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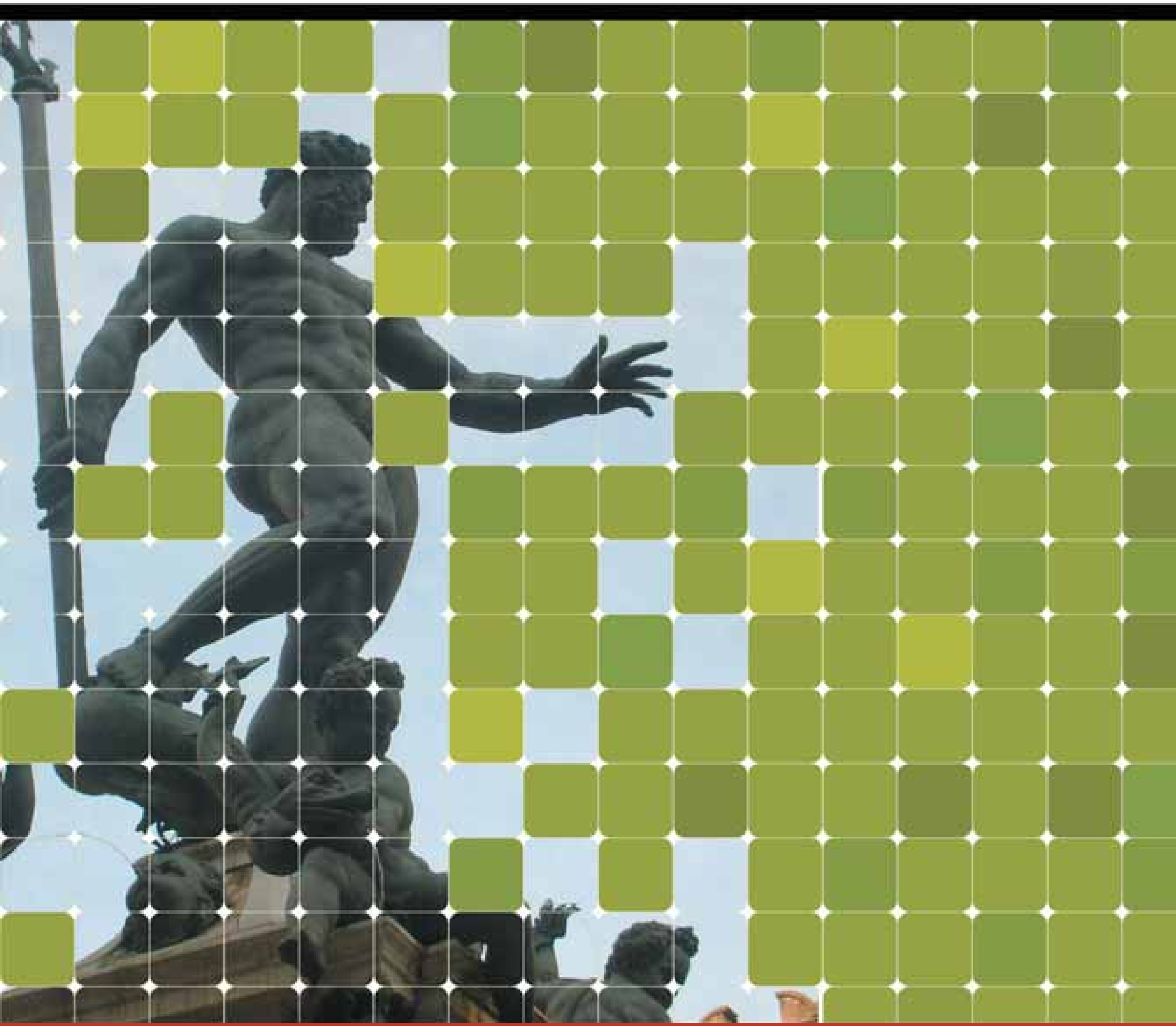

PROCEEDINGS

WVOC

3rd World Veterinary Orthopaedic Congress, ESVOT-VOS
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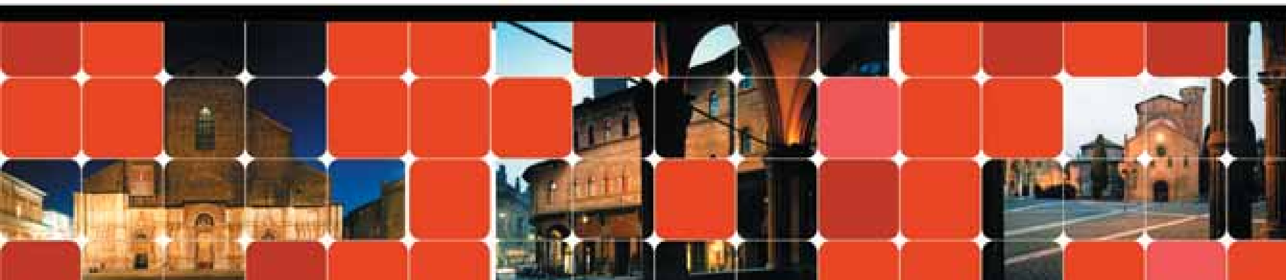

Pros and cons of epidurals with local for orthopaedic surgery

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Epidural administration of analgesics has proven to be effective in relieving pain confined to the inferior/caudal part of the body in both humans and small animals. In addition, many studies have pointed out benefits of using the epidural route to provide analgesia in surgical and trauma patients. Epidurally administered analgesics provide longer and more effective analgesia with less side effects compared to systemic administration. The somatic and autonomic blockade provided by high doses of local anaesthetics blunts the catabolic response to surgery, preventing stimulation of the hypothalamic-pituitary-adrenal axis and attenuating the cortisol and catecholamine response. However, this depends upon the concentration of local anesthetic and the extent of the block. Despite providing complete analgesia, epidural opioids are less effective than local anaesthetics in blunting the stress response to surgery. Although a significant reduction in cortisol occurs, circulating concentrations of catecholamine and metabolites are not modified. In the postoperative period combinations of local anaesthetics and opioids are more effective than opioids alone.

Epidural anaesthesia is a common technique in veterinary patients undergoing surgery of the pelvis, pelvic limb, perineum and caudal abdomen. Local anaesthetics (e.g. lidocaine, bupivacaine and ropivacaine), opioids (i.e. morphine, fentanyl, butorphanol and buprenorphine-) and alpha-2 agonists (i.e. medetomidine, xylazine, romifidine and clonidine) have been shown to provide effective antinociception/analgesia when administered epidurally to dogs and cats.

Although epidural anaesthesia has been reported in awake or sedated animals, it is usually associated with general anaesthesia. This association allows the surgical procedure to be carried out without causing stress to the patient, and offers the advantage of a rapid and less painful recovery compared to general anaesthesia alone. However, it may result in a greater degree and incidence of hypotension compared to the epidural block alone. Such hypotension is mainly due to a decrease in venous return, and to attenuation of the compensatory vasoconstriction of nonanaesthetized sympathetic tone via central depressant effects of general anaesthetics on the vasomotor center.

Reported side effects and complications of epidural anaesthesia in small animals include urinary retention, delayed recovery of motor function and/or proprioception, hypotension, hypothermia, local anaesthetic toxicity and inadvertent dural (subarachnoid) puncture.

Opioids are often used in preference to local anesthetic agents because side effects possibly are less severe, duration of analgesia is longer, motor function is preserved, and sympathetic blockade does not occur. However, current evidence in dogs suggests that local anaesthetics exert beneficial effects on stress response to surgery, postoperative analgesia, splanchnic circulation, gastrointestinal motility, early oral intake and functional recovery.

Strategies to decrease the incidence of side effects and complications related to epidural administration of local anaesthetics and opioids include the following:

PROPER NEEDLE AND TECHNIQUE

An epidural needle (e.g. Thuohy) and a loss-of-resistance (LOR) syringe should be used. The 'standard' Tuohy needle has a long, curved tip, but with a rather sharp point at the end, and a close-fitting removable stylet. The curved needle end permits easier identification of the ligamentum flavum, and is less likely to puncture the dura compared to spinal needles. A close-fitting stylet is essential to prevent plugging of the needle tip with skin and failure to recognize loss of resistance. It also decreases the risk of depositing plugs of skin into the epidural space. Specific LOR syringe, filled with either air or saline, allows reliable recognition of the epidural space. Although very popular in veterinary anaesthesia, spinal needles (e.g. Quincke, Yale) and 'standard' syringes should be avoided.

In small animals a paramedian, 'paraspinous' (lateral) approach to lumbar epidural space and the loss of resistance technique should be used. The Tuohy needle is inserted lateral to the midline at the level of the caudal edge of the spinous process of the vertebra (e.g. L6) next to the interspace of intended level of entry through ligamentum flavum (e.g. L5-6). Depending on patient characteristics, cranial angulation is 45 to 55 degrees to long axis of the spine below. The needle is walked until the tip hits the ligamentum flavum. Then the epidural space is identified using the Bromage grip and the loss-of-resistance technique with an air-filled

LOR syringe. The Bromage grip is a vice-like grip of the needle between the thumb and fist. Metacarpal heads are braced against the back of the patient, and the needle is advanced by gentle, but firm rotation of the entire hand around the metacarpal heads. As a result, only small, highly controlled movement is possible without repositioning the hand on the needle. Whilst advancing the needle, a continual compression of the syringe plunger with a 'bouncing' movement is exerted. As soon as the ligamentum flavum is pierced, resistance to syringe plunger is lost and the needle is halted.

SEGMENTAL EPIDURAL ANAESTHESIA

Segmental epidural anaesthesia was first described by Dogliotti in 1933.[1] '*The space between the vertebrae into which injection is to be made will be chosen approximately according to the level at which anesthesia is desired. A difference of two or three spaces up or down will not matter. We know that the injected fluid spreads up and down for a considerable distance so that it is unnecessary in a given operation to adhere rigidly to one fixed point of injection.*' He also stated that '*according to the height* [i.e. level] *at which the injection is made and the amount of solution used, so will the extent of the anesthetised area vary*'. Using a Tuohy needle and the technique described above epidural puncture has been performed safely and effectively at different lumbar interspaces in small animals as well.[2-6] In the dog and the cat segmental epidural anaesthesia allows the administration of smaller doses of local anaesthetic, so that only the nerve roots supplying a specific area are affected.

DOSE, VOLUME, CONCENTRATION

According to studies with contrast media or dye, epidural solutions tend to spread more in a cranial than caudal direction.[7] However, these studies have limited value because access to the CSF is important in determining the clinical effect of local anaesthetics. Clinically, the blockade tends to be more intense and more rapid in onset close to the site of injection. In humans, time-segment diagrams reveal that L2 injection results in a somewhat greater cranial than caudal spread. A delay in L5 and S1 segments is also possible, and it is likely to be due to large size of these nerve roots. Very little data are available in dogs and cats.

The dose of the local anaesthetic (concentration x volume) determines the spread of the sensory block, as shown by Bromage. However, providing that the same total dose (mg) of local anaesthetic is administered, a greater volume of a less concentrated solution produces a more cranial sensory block than a smaller volume of a more concentrated solution. With regard to motor blockade, dose becomes less important when diluted solutions are used (e.g. bupivacaine 0.125% or 0.065%), although the intensity of sensory and motor block will increase with each additional injection. Conversely, increasing concentration will result in reduction in onset time and intense motor blockade.

WHICH LOCAL ANAESTHETIC?

In dogs administered 0.5 ml kg^{-1} of local anaesthetic with adrenaline at L6, duration of action of 0.5% bupivacaine is about double that of 2% lidocaine, although onset of block is similar.[8] In addition, lidocaine has a greater spreading propensity and central effect as reflected by higher incidence of front limb paresis and sedation.[8]

In dogs administered 0.3 ml kg^{-1} of bupivacaine (0.5% and 0.75%) or ropivacaine (0.5% and 0.75%) at lumbar level (L3-L7), the motor and sensory block are dose-dependent, with 0.5% ropivacaine producing the shortest lasting and 0.75% bupivacaine the longest.[2] Ropivacaine is slightly less potent, according to lower incidence of motor block with the 0.5% solution. In addition, 0.5% ropivacaine provides a sensory block that persists significantly longer than motor block, as reported in humans.[2]

FLUID RESTRICTION

Fluid administration should be restricted to maintenance rate (2-4 ml kg^{-1} h^{-1}). In humans, prophylactic treatment with intravenous fluids do not prevent the decrease in arterial pressure after combined lumbar epidural and isoflurane general anaesthesia. Large amounts of intravenous fluids can cause urinary retention by producing overdistension of the wall of the bladder.

VASOACTIVE DRUGS TO TREAT HYPOTENSION

Hypotension results from a decrease in venous return. In humans, prophylactic administration of ephedrine may decrease its incidence by maintaining systemic vascular resistance. In addition, atropine has been suggested to maintain heart rate, and phenylephrine has been shown to restore mean arterial pressure during combined epidural and general anaesthesia. Careful titration of general anaesthetics to maintain a light plane of anaesthesia is likely to be most effective in preventing hypotension during segmental epidural anaesthesia in dogs and cats. Correction of preoperative hypovolaemia, limiting the extent of sensory block and promoting venous return by patient positioning (e.g. Trendelenburg) are most significant preventing measures.

MONITORING OF NEURAL BLOCKADE

Careful monitoring of onset time, duration and characteristics of each block will help with the definition of the dose providing the best perioperative conditions with minimal incidence of side effects for any given surgery.

BLADDER EXPRESSION OR TEMPORARY URETHRAL CATHETERIZATION

Urinary retention is the inability to void with a distended bladder. Epidural local anaesthetics cause temporary atonia of the bladder and loss of bladder sensation, which are usually short-lived. Spinal opioids decrease detrusor muscle tone by decreasing sacral parasympathetic outflow, and this results in an increased bladder capacity. Urinary disturbances are frequently reported after intrathecal or epidural morphine, and reversed by intravenous naloxone.

Because overfilling affects detrusor contractility, postoperative distension of the urinary bladder should be avoided to prevent urinary retention. At end of surgery the bladder should be checked, and emptied by manual expression or urethral catheterization if necessary.

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