HOW TO AVOID MISTAKES? - SAFETY ISSUES WITH EPIDURALS

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The operating and recovery rooms, by their very nature, are extremely stressful, uncertain, dynamic, and demanding environments where staff members need to manage multiple highly technical tasks, often simultaneously and often under time pressure. Time pressure is a contributing factor to inadvertent error, which can be catastrophic for the patient. The wrong solution injected as a wrong dose or content into the wrong site into the wrong patient is the culmination of errors which may occur. Inadvertent injections of medication in the epidural space is such an error that certainly is underreported, with potential devastating results for the patient. Why do inadvertent injections in the epidural space occur?

Technique Related and Procedural Problems

No dedicated epidural block corner; inadequate material; no uniform epidural kit; inadequate catheter connection to the epidural filter; no labeling of epidural filters and catheters; no uniform color coding of epidural catheters; ampoule error; absence of uniformity of or no drug labeling; syringe swap; no double-check of drugs; epidural/intravenous line confusion at the time of (re)connection; no adequate use of or no use at all of appropriate monitoring; wrong level of epidural catheter; lack of check of resulting block; lack of use of test dose; excessive bolus administration; excessive hourly overdose of local anesthetics too can result in blocks which extend too much, even to level which exceed the cervical region.

Personnel Related Problems

No dedicated personnel; personnel not skilled nor competent in administering epidural drugs; no help at all;

Anesthesiologist related problems

Time stress; not enough time dedicated to do the job properly; busy working environment; inadequate or no skills in managing regional anesthesia techniques.

What kind of non-epidural drugs are administered into the epidural space?

The epidural space can be considered as the human dustbin as virtually every drug or solution used in the hospital has been reported to be injected into the epidural catheter.
Drugs

i.v. anesthesia induction agents; benzodiazepines and opioids; muscle relaxants; antibiotics; sympathicomimetics; antiemetics; electrolytes (potassium, magnesium); pain killers (phenol); others (paraldehyde, ether, insulin); either as boluses or continuous infusions.

Solutions

Parenteral nutrition; intralipid; hypertonic saline; glucose solutions.

What is the result of inadvertent injections of wrong drugs in the epidural space?

Most injections do not result in sequelae other than pain during the injection. Very seldom the wrong injection leads to a permanent or even temporary neurologic deficit. An exception is potassium chloride, which may cause a range of serious problems when injected epidurally (from intense pain to permanent paraplegia and death). Epidural injected paraldehyde can result in immediate pain progressing to quadriplegia. The total dose administered and the time frame during which the drug is administered, certainly play an important role in the final outcome. The outcome of wrongly injected drugs into the epidural space can lead to sensory changes and bladder/bowel incontinence of varying duration and recovery cannot be guaranteed.

What to do when an inadvertent epidural injection occurs?

Immediate appropriate action is warranted. If toxicity occurs due to local anesthetics or other drugs, oxygen should be administered; any ongoing (continuous) solution administered via the epidural space should be stopped immediately; and if possible, an antidote should be given via an intravenous route, e.g. naloxone (opioids), intralipid (local anesthetic toxicity), neostigmine or sugammadex (muscle relaxants). However the solution administered inadvertently via the epidural catheter, should not be discarded but kept and the exact content determined. If pain is the result of the inadvertent wrong drug injection, a local anesthetic can be injected to relieve immediately the pain or physiologic saline (0.9% NaCl) can be administered to dilute the wrongly injected solution. However the latter may be at the cost of extending even further the wrongly injected drug.

How to avoid inadvertent injections into the epidural space?

Prevention is the mainstay to provide safe and effective epidural anesthesia and analgesia in patients. The use of an appropriate test dose (enough local anesthetic to show accidental subarachnoid position of epidural needles/catheters; sufficient epinephrine to rule out an accidental intravenous location of an epidural needle/catheter) and adequately checking the result of the resulting sensory and/or motor blockade, before the patient leaves the block corner where the epidural was instituted, may contribute in detecting wrongly injected drugs in the epidural space. The use of skillful personnel, adequate monitoring, one uniform epidural kit and a dedicated anesthesia block corner certainly creates a safer environment to avoid mistakes. Material and drugs should be adequately labeled (including the use of bar codes) and double checked (controlled by two people). The use of uniform color coding for local anesthetics (single bolus ampoules or
prefilled syringes by the hospital pharmacy) further contributes to the final safety of the procedure. Specifically designed non-Luer-lock syringes and similar connections (filters, epidural connectors) to be used solely for epidural drugs recently has been opted by some manufacturers of epidural catheters. Indeed indwelling epidural catheters may be accidently disconnected from the filter and it occurs often that the disconnected catheter is lying on the patient's skin, clothing or bedclothes. Better catheter securing devices (locking adapters) and adequately fixation devices on the patient's skin help to prevent detachments of epidural catheters from the epidural filter. Consequently nursing personnel in the ward do not need to reattach detached epidural catheters, and therefore errors of mismatching solutions (I.V. solutions attached to epidural catheter instead of local anesthetic solution) are avoided. A regular updated protocol of postoperative epidural pain relief (uniform local anesthetic solution) further helps in avoiding errors. Restricting handling epidurals to a dedicated pain team works better than having a large variety of personnel taking care of epidural catheters on the ward, including top-ups of local anesthetics, and refilling and reconnecting continuous infusions of local anesthetic solutions, although the latter can be questioned about its safety as far as sterility is concerned. The technique of epidural anesthesia has stood the test of time and has proven to result in satisfactory anesthesia and analgesia for patients undergoing surgery. However each technique has its price as complications and side-effects are still possible. Inadvertent injections of non-epidural drugs in the epidural space have the potential for serious morbidity and even mortality. Regular auditing of the epidural insertion technique, top-up technique or administration of continuous infusion of local anesthetics and all other aspects of handling epidural catheters, including written protocols readily available for all those involved with the procedure, will help in avoiding unwanted complications in epidural anesthesia and analgesia.