authors question whether RA-only programs should exist uniquely and independently as opposed to functioning as a component of a thoroughly comprehensive anesthesiology residency program. Would not a division of any other anesthesiology-related procedure, such as central-line placement, for example, be considered preposterous? [Arguments for ultra-focused fellowships may be considered for those trainees interested in an academic practice, but our experience suggests such trainees are also inclined to include research or education methodology training into their personal program.]

■ Current Trends in Training and Practice of PPM

The distinction between RA and PPM is clear: the focus of RA is on anesthesia-related procedures, which are commonly performed by anybody providing anesthesia. The focus of “pain management” is the patient suffering from pain. Pain, like atrial fibrillation, can be easy to treat simply. Anybody with a license to prescribe potent opioids can treat pain, as can anyone able to push a button treat atrial fibrillation, but what about the timing of the zap? What about the decision to use pharmacologic modalities to convert atrial fibrillation? Why not discuss anticoagulation with the patient?

The focus of PPM is the patient rather than the procedure, therefore, PPM entails a much more complex practice of medicine—clearly the domain of a traditional medical team of physicians working side-by-side with and supported by a team of well-trained, specialized nurses. Trainees in PPM programs expand upon their anesthesiology training to gain experience in how to:

- Treat patients with acute pain from any cause (trauma, cancer, surgery, etc),
- Consider which modality to use in managing that pain—multimodal, conductive nerve blocks, *N*-methyl *D*-aspartate receptor blockade, opioid receptor blockade, combinations of the above, or whatever is appropriate for a specific patient,
- Use that information to develop a multidisciplinary strategy to suit the needs of individual patients,
- Take ownership of the strategy, procedure or approach, and adapt it daily to the clinical needs of the patient, and follow the patient either in the hospital or ambulatory setting,
- Supervise the PPM team and serve as the institution’s consultant in PPM.

Anesthesiologists are in the ideal position to host the emerging subspecialty of PPM. Divisions of PPM, with fully trained and experienced faculty members, can provide a consulting service to not only care for and treat patients with acute perioperative pain in the

intensive care units, wards, and beyond, but to also provide a full and comprehensive RA service to patients who undergo inpatient and ambulatory surgery. For example, in the daily practices at the Universities of Pittsburgh and Florida, and the Walter Reed Army Medical Center and its extensions into the war theaters, continuous or single-injection nerve blocks are typically placed when appropriate, and multimodal analgesia is initiated when appropriate preoperatively; the anesthesia is managed by another provider in the operating room; and the patient followed again in the recovery room, and treated and followed on the floor or at their homes through the acute pain phase on a daily or often twice daily basis—often long after the continuous nerve blocks have been discontinued or with extended use of continuous nerve blocks.³

Acute pain issues are referred directly to the team of dedicated specialists on call 24/7 from obvious sources such as anesthesiologists, orthopedic, and trauma surgeons, but also from the far afield palliative care physicians.¹ The team for an academic training center consists of dedicated anesthesiologists (attending, fellow, and resident physicians) and nurses working exclusively within the field of PPM. This team would obviously need streamlining in the case of private practice. The principle, however, remains that the PPM service must be a dedicated team or person free to commit most of their efforts outside of routine operating room duties. Most, if not all, of our anesthesiology colleagues—and certainly all of our surgery colleagues and patients—appreciate this service,⁴ and it makes perfect economic sense. Such a service is financially feasible and efficient if applied and administrated correctly.

The perioperative physician model offers some unique opportunities to improve both patient care and the local practice of anesthesiology:

- By necessity, this model requires feedback on preoperative and intraoperative management into postoperative functional performance;
- Promotes efficiency and continuity of intraoperative care for those patients making repeated short-term visits to the operation room (wound washout, wound vacuum change, tumor excision after biopsy, etc);
- Expedites quality improvement efforts by shortening time to feedback and adjustment of future therapies on both a systems-level and a patient-specific level;
- Although hinging upon pain issues, the increased preoperative and postoperative interactions between PPM anesthesiologists and other members of the healthcare team promote further collaborations into matters not strictly related to pain;
- Extends the reach of anesthesiology outside of the surgical environment, permitting improvement to care in the arch-disciplines of medicine and pediatrics.

■ **Limitations and Opportunities in the Current Practice of Perioperative Pain Medicine**

Although promoting advanced care of the patient suffering from pain, the current training of PPM fellows falls short in some areas. For instance, PPM fellows are not yet trained to optimally care for the patient suffering from pancreatic cancer, a patient population that might benefit from a celiac plexus block. The transition of patients from the acute pain setting to the chronic pain management environment represents yet another hurdle in identifying the optimal method for efficient transfer of care. Fluoroscopic procedures have traditionally been the domain of chronic pain medicine training programs, whereas those placing perioperative nerve blocks have eschewed fluoroscopy for nerve stimulation and ultrasound. Interestingly, ultrasound is increasingly being used for blocks placed in the chronic pain setting, although the introduction of fluoroscopy into PPM has lagged considerably.

The focus of regional anesthesiologists toward PPM conversely means less attention paid to the subspecialty of orthopedic anesthesia (OA). In many settings, those anesthesiologists with training in RA traditionally provided principal intraoperative care for those patients undergoing orthopedic surgery. With the expected increases in primary and revision total joint arthroplasty (TJA) surgeries in the coming years,⁵⁻⁷ efforts to further refine the perioperative care of the orthopedic surgical patient may yield drastic improvements when scaled to the national level. This topic becomes even more critical because of the fact that the complexity of TJA is expected to increase as the proportion of TJA revisions continues to increase.⁸

The development of separate training programs may remedy this gap. Pain medicine is expected to become a separate, multidisciplinary training program supported by the Accreditation Council for Graduate Medical Education beginning in 2014. In addition, several institutions have initiated dedicated fellowship programs focusing on OA. Continued advances in the overlapping yet distinct disciplines of PPM and OA will likely yield continuing opportunities for improvement in patient care throughout the perioperative period.

■ **Future Directions**

Remarkable progress in the performance of nerve blocks has ultimately offered perhaps more questions than answers. For instance, which patients will be optimally served by a preoperative nerve block? How long should a nerve block remain in place to permit a comfortable transition from an analgesic block to low-dose oral opioid therapy? For which surgical procedures should a perineural catheter be chosen over a single-injection nerve block? How does a nerve block alter the effect of various multimodal

and preemptive analgesics? Similar to PPM, such questions involve nerve blocks, but focus on the patient rather than details of the block's placement.

The critical reader may recognize that the answers to such questions can only be answered outside of the routine definition of the perioperative period. Such evaluations may occur well before surgery, in attempting to stratify patients based upon their risk of severe postoperative pain. The transition from RA to PPM forces the physician to consider the nociceptive load inherent to different surgical procedures as it will pertain to postoperative goals of rehabilitation and physical therapy. Perioperative pain medicine in this paradigm becomes an extension of perioperative medicine.

■ Conclusions

The basic tenets of PPM/acute pain medicine were first developed within the realm of RA. As the art and science of RA progressed, it has become a collection of techniques widely used throughout modern anesthesiology. Such success would not have been possible without the decades of research, innovation, and technique refinement upon which our modern methods were built. This paradigm shift permits the specialty to progress into PPM, a true practice of perioperative medicine. Future directions should focus on how nociceptive modulation and pain therapy can improve patient care on both the personal and system levels of modern medicine.

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