

1

The Importance of Studying Complications in Pain Medicine

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It is terrifying to have complications following procedures performed to help patients. A complication can be as minor as a local skin infection, or much more severe with hematomas, paralysis and even death following a neuraxial or visceral nerve block. No physician ever goes to work, thinking “Today, I am going to injure someone”. Rather, physicians may believe that a complication is simply an unfortunate event that was just unavoidable or unlucky. But luck favors the prepared. Even without mal-intent, the truth is, many complications are avoidable. With an appropriate understanding of indications contraindications, anatomy, physiology, and techniques, the risk of most complications can be mitigated.

Over the past several years, as the number of interventional procedures for pain management has increased, so has the number and types of complications that occur. When we entered the field of pain medicine, there were few therapeutic strategies available to the pain physician, and patients suffered in silence, or underwent much more invasive and far less effective strategies than we have to date. In fact, the field of pain medicine was at such a state of infancy that randomized controlled trials (RCTs), and long-term follow up was considered rare. As the field has expanded to the breadth of what pain physicians offer, the complexity of therapies and the frank number of procedures offered, so has the rate of complications. The length of training has not increased, making the rate of knowledge acquisition much quicker than was expected a mere 20 years ago.

While some complications are relatively minor, others can be severe and debilitating. Unfortunately, these complications are rarely reported. The medico-legal system discourages reporting of complications,

and physicians may be embarrassed or fearful of legal or disciplinary action. For this reason, many physicians under report the true complications. Thus, the true incidence and severity of complications is also likely to be under reported. In order to provide true informed consent and make the most appropriate recommendation to patients, it is important to understand the scope and severity of any problems. Moreover, if we understand the scope of the problem, we can proactively develop safer tools and approaches to avoid such complications.

Several textbooks cover the techniques, indications, contraindications, and mechanism of action of interventional pain management techniques, but only a few textbooks have focused on the complications, how to avoid them, their impact on patients, and the psychology of the treating team, as well as their medicolegal consequences. The combination of interventional pain physicians with quite diverse training backgrounds, as well as the recent significant increase in the use of interventional diagnostic and therapeutic techniques, raises the potential for increased complications. Unfortunately, there are major limitations in the analysis of complications. This text intends to provide pearls and strategies to avoid complications, as well as strategies to treat them and avoid long-term injury.

Historically, physicians have a tendency not to report poor outcomes; therefore, the true incidence of complications is not fully known. Only a fraction of the total number of complications that occur following procedures are reported. Health privacy issues and fear of litigation prevent some physicians from reporting the complications of interventional techniques. Further, any complications may be reported to

different databases, making a general analysis even more difficult. Although the overall incidence of significant complications in interventional pain medicine is low, some catastrophic complications do occur.

Interventional pain management physicians and staff must clearly explain these complications in layman's terms to the patient so as to reduce the occurrence of claims. Written preoperative instructions explaining the procedure and potential complications should be given and signed by the patient before the procedure, allowing time for review. The informed consent before all procedures should include a discussion about the indications, complications, risks, and available alternative therapies.

Most importantly, complications are inevitable and it is imperative to identify and treat these problems promptly to minimize their impact when they do occur and to communicate these issues with the patient.

Although pain medicine is now an established subspecialty in many countries, residency or fellowship training in the field of interventional pain medicine does not universally exist. Without a universally accepted curriculum necessary for establishing competency in the specialty, greater variability in indications, techniques, and outcomes will be noted. This of course will also translate into great variability in the occurrence of complications.

There are several ways for physicians entering the field of pain medicine to gain necessary experience. Of course a full fellowship curriculum is ideal, with hands-on training, slowly increasing responsibility and complexity of training over time. However, many physicians are learning a specific technique, which may involve simple observation of experienced physicians, taking a weekend cadaver course, or careful review of techniques written in interventional pain procedures techniques. Over several decades, we have seen a dramatic increase in the number of physicians performing interventional pain procedures, with a concomitant exponential increase in the performance of procedures to treat pain. This has, unfortunately, also led to a rise in the number of complications [1] and an increase in malpractice claims [2].

Interventional pain procedures may be minimally invasive but have the potential to be maximally dangerous. Serious complications are devastating for the patient, devastating and expensive for the physician and are often avoidable.

However, the incidence of complications from interventional pain procedures remains unknown. Interventional complications, by virtue of their nature, do not lend themselves well to prospective studies. As such, reported complication rates are extrapolated for the most part from observations in

prospective studies or anecdotally from case reports, retrospective reviews and closed claim studies [3]. Nevertheless, considerable and useful information on complications and potential approaches to their prevention can be gained from such reports [3].

Nonetheless, not all pain therapy complications are the result of preventable medical mistakes.

Whenever there is an adverse event or complication, it is important to protect the evidence, document the incident, report the incidence, and analyze it in order to prevent any recurrence of such an event [4].

Another important barrier to improvement of safety of patients and procedures is that adverse event protocols for interventional pain treatment are not widely promoted. Interventional pain practitioners need to be aware of the potential complications, know how to avoid and more importantly, how to treat them, should they occur. Adverse events can be as minor as tenderness in the puncture site or as catastrophic as an epidural hematoma causing severe neurologic disease or even respiratory and cardiac arrest leading to death [5].

For physicians who perform interventional pain therapies, the question is not if but when a complication will occur. Despite appropriate training, experience, patient selection, and safeguards, there will be times when a near miss (a complication without a negative outcome), an accidental injury or even a serious or life-threatening complication occurs.

Complications can be classified in several ways; 1) by their severity; 2) by their source (human error, equipment failure, drug- or treatment-related); or 3) by whether they are preventable or unpreventable.

Preventable complications result from either the failure of a system (equipment failure, notification error in reporting an abnormal test result) or human error. Patients and their family members usually perceive preventable complications. Unpreventable complications involving injury or medical complications are errors that, while they may or may not be expected, cannot be avoided.

Examples of unpreventable complications are drug reactions or the effects of certain procedures that are probable and even foreseeable in some cases. Nonetheless, they are unfortunate occurrences.

In order to prevent "preventable complications" physicians should be trained in a way that they have all precautions taken, all facilities including intensive care at their disposal, a team including an anesthesiologist, nurses, and other healthcare personnel are around helping and supporting in case of any complications.

The first step in preventing complications is the history taking. The history taking for a patient to be prepared for an interventional pain procedure differs

from a general history taking. The history should include factors related to age, bleeding disorders, cardiopulmonary status, medication allergies/anaphylaxis, neurologic and musculoskeletal status, and any history of difficult airway problems. Properly preparing the patient prior to the procedure will prevent most complications. There are special areas of concern such as the cranium, occipital region, neck, and thorax. For procedures on these areas, the technique to be performed should be carefully chosen. In particular, for sympathetic blocks in that region, the patient should be prepared for an iatrogenic hypotension prior to the procedure.

Past medical history is also important for discovering conditions that make the outcome of an interventional procedure hazardous. Any complications arising during previous operations or interventional procedures may prevent future complications. Allergic reactions which occurred any time in the history of the patient are red flags and the patient should be prepared accordingly.

Previous psychological or psychiatric problems the patient may have had are important for deciding any procedure in these patients as there may be secondary gain after performing any procedure.

Medication history is important as it impacts a patient's response to the procedure. Thus, all medications the patient uses, especially antiplatelet medications should be recorded and stopped prior to the procedure, according to the drug used.

The physical exam is important for placing the patient on the table for the procedure. Close attention should be paid to the airway if sedation is considered during the procedure. Morbidly obese patients require more attention than the others.

A careful preoperative screening is mandatory to discover and prevent complications before they occur. During this preoperative screening, any allergy to any drugs, bleeding disorder, replacements within the body, e.g. pacemaker, drugs such as antiinflammatories, antiplatelet medications, and recent local and systemic infections, should be recorded. If the patient answers affirmatively to any of the above questions, the injectionist must carefully consider options before proceeding.

Perioperative Prevention of Complications

One should bear in mind that interventional pain procedures should be recognized as minimally invasive surgery and all precautions should be taken prior to the procedure. All procedures should be performed in the operating room with all facilities for

emergency with the presence of an anesthesiologist or intensive care specialist. The patient should be monitored throughout the whole procedure. Even if the physician performing the procedure has a background in anesthesia, a second anesthesiologist should be present during the procedure for sedation, analgesia, monitoring, and emergency situations. This allows the surgeon to concentrate on the technique of the procedure to optimize the patient outcome.

As the first step, the patient's name, diagnosis, procedure to be performed, and the side or location of the body must be confirmed. Patient's positioning on the table is vital and a bolster should be placed under the patient allowing the belly to hang in a pendulous manner for spinal procedures.

One of the most common complications is infection. Important methods to decrease complications, or infections include appropriate sterile technique and use of antibiotics. This will include appropriate face coverings, handwashing, and patient preparation. The entrance area should be prepped with aseptic technique with povidone iodine or chlorhexidine. The scrub should last at least five minutes and should be allowed to dry.

The table on which all syringes with medications to be injected, needles, and electrodes should be ready prior to the procedure in a well-prepared fashion. All syringes should either be prepared by the physicians, or nurse and must be labeled. Failure to do so may result in a life-threatening event.

The physician who will perform the procedure should be prepared as a surgeon, with hood, face mask, surgical gown, and sterile gloves. In cases where fluoroscopy will be used, the physician should wear a radiation gown, under their surgical gown, a thyroid shield, radiation eyeglasses, and radiation gloves.

Fluoroscopy is an important tool for performing interventional procedures. The physician should be aware of all radiation safety rules. In order to decrease the amount of radiation received by the physician, they should use the fluoroscopy pedal for shooting the image themselves.

Correctly interpreting images by fluoroscopy during the procedure is one of the main rules to prevent complications. The first step, while using fluoroscopy, should be to identify the target in the best position with the optimal image. To see the image instantly may mislead and cause complications. Interpreting the spread of the dye is the second step. Any inadvertent arterial, venous injection, inadvertent puncture of the dura or spread of the dye to unexpected areas such as the lungs or esophagus, should be identified by the physician.

While introducing and advancing the needle, the physician should know where the tip of the needle is, either on the bone, ligament or a potential space. The previous image should be saved while advancing the needle. The patient should not be heavily sedated so that the response of the patient is available in case of inadvertent nerve or spinal cord injury. In critical procedures, aspiration of either blood or cerebrospinal fluid (CSF) is mandatory. In case of aspiration of blood, the tip of the needle may be replaced and, if bleeding continues, the procedure should be terminated. In case of CSF aspiration, if an epidural block is planned, the procedure is terminated. In case of any doubt, first stop, then inject contrast material again, check both in AP and lateral view, and if you still have doubt, cease the procedure. To explain why you stopped the procedure is far better than trying to explain a complication.

Vasovagal syncope at the beginning of the procedure is the most common risk. Signs and symptoms include sweating, cold or clammy skin, bradycardia, hypotension, nausea and vomiting, disorientation, pallor, and loss of consciousness. In such a case, the patient should immediately be turned supine, administer oxygen, IV bolus fluid and bear in mind other medication used during an emergency may be required. This is the reason for insisting on the presence of an anesthesiologist in the ward during the procedure.

Postoperative Management

Once the procedure is over, the patient should be taken by a gurney to the recovery unit. They should be observed for several hours until they are awake, have vital signs and can communicate. All motor functions should be tested and full recovery should be documented.

The patient should never be discharged alone; an accompanying person should be present, the patient must be told not to drive and to take bed rest depending on the type of the procedure. The patient should be instructed to notify the treating physician or go to the emergency room immediately if any of the following symptoms occur: fever, chills, a change in mental status, severe neck or back pain, difficulty breathing, a prolonged and severe headache, numbness and/or weakness in the arms or legs, loss of control of the bladder and/or bowel, excessive redness, swelling, or drainage from the area of the injection.

Conclusions

A serious complication is devastating for the patient, devastating for the physician and, in many cases, avoidable. The wise interventional pain physician should anticipate any problems, be prepared for them, react appropriately to an emergency and, with appropriate intervention, can avoid disaster.

In order to avoid complications; the physician should know the appropriate indications and contraindications of any proposed procedures, learn the relevant anatomy and perform the procedures in the safest manner possible. The physician should practice within their abilities and, if they are in doubt, they should not proceed with the planned procedure. The physician should obtain the best training possible. The physician should not try to fit a procedure to the patient, they should know which patient should not have a procedure. The physician must remember that each procedure may carry its own possible complications, so they should try to anticipate these and avoid any complications from happening. The physician should explain all possible complications to the patient and their companion in detail, from the simplest to the most severe, then the patient should make their own fully informed decision on whether to proceed, at which point, the physician must ensure they obtain signed, informed consent from the patient.

During the procedure, meticulous attention to the technique is necessary. In order to do this, the physician should verify all drugs and contrast agents. Appropriate monitoring of equipment, personnel, and resuscitation equipment is crucial for the success of the procedure. The physician should never be over-confident.

Do not forget that many serious complications are done by very experienced physicians. Thus, the physician should know when to stop. Lastly, the physician should not walk away from a complication, they must sort it out and resolve it.

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