FAILED EPIDURAL AND SPINAL: WHY DO THEY AND WHAT TO DO?

Marcel Vercauteren

Neuraxial blocks may result in a failure for many reasons. These may be related to the practitioner, the patient or the equipment. It is unclear what should be considered as a failure: the persistence or reappearance (no catheter in place) of pain, the lack of motor block, the need for replacement of a catheter or repeat of the block, or only conversion to general anesthesia. In obstetrics the overall failure rate has been reported to be 6-13%. The lowest failure rate may be expected from a spinal as initial technique (<1%) while especially epidurals used for conversion of labor analgesia to cesarean section anesthesia may result in up to 20% failures (data to be published in 2006).

Rather than focusing too much on rescuing a failing block, it might be wiser to prevent a block to result in a failure or try to determine the risk factors by which the success of a block may be compromised.

HOW TO PREVENT A FAILURE?

Technical aspects

The technical experience of the anesthetist may be of crucial importance. With epidural anesthesia it has been shown that performing the loss of resistance technique to saline may result in less unblocked segments and less dural taps although the latter can not be regarded as a failure. Also the use of multi-orifice catheters seems to be more successful. Whether an epidural should be performed in the lateral or sitting position or whether a midline or paramedian approach results in differing success-rates is less clear. Leaving the catheter 2-4cm in the epidural space may be sufficient to prevent unilateral blocks.

With spinal anesthesia many believe that the success-rate may be higher because the endpoint (i.e. obtaining CSF) is more clear, while the risk of block asymmetry may be minimal. Nevertheless even a spinal block may fail despite the appearance of CSF and an immobile technique should prevent any further advancement or slipping out of the spinal needle. As the pencil-point designed needles have their orifices few millimeters more proximal of the tips, it has been believed that this design may explain failures. Especially the Sprotte design with larger orifices and being located more proximately was thought to cause a higher failure rate than the Whitacre design. Actually most needles look the same. Smaller needles than 27G should not be used because they may offer more failures while no further benefit in terms of post dural puncture headache (PDPH) should be expected.

Combined spinal-epidural anesthesia may combine the advantages of both previous techniques (i.e. the success-rate and block quality of the spinal with the flexibility of the epidural). Some authors have been able to demonstrate that CSE decreases the incidence of taps while others found that epidural catheters placed during a CSE technique were more likely to be in the midline

University Hospital Antwerp, Belgium

position preventing unilateral blocks. Nevertheless several investigators have tried to improve the design of this combined technique such as back holes, lockable needle design and double-lumen needles but it remains to be demonstrated whether these changes can be translated in a higher success-rate. Although most studies claim a lower failure incidence when performing this technique using two separate interspaces, the single-interspace technique may be less time-consuming and offer more comfort to the patient.

Finally, CSA (Continuous Spinal Anesthesia) may, due to its flexibility, remain the future dream of regional neuraxial blocks. Unfortunately the lack of optimal equipment (still too much headache), technical difficulty, the risk of TRI/TNS and cauda equina will limit the success of CSA. Articles on the use of CSA during recent years were mostly restricted to isolated case reports for which it was thought that CSA may offer the best way-out. When the anesthetist thinks that CSA is the really best technique in a high risk patient in whom general anesthesia should be avoided at all price, then the benefit of CSA outweighs the risk of PDPH.

Pharmacological aspects

Local anesthetics remain the cornerstone of drug choice. With single dose spinals a dose high enough should be selected to prevent that the block wears off before the end of surgery. Several adjuvant drugs have been used hoping that they would increase the success of the block. Most adjuvant drugs however will undoubtedly accelerate the onset of the block (opioids, bicarbonate), prolong its duration (opioids, epinephrine, clonidine) or accentuate the motor block (epinephrine), allow dose reductions of the local anesthetic, rather than really preventing a block failure. Of other substances it is even more unclear whether they affect the block quality (neostigmine, ketamine, midazolam etc.). To my knowledge no well designed study has been able to show that adjuvant substances improve the success-rate of a neuraxial block although it is my personal experience that since the use of opioids as adjuvant substance, less patients complain of unilateral blocks. On the other hand, an adjuvant is not beneficial in all cases surely not when the dose of the local anesthetic is lowered simultaneously.

Sufentanil and fentanyl are probably the most widely used adjuvant substances. The more potent sufentanil may offer faster onset, less accumulation, and longer duration of action when administered in equipotent doses as compared to fentanyl. Unfortunately opioids, epinephrine and clonidine may enhance some local anesthetic related side effects.

If pre-emptive administration of adjuvant substances may not be useful in terms of failure rate,(1) then it may be questioned even more whether they would be interesting to rescue a failing block.

The only major advantage of adjuvant substance may be that local anesthetic doses may be reduced significantly, which may leave some reserve to repeat an epidural block without exceeding toxic doses.

CAN WE PREDICT A BLOCK FAILURE?

Several studies have tried to predict the circumstances that may include more risk for a possible failure (2-4). Predicting a failure may be important because little can be done when the failure becomes apparent during surgery. It speaks for itself that the experience of the anesthetist is very important. Other factors are the body mass index and in connection to this the ability to determine the landmarks. Again much depends on the definition of a failure: is it the need for supplementation, the reappearance of pain, the need for catheter replacement or repeating the block, or only conversion to general anesthesia? Long duration of surgery may cause pain to reappear when single dose techniques are used. Others consider the need for a second attempt as a failure. However, most studies that have tried to determine factors at risk for a failure did not evidence that a second attempt would signify a higher failure rate. Most studies on failures have been performed in delivering women because there is more concern about 'success-rate' as general anesthesia should be

avoided at all price, rather than in a non-pregnant population. It is also of crucial importance that a failing block should be anticipated long enough before the moment of truth such as in case of conversion of a labor epidural to one for cesarean section. Although not all studies are in full agreement, the higher the parity, the longer the duration of gestation, the more top-ups required during labor, and the higher the pain score during the last hours, the more likely it is that the epidural catheter would fail to be used for cesarean section. The occurrence of paresthesias during catheter placement does not seem to be of any influence (3). There is no agreement either whether younger or older parturients are more at risk to have a failing epidural. A recent study in 100 patients requiring a C-section with an efficient labor epidural revealed that younger, obese patients, at higher gestational weeks, higher VAS scores and several top-ups during the 2 hours preceding surgery were at risk for catheter failure to achieve sufficient anesthesia depth and spread during their cesarean (4).

Previous back surgery does not seem to be a risk factor. However, a French group found a failure rate of 18% (9% technical and 9% analgesic failure) but concluded that epidural anesthesia is not contraindicated in patients with previous spine surgery.(5) Personally, I would select a spinal or spinal-related technique.

Even perfectly functioning catheters during labor may afterwards fail (6-16%) to be used for the later stages of labor or cesarean section (1,5). This may be explained by the fact that low dose combinations with a large proportional contribution of opioids may be sufficient to treat labor pain, especially during early labor, but may become apparently problematic when potent doses of local anesthetics are used to perform a surgical delivery. Depending on the definition of failure, the incidences vary between 6 and 13% (1,3,6).

It remains to be answered if, when certain conditions are present at risk for a failure, another technique should be selected in advance, general anesthesia should be considered, or systematical conversion into another block should be initiated without waiting for the effect of primary block (such as in cases of conversion from labor into surgical anesthesia).

WHAT TO DO THEN WHEN A BLOCK FAILS?

Intra-operative block

As mentioned before little can be done when surgery has been initiated. When the surgeon can interrupt surgery, and doses are not close to maximal levels, additional drug substance can be given possibly following positional adjustment (lateral tilt, head down or head up etc.). Local anesthesia may be helpful in some cases but it may be difficult to do when touching the peritoneum is still painful. Intravenous supplementation with opioids, sedative drugs, ketamine, nitrous oxide or propofol may be of partial help although it should never mask a failing block. Nevertheless in Cesarean section patients it may be better than general anesthesia even when it may affect consciousness of the mother during the crucial moment of birth. Neuraxial administration of adjuvant substances may be occasionally helpful but most of the time the dose of opioids already administered during labor is large enough that further improvement by a supplemental dose should not be expected.

Sometimes it is not necessary to intervene. When a parturient starts to feel pain during the last sutures of closing the peritoneum, she may be reassured that in spite of this she may not feel the remaining of the fascia, muscle, subcutaneous and skin suturing.

When installing a block it may become obvious soon that the block is not optimal. The anesthetist should remain calm and reassure the patient. Patience is a better solution than testing hypoesthesia too frequently. Very simple physical interventions or adjustments may be sufficient to save a failing block. The catheter may be withdrawn until it is left for maximally 2cm in the epidural although this should have been done in the first place. Withdrawal of the catheter may solve the problem in >46% of the cases especially with inadvertant intravenous placement (6,7). A positional change (unilateral, head-up, head-down, sitting-up etc.) following a supplemental dose may also be extremely helpful to solve a unilateral block.

A spinal block may, though hypoesthesia is experienced, tend to fail when the upper level does not reach the desired dermatome. This level may be extended more cephalad by positional change or, as not all believe, by a Valsalva manoeuvre or cough. When as in CSE an epidural catheter is present the upper sensory level may be increased by the injection of air, saline (and of course a small dose of local anesthetics). This is called EVE (i.e. epidural volume extension). It should be emphasized that when injecting local anesthetics in the epidural space after CSE, the upper sensory level tends to be several dermatomes higher than in plain epidural top-ups even when injected significant time after the spinal when the effect of the latter is wearing off.

When all of these adaptations are not helpful, repeating/reinstalling the block may remain the only option. Especially when no measurable sensory block is present or when the block is strictly unilateral, there is little chance that the block can be saved without a major intervention.

A spinal block can be repeated very easily as no large doses have been used. However, the anesthetist should wait long enough to be sure that no effect is observed. This interval should be at least 20 minutes. The same may account for CSE anesthesia. Most anesthetists however will not wait that long when it appears that the spinal part does not offer sufficient analgesia/ anesthesia. Most of them will rather prefer a small local anesthetic dose instead of speculating on the EVE-effect of saline alone.

Of more concern is the failing epidural block. When repeating the block or replacement of the catheter becomes mandatory, much depends on the dose already administered and the time allowed to initiate surgery such as in cesarean section. Especially following labor analgesia and subsequent administration of a surgical dose, near toxic doses may have been given forcing the anesthetist to perform another type of block. I had several successes with the injection (through the Tuohy needle before catheter placement) of a small dose of lidocaine 2% (5-8mL) in cesarean section patients, lying on the unanesthetised side while either removing or leaving the first catheter.

Spinal anesthesia may be an excellent option to save a failing epidural. This has been used as an attractive alternative in obstetric practice. However, up to date at least 12 cases have been reported of a high and even total spinal block after the performance of a spinal block following a failing epidural. Pregnant women require significantly lower doses than their non-pregnant counterparts. Due to this it is even more challenging to predict the spinal dose required to save a partially functioning epidural. Compression of the subarachnoid space by previous epidural injections or infusion may also partly explain the occurrence of total spinals with obviously 'normal' doses.

The experience with a spinal after a failing epidural is actually very controversial with some authors observing no single problem even in series of patients while others strongly rejected this practice based upon few cases observed in their practice (8,9). Few authors leave their pre-existing catheter although this may compromise the aseptical conditions while these failing catheters are most probably of no use.

To avoid the risk of a high or total spinal it is recommended that no epidural top-ups should have been administered during the last 30 minutes, to let the block recede to the lumbar dermatomes (if time allows) and to administer a 20-30% lower spinal dose than when it would have been used as the initial technique (9). As a consequence bupivacaine doses of 9-11mg are recommended which in my opinion still seem extremely large as in our hospital we use less than 7mg with sufentanil as our primary technique for elective cesarean section. In addition, keeping the parturient in the sitting position for several minutes may also prevent an inadvertant cephalad spread of the block.

A CSE or even CSA technique may allow the use of very small doses that may be adjusted by the freshly placed new catheter (7). Leaving the spinal catheter for at least 24 hours may significantly reduce the incidence of headache, and at least of the need for an epidural blood patch.

Postoperative analgesia

Although the correct placement of the epidural catheter during CSE anesthesia may not always be obvious, or even after correct initial

placement analgesia may fail afterwards, no algorithms exist to manage failing postoperative epidural analgesia. Actually the majority of epidural catheters used for postoperative analgesia will be connected to bags containing a combination of local anesthetics with either an opioid and/or clonidine and/or epinephrine.

When patients feel discomfort, the first question to be answered is whether there is any measurable hypoesthesia. This may be absent because weak concentrations are used very commonly in postoperative pain relief. The next step in this case will be the injection of a small dose of lidocaine 2% (5mL) with epinephrine (because the catheter might have migrated into the intravascular space). When still no hypoesthesia can be detected, it may be wise to remove the catheter, repeat the epidural or convert the regimen into conventional pain therapy.

When there is measurable hypoesthesia with the analgesic mixture or following the lidocaine dose several possibilities exist. The extent of hypoesthesia may be appropriate and it may be recommended to increase the potency of the mixture. Otherwise it is possible that the spread is not in accordance with the required dermatomes, that the block is unilateral (while it should be bilateral), or located at the wrong side when it should be unilateral. In all these cases, either catheter withdrawal, positional changes, increasing the dilution/volume of the mixture or deleting the local anesthetic may be possible options. When this does not help the only remaining options are replacement of the catheter or conventional pain therapy.

CONCLUSIONS

Failing neuraxial blocks may be a challenge for every anesthetist. A good choice of equipment, technique and drugs may prevent to a large extent that blocks may fail. When they fail there should be no reason for panic. Simple physical interventions may be sufficient while repeating the block (the same or other) may be the best alternative before general anesthesia is considered as the ultimate option. CSE and CSA as the technique for rescuing the block (or even better to prevent a failure) deserve some preference as they allow to use low doses to titrate the block and avoid surprises.

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