Unilateral retrobulbar hemATOMA following maxillary nerve block in a dog.

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OBJECTIVE: To describe the clinical findings and management of a case of retrobulbar hematoma formation secondary to performance of a maxillary nerve block in a dog.

CASE SUMMARY: An 11-year-old dog was presented for a routine dental procedure including dental extraction to be performed under general anesthesia. After premedication with intramuscular methadone, anesthesia was induced with intravenous alfaxalone until depth of anesthesia was sufficient to allow orotracheal intubation. Anesthesia was maintained with isoflurane delivered in 100% oxygen. A bilateral maxillary nerve block was performed. During administration of the left nerve block, blood was aspirated. Twenty minutes after placement of the left maxillary nerve block, exophthalmos, periorbital swelling, extensive scleral hemorrhage, and ecchymosis with a 2 × 2 cm region of moderate swelling on the palatal mucosa around the injection site were noted. These lesions were the result of retrobulbar hematoma formation following vessel puncture. Treatment included immediate creation of a drainage tract and administration of anti-inflammatories (carprofen 2 mg/kg PO q 12 h for 7 days), broad spectrum antimicrobial therapy (cefovicin 8 mg/kg SC once), and eye drops (viscotears, 2 drops OS q 12 h for 7 days). The periorbital swelling was significantly reduced within 1 hour of drainage and had almost completely resolved 1 week later.

NEW OR UNIQUE INFORMATION PROVIDED: This clinical report details the development and successful management of a unilateral retrobulbar hemorrhage following maxillary nerve block. Management of this condition requires prompt recognition and treatment to prevent permanent damage to the eye. The cornerstone of treatment is drainage, which rapidly decreases the increased intraorbital and intraocular pressure. To our knowledge, this is the first documentation of this complication in the English language literature.

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DOI: 10.1111/vec.12486
PMID: 27155297 [PubMed - in process]

The effects of lidocaine or a lidocaine-bupivacaine mixture administered into the infraorbital canal in dogs.

Pascoe PJ.

OBJECTIVE To determine the onset, duration, and extent of regional nerve blocks performed by administration of lidocaine or lidocaine-bupivacaine into the infraorbital canal in dogs. ANIMALS 6 healthy hound-type dogs. PROCEDURES Under general anesthesia, stimulating needles were inserted into the gingiva dorsolateral to both maxillary canine (MC) teeth and the maxillary fourth premolar (MPM4) and second molar (MM2) teeth on the treatment side. A reflex-evoked muscle potential (REMP) was recorded from the digastricus muscle after noxious electrical stimulation at each site. After baseline measurements, 1 mL of 2% lidocaine solution or a 2% lidocaine-0.5% bupivacaine mixture (0.5 mL each) was injected into the infraorbital canal (at approx two-thirds of the canal length measured rostrocaudally). The REMPs were recorded for up to 7 hours. The REMP data for the contralateral (untreated control) canine tooth were used to normalize results for all stimulation sites. RESULTS With both treatments, nerve block for MC teeth on the treated side was achieved by 5 (n = 5 dogs) or 10 (1) minutes after injection, but nerve block for ipsilateral MPM4 and MM2 teeth was successful for only 3 dogs and 1 dog, respectively. Mean duration of nerve blocks for MC teeth was 120 and 277 minutes following injection of lidocaine and lidocaine-bupivacaine, respectively. CONCLUSIONS AND CLINICAL RELEVANCE Local anesthesia, as performed in this study, successfully blocked innervation of MC teeth, but results for MPM4 and MM2 teeth were inconsistent. This specific technique should not be used during tooth extractions caudal to the MC teeth.

DOI: 10.2460/ajvr.77.7.682
PMID: 27347819  [PubMed - indexed for MEDLINE]


Use of a perfusion index to confirm the presence of sciatic nerve blockade in dogs.

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OBJECTIVES: To evaluate perfusion index (PI) as a determinant of regional nerve
block success following sciatic nerve blockade with bupivacaine in dogs undergoing stifle surgery.

STUDY DESIGN: Prospective clinical trial.

ANIMALS: Ten adult dogs, aged 5.6 ± 2.6 years and weighing 36.9 ± 16.8 kg, undergoing a tibial plateau leveling osteotomy.

METHODS: Dogs were premedicated with acepromazine (0.03 mg kg(-1)) and hydromorphone (0.1 mg kg(-1)) intramuscularly, and anesthetized with propofol (up to 4 mg kg(-1)) intravenously and isoflurane in oxygen. An ultrasound-guided femoral and sciatic (F+S) nerve block was performed on the surgical limb with bupivacaine (0.75%), 0.2 mL kg(-1) at the femoral site and 0.3 mL kg(-1) at the sciatic site, with a maximum volume of 10 mL per site. Physiological variables were recorded every 5 minutes throughout anesthesia. A pulse co-oximeter probe was placed between the third and fourth digits of both pelvic limbs, and the PI was recorded 5 minutes before infiltration with bupivacaine, immediately afterwards, and every 5 minutes for 30 minutes. Motor nerve conduction velocity (MNCV) of the sciatic nerve was performed on the surgical limb 5 minutes before and 20 minutes after bupivacaine administration to confirm nerve block.

RESULTS: The PI of the surgical limb was significantly greater than the contralateral pelvic limb at 10 minutes (p = 0.03) and 15 minutes (p < 0.01) after F+S nerve blockade. The MNCV performed after sciatic nerve blockade revealed a functional motor blockade for all dogs. There were no significant changes in physiological variables.

CONCLUSIONS AND CLINICAL RELEVANCE: The PI provided a reliable indication of successful sciatic nerve blockade in the clinical patients in this study. No increase in the PI by 15 minutes after bupivacaine administration around the sciatic nerve could indicate partial or total failure of anesthetic blockade.

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DOI: 10.1111/vaa.12378
PMID: 27109568 [PubMed - in process]


The effect of loco-regional anaesthesia on motor activity induced by direct stimulation of the sciatic nerve in dogs.

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A prospective, randomised, blinded, case-controlled clinical study was designed using client-owned dogs undergoing unilateral pelvic limb orthopaedic surgery, to determine the effect on induced motor activity by electrical stimulation of the sciatic nerve distal to the site of local anaesthetic administration. Dogs were
administered 0.5% bupivacaine either extradurally or via a femoral and transgluteal sciatic electrolocation-guided nerve block prior to pelvic limb surgery. Motor response to electrical stimulation of branches of the sciatic nerve was tested and the minimum current required to induce muscle twitch was recorded prior to bupivacaine administration. Provided sensory blockade had been deemed successful intraoperatively, testing was repeated postoperatively, with each dog acting as its own control. Paired t-tests were performed to compare pre- and postoperative minimum currents. Eleven dogs administered extradural and 11 dogs administered femoral and sciatic perineural bupivacaine were eligible for post-operative testing. All dogs displayed normal motor response to electrical stimulation of the sciatic nerve at both sites tested before and after bupivacaine administration. There was no significant difference in the minimum current required to induce muscle twitch between pre- and post-operative testing (P = 0.31 sciatic site, P = 0.36 peroneal site), nor between the two groups using different loco-regional anaesthetic techniques (minimum P = 0.13). This study shows that stimulation of the sciatic nerve distal to the site of bupivacaine administration induces motor activity, despite adequate sensory blockade. This is relevant in surgical cases where mechanical stimulation of the sciatic nerve might be expected and needs to be recognised to avoid postoperative neurapraxia.

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DOI: 10.1016/j.tvjl.2015.12.002
PMID: 26831173 [PubMed - indexed for MEDLINE]


Evaluating Femoral-Sciatic Nerve Blocks, Epidural Analgesia, and No Use of Regional Analgesia in Dogs Undergoing Tibia-Plateau-Leveling-Osteotomy.

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This is a retrospective study evaluating femoral-sciatic nerve blocks (FSBs), epidural analgesia, and non-regional analgesia (NRA) in dogs undergoing tibia-plateau-leveling-osteotomy surgery. Thirty-five records met the criteria for each of the FSB and epidural analgesia groups. Seventeen anesthesia records met the criteria for the NRA or control group. The parameters reported were: isoflurane vaporizer setting, rescue analgesia/anesthesia drugs received, heart rate, systolic blood pressure, and recovery quality (0-4, with 0 being poor and 4 being good). Rescue analgesia-anesthesia during surgery was performed with either fentanyl, ketamine, or propofol. A larger percentage of dogs in the NRA group required rescue analgesia during surgery. The FSB group had a higher recovery quality with median (95% confidence interval of four (±0.3) when compared to two (±0.8) in NRA (p < 0.01). No difference between groups was observed on any other
As part of a multimodal analgesia approach for tibia-plateau-leveling-osteotomy surgery, the use of femoral and sciatic nerves blocks with bupivacaine appears to be an alternative technique to help with analgesia and anesthesia during surgery.

DOI: 10.5326/JAAHA-MS-6278
PMID: 26808436 [PubMed - indexed for MEDLINE]


Comparison of Short-Term Postoperative Analgesia by Epidural, Femoral Nerve Block, or Combination Femoral and Sciatic Nerve Block in Dogs Undergoing Tibial Plateau Leveling Osteotomy.

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OBJECTIVE: To compare early postoperative analgesia in dogs undergoing unilateral tibial plateau leveling osteotomy (TPLO) that received bupivacaine via preoperative femoral nerve block (FNB), combination femoral-sciatic nerve block (F+SNB), or lumbosacral epidural (EPI).

STUDY DESIGN: Randomized, blinded, prospective clinical trial.

ANIMALS: Forty-five client-owned dogs undergoing unilateral TPLO.

METHODS: Dogs undergoing unilateral TPLO were enrolled and randomly allocated to 1 of 3 treatments: FNB, F+SNB, or EPI. Assessments were completed by an observer blinded to treatment at 0, 1, 2, 4, 6, and 8 hours after extubation using the Glasgow Composite Pain Score-Short Form (GCPS-SF). Dogs with a total score ≥ 6 or ≥ 3 in any category were given a rescue analgesic. Outcome measures analyzed for differences across treatments were the GCPS-SF at each time point, time to first rescue analgesic, and total number of rescue analgesic doses per dog.

RESULTS: The GCPS-SF score at extubation was significantly higher for FNB (median 3) compared to F+SNB (median 2). A significantly higher proportion of dogs receiving FNB (4/14) than F+SNB (0/17) required rescue analgesic at extubation. There was no significant difference in the proportion of dogs requiring rescue at extubation between FNB and EPI (2/14) or between F+SNB and EPI. There was no significant difference in the median time to first rescue between FNB (0 hours) and F+SNB (2 hours) or between F+SNB and EPI (1.5 hours).

CONCLUSION: In dogs undergoing unilateral TPLO, bupivacaine administered via FNB, alone or in combination with sciatic nerve block, can provide short-term postoperative analgesia not different to that with administration via lumbosacral epidural.

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DOI: 10.1111/vsu.12406

A modified approach for performing ultrasound-guided radial, ulnar, median and musculocutaneous nerve block in a dog.

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DOI: 10.1111/vaa.12292
PMID: 26270601 [PubMed - indexed for MEDLINE]


Pneumothorax following nerve stimulator-guided axillary brachial plexus block in a dog.

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DOI: 10.1111/vaa.12288
PMID: 26133051 [PubMed - indexed for MEDLINE]


Anatomical and ultrasonographic study of the femoral nerve within the iliopsoas muscle in beagle dogs and cats.


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OBJECTIVES: An ultrasound (US)-guided ventral suprainguinal approach to block the femoral nerve (FN) within the iliopsoas muscle (IPM) has recently been described in dogs. The goal of the present study was to provide the operator with additional information to locate the FN within the IPM in dogs and cats using US.

STUDY DESIGN: The study was carried out in three phases: a dissection of the FN (phase 1); an in vivo US-assisted nerve study (phase 2), and an anatomical cross-sectional study (phase 3).

ANIMALS: Nine healthy adult beagle dogs and nine healthy adult cats.

METHODS: Dissections were performed to investigate the anatomical characteristics of the FN and its related structures in one dog and one cat. Ultrasound scans of the left and right FN were performed in eight dogs and eight cats. The FN diameter and the distance between the FN and the external iliac artery (EIA) in US images and in anatomical cryosections were measured.

RESULTS: The median FN diameter did not differ significantly between cats and dogs (1.1 mm versus 1.0 mm) or between the two techniques (US versus anatomical cross-sectional study) (1.1 mm versus 1.1 mm in dogs; 1.0 mm versus 1.1 mm in cats). The US and anatomical measurements of the median distances between the FN and EIA differed significantly between dogs and cats (8.2 mm versus 5.8 mm by US; 5.7 mm versus 4.8 mm in the anatomical study).

CONCLUSIONS AND CLINICAL RELEVANCE: The distance between the EIA and FN is reproducible in beagle dogs and cats and can be used in locating the FN within the IPM.

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DOI: 10.1111/vaa.12240
PMID: 25614950 [PubMed - indexed for MEDLINE]


Comparison of epidural versus intrathecal anaesthesia in dogs undergoing pelvic limb orthopaedic surgery.

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OBJECTIVE: To compare the procedural failure rate (PFR), intraoperative rescue analgesia (IRA) probability and postoperative duration of motor block after epidural and intrathecal anaesthesia in dogs undergoing pelvic limb orthopaedic
surgery.

STUDY DESIGN: Prospective, randomized clinical trial.

ANIMALS: Ninety-two client-owned dogs.

METHODS: Dogs were assigned randomly to receive either lumbosacral epidural anaesthesia (EA) (bupivacaine 0.5% and morphine 1%) or intrathecal anaesthesia with the same drugs in a hyperbaric solution (HIA). Inaccurate positioning of the needle, assessed by radiographic imaging, and lack of cerebral spinal fluid outflow were considered procedural failures (PFs) of EA and HIA, respectively. Fentanyl (1 μg kg(-1) IV) was provided for intraoperative rescue analgesia, when either the heart rate or the mean arterial pressure increased by 30% above the pre-stimulation value. Its use was recorded as a sign of intraoperative analgesic failure. The motor block resolution was evaluated postoperatively. Variables were compared using Fisher's exact test, the Mann-Whitney U test and the Kaplan-Meier 'survival' analysis as relevant.

RESULTS: The PFRs in the EA and HIA groups were 15/47 (32%) and 3/45 (7%), respectively (p = 0.003). Differences in iRA were analysed in 26 and 30 subjects in the EA and HIA groups respectively, using Kaplan-Meier survival analysis. The iRA probability within the first 80 minutes of needle injection (NI) was higher in the EA group (p = 0.045). The incidence of dogs walking within 3 hours of NI was significantly higher in the HIA group (8/20, 40%) than in the EA group (0/17) (p = 0.004).

CONCLUSIONS AND CLINICAL RELEVANCE: HIA was found to have lower PF, lower intraoperative analgesic failure and faster motor block resolution. In this study HIA was shown to provide some advantages over EA in dogs undergoing commonly performed pelvic limb orthopaedic surgery in a day-hospital regime.

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DOI: 10.1111/vaa.12229
PMID: 25287980  [PubMed - indexed for MEDLINE]


Comparison of the effects of lidocaine and fentanyl in epidural anesthesia in dogs.

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The study included 12 clinically healthy, adult male dogs of various breeds, admitted to our clinic for castration. After general anesthesia with sevoflurane, we administered epidural fentanyl (1 mcg/kg) to fentanyl group, while lidocaine group was given Lidocaine (3 mg/kg) through epidural administration. When hemodynamic parameters were stabilized, first measurements were recorded at minutes 0, 15, 30, 60 in both groups, which included Heart Rate (HR), body temperature, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), sodium (Na+), potassium (K+), glucose (GLC), and hemoglobin (HB) measurements. In addition, serum samples were obtained from arterial blood at the same measurement times, and pH, pO₂, pCO₂, HCO₃, %O₂
Saturation, BE levels were measured. For hematological analysis, WBC, RBC, HCT, THR counts were performed. For serum biochemical analysis, venous blood samples were collected at minutes 0 and 60 and CK, TP, UREA, ALT, AST, ALB, GGT, CRE, CK-MB parameters were assessed using auto-analyzer. Moreover, cortisol levels were measured in the samples collected at minutes 0, 30, and 60. Mean arterial blood pressure values measured at minutes 15, 30 and 60 were found significantly lower in the fentanyl group (p<0.01). In conclusion, we suggest that epidural anesthesia with lidocaine and fentanyl can provide an effective and safe option in high-risk groups (Tab. 5, Fig. 1, Ref. 24).

PMID: 25246289 [PubMed - indexed for MEDLINE]


Comparison of two techniques for ultrasound-guided axillary brachial plexus blockade in cats.

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Axillary blockade of the brachial plexus (BP) is advocated in humans and dogs for surgical procedures carried out on the foot, carpus and elbow as it provides complete analgesia distally from above the elbow joint. The aim of this study was to develop an ultrasound (US)-guided approach to block the BP in cats. Two groups of 12 feline cadavers each were used to compare two different techniques to block the BP at the axillary level. The reliability of the techniques was assessed by anatomical and computed tomography (CT) studies. Cadavers of the first group were positioned in dorsal recumbency with the forelimb to be blocked adducted (thoracic limbs flexed and orientated caudally) (FAD technique). The second group was positioned in dorsal recumbency with the forelimb abducted 90° (FAB technique). The accuracy of the techniques was determined by US after injecting 1 ml blue ink along the BP nerves, and by CT after injecting 1 ml of an iodinated contrast medium. The anatomical and CT studies confirmed the accuracy of the US location of the BP nerves. Staining of the axillaris, musculocutaneous, radialis, medianus and ulnaris nerves was observed in 100% of cats using the FAB technique and in 66% of the cats using the FAD technique. Rate of complications was higher in the FAD technique. In conclusion, a US-guided axillary approach to the BP by the use of a FAB technique is a safe and feasible procedure to block the BP in the cat. Further studies are needed to ascertain whether the technique can be
applied in a clinical setting.

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DOI: 10.1177/1098612X14548785
PMID: 25193280 [PubMed - indexed for MEDLINE]


Comparison of three ultrasound guided approaches to the lumbar plexus in dogs: a cadaveric study.

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OBJECTIVE: To assess the accuracy of contrast material injection and the dispersion of injectate following ultrasound guided injections at the level of L6 and L7, in canine cadavers.

STUDY DESIGN: Prospective, randomized, experimental study.

ANIMALS: Twenty nine mixed breed canine cadavers (28.9 ± 6.0 kg).

METHODS: Three ultrasound-guided approaches to the lumbar plexus (LP) were compared: 1) a dorsal pre-iliac approach at the level of L6; 2) a lateral paravertebral approach at mid-L6; and 3) a lateral paravertebral approach at mid-L7. An isovolumic mixture of iodine-based contrast with new methylene blue (0.1 mL kg(-1)) was injected bilaterally in the juxta-foraminal region along the L6 or L7 nerve root. Computed tomography was performed followed by segmentation and 3D reconstruction of the lumbar spine and contrast material volumes using dedicated software. Distances between contrast material and the fifth through seventh lumbar foraminae, and length of femoral (FN) and obturator (ON) nerve staining were measured and compared between approaches (p < 0.05).

RESULTS: Injectate moved cranial and caudal to the site of injection, and dispersed into an ovoid shape between the quadratus lumborum, ilioptoas and psoas minor muscles. Injections at L7 resulted in significantly closer contrast proximity to the L6 and L7 foraminae (p < 0.001). Femoral nerve staining was similar for all approaches, ON staining was more consistent after L7 injections (p < 0.001).

CONCLUSION AND CLINICAL RELEVANCE: An ultrasound-guided lateral paravertebral approach to the LP proved very practical and accurate, with easy visualization of the plexus and associated nerves. To ensure that the ON is covered by injectate, an approach at the level of L7 is recommended. Further studies are necessary to determine if this correlates with clinically effective local anesthesia.
The use of a nerve stimulator for intraoperative stimulation of individual nerves of the brachial plexus.

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Analgesia for pelvic limb surgery. A review of peripheral nerve blocks and the extradural technique.

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OBJECTIVES: To describe the anatomy and approaches reported for peripheral nerve blockade (PNB) of the pelvic limb in dogs and cats and to consider the role of PNB in relation to the extradural technique.

DATABASES USED: This review was conducted using the terms 'nerve block', 'extradural' 'dog' and 'cat' entered into Pubmed and Google. Results were filtered manually to narrow the field to pelvic limb nerve blocks. The reference lists of retrieved papers were scrutinized to identify further studies for inclusion.

CONCLUSIONS: Successful PNB techniques require thorough anatomical knowledge for the establishment of reliable landmarks, puncture sites, the direction and depth of needle insertion, and relevant structures to be avoided. To date, clinical evaluations have been made in subjects undergoing stifle surgery where the sciatic nerve has been blocked in combination with various approaches to the femoral nerve. Currently the bulk of literature examines new approaches to these nerves and each of these is described. To date there are no veterinary studies
directly comparing one approach versus another, and therefore one is unable to
draw conclusions of superiority. The role of PNB's versus the extradural
technique is discussed.

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DOI: 10.1111/vaa.12184
PMID: 24962107 [PubMed - indexed for MEDLINE]


Antinociceptive effects of epidural magnesium sulphate alone and in combination
with morphine in dogs.

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OBJECTIVE: To compare the antinociceptive effects of magnesium sulphate (MgSO(4))
when administered epidurally alone and in combination with morphine.
STUDY DESIGN: Experimental, randomized, 'blinded', crossover study.
ANIMALS: Six healthy adult Beagle dogs.
METHODS: Evaluated treatments were MgSO(4) (2.5 mg kg(-1)) alone (Mg), morphine
(0.1 mg kg(-1)) alone (Mo), MgSO(4) in combination with morphine (Mm), and
sterile water (0.115 mL kg(-1) ; Co) that were injected in the lumbosacral
epidural space using an epidural catheter. Antinociception was measured using the
von Frey mechanical threshold device applied to the carpal pads, both sides of
the thorax and metatarsi. Measurements were obtained at time points: before
treatment (baseline) and 0.5, 1, 2, 4, 6, 12, 18 and 24 hours after the epidural
injection. Sedation, behaviour score and presence of motor deficits were
assessed. Data were analyzed using a linear mixed model and Bonferroni
adjustments, with significance set at p < 0.05.
RESULTS: There were significant effects of treatment and time in all regions.
Overall threshold values in grammes force [median (interquartile range)] when
stimulation regions were combined were significantly higher in Mg [164
(135-200)], Mo [156 (129-195)] and Mm [158 (131-192)] compared to Co [145
(120-179)]. Thresholds were significantly higher compared to Co in Mg, Mo and Mm
at the thorax and metatarsi, but only in Mg and Mo at the carpal pads. No motor
deficits were observed at any time point. Thresholds (combined regions) were
increased from baseline at one or more time points with all treatments, including
control.
CONCLUSION AND CLINICAL RELEVANCE: Epidural MgSO(4) produced an antinociceptive
effect characterised by an increase in the mechanical thresholds of similar
magnitude to that produced by epidural morphine, compared with the control group,
without causing any motor deficits. No potentiation of morphine antinociception
was observed. The onset and offset times of antinociception could not be clearly established. To what extent these results can be extrapolated to clinical cases requires further investigation.

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DOI: 10.1111/vaa.12211
PMID: 25039803 [PubMed - indexed for MEDLINE]

Retrospective clinical evaluation of ultrasound guided transverse abdominis plane block in dogs undergoing mastectomy.

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HISTORY: Eleven female dogs of different breeds undergoing unilateral radical (n = 7) or regional abdominal mastectomy (n = 4) received an ultrasound guided transverse abdominis plane block (TAP-block).

PHYSICAL EXAMINATION: Subjects showed single or multiple mammary tumours. Serum biochemistry, CBC and electrocardiogram were unremarkable. Eight animals were classified as ASA physical status II and 3 as ASA III.

MANAGEMENT: Dogs were premedicated with methadone [0.1 or 0.2 mg kg(-1) intravenously (IV) or intramuscularly respectively] or fentanyl (2.5 μg kg(-1) IV). Anaesthesia was induced with propofol and maintained with isoflurane or sevoflurane. Unilateral ultrasound guided TAP blocks were performed in the caudal and cranial abdomen with bupivacaine 0.25% (0.3 to 0.35 mL kg(-1)). Intercostal nerve blocks (T4 to T11 ) with bupivacaine 0.25% (0.013 to 0.04 mL kg(-1) ) completed the blocked area in dogs undergoing radical mastectomy.

FOLLOW UP: The median (range) of end-expired isoflurane and sevoflurane necessary to maintain anaesthesia was 1.15 (1.07-1.22) and 2.07 (2.05-2.2) vol% respectively. A single administration of fentanyl (2.5 μg kg(-1), IV) was administered to control nociception (defined as an increased heart rate or mean arterial blood pressure above 20% of the pre-incisional value) in four of 11 dogs. All dogs received carprofen (2 mg kg(-1) subcutaneously) at the end of surgery. Post-operative pain, assessed for 120 minutes using the short form of Glasgow Composite Pain Scale (0-24), was always lower than 3. No rescue analgesia (allowed by the protocol) was required in this time.

CONCLUSION: Transverse abdominis plane block combined with intercostal nerve blocks may be useful to produce intraoperative anti-nociception and short term post-operative analgesia in dogs undergoing unilateral mastectomy.
The effect of epidural injection speed on epidural pressure and distribution of solution in anesthetized dogs.

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OBJECTIVE: To determine the effect of injection speed on epidural pressure (EP), injection pressure (IP), epidural distribution (ED) of solution, and extent of sensory blockade (SB) during lumbosacral epidural anesthesia in dogs.

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Ten healthy adult Beagle dogs weighing 8.7 ± 1.6 kg.

METHODS: General anesthesia was induced with propofol administered intravenously and maintained with isoflurane. Keeping the dogs in sternal recumbency, two spinal needles connected to electrical pressure transducers were inserted into the L6-L7 and the L7-S1 intervertebral epidural spaces for EP and IP measurements, respectively. Bupivacaine 0.5% diluted in iohexol was administered epidurally to each dog via spinal needle at L7-S1 intervertebral space, at two rates of injection (1 and 2 mL minute(-1) groups), with a 1-week washout period. Epidural distribution was verified with computed tomography, and SB was evaluated after arousal by pinching the skin with a mosquito hemostatic forceps over the vertebral dermatomes. The results were analyzed according to each injection speed, using paired t- and Wilcoxon signed-rank tests.

RESULTS: Mean ± SD of baseline EP and IP values were 2.1 ± 6.1 and 2.6 ± 7.1 mmHg, respectively. Significant differences were observed between 1 and 2 mL minute(-1) groups for peak EP (23.1 ± 8.5 and 35.0 ± 14.5 mmHg, p = 0.047) and peak IP (68.5 ± 10.7 and 144.7 ± 32.6 mmHg, p <0.001). However, the median (range) of the ED, 11.5 (4-22) and 12 (5-21) vertebrae, and SB, 3.5 (0-20) and 1 (0-20) dermatomes, values of the two groups were not related to injection speed.

CONCLUSIONS AND CLINICAL RELEVANCE: The EP profile during injection was measured by separating the injection and pressure monitoring lines. The increase in epidural injection speed increased the EP, but not the ED or the SB in dogs.

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The use of electrical stimulation to guide epidural and intrathecal needle advancement at the L5-L6 intervertebral space in dogs.

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OBJECTIVE: To determine the minimal electrical threshold (MET) necessary to elicit appropriate muscle contraction when the tip of an insulated needle is positioned epidurally or intrathecally at the L5-6 intervertebral space (phase-I) and to determine whether the application of a fixed electrical current during its advancement could indicate needle entry into the intrathecal space (phase-II) in dogs.

STUDY DESIGN: Prospective, blinded study.

ANIMALS: Thirteen (phase-I) and seventeen (phase-II) dogs, scheduled for a surgical procedure where L5-6 intrathecal administration was indicated.

METHODS: Under general anesthesia, an insulated needle was first inserted into the L5-6 epidural space and secondly into the intrathecal space and the MET necessary to obtain a muscular contraction of the pelvic limb or tail at each site was determined (phase-I). Under similar conditions, in dogs of phase-II an insulated needle was inserted through the L5-6 intervertebral space guided by the use of a fixed electrical current (0.8 mA) until muscular contraction of the pelvic limb or tail was obtained. Intrathecal needle placement was confirmed by either free flow of cerebrospinal fluid (CSF) or myelography.

RESULTS: The current required to elicit a motor response was significantly lower (p < 0.0001) when the tip of the needle was in the intrathecal space (0.48 ± 0.10 mA) than when it was located epidurally (2.56 ± 0.57). The use of a fixed electrical stimulation current of 0.8 mA resulted in correct prediction of intrathecal injection, corroborated by either free flow of CSF (n = 12) or iohexol distribution pattern (n = 5), in 100% of the cases.

CONCLUSION AND CLINICAL RELEVANCE: Nerve stimulation may be employed as a tool to distinguish epidural from intrathecal insulated needle position at the L5-6 intervertebral space in dogs. This study demonstrates the feasibility of using an electrical stimulation test to confirm intrathecal needle position in dogs.

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DOI: 10.1111/vaa.12137
PMID: 24628834 [PubMed - indexed for MEDLINE]
Different volumes of injectate using electrostimulator and blinded techniques for brachial plexus block in dogs.

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To compare different volumes of injectate using electrostimulator (ES)-guided and blind brachial plexus blockade (BPB) techniques in dogs. Prospective, randomised, blinded study. Fifty-eight healthy adult purpose-bred beagle dogs. Animals were randomised into 4 groups based on the volume of methylene blue 0.1 per cent administered for BPB, three using ES technique: E1 (0.2 ml/kg, n=22), E2 (0.6 ml/kg, n=22), and E3 (1.0 ml/kg, n=14), and one using blinded technique B4 (1.0 ml/kg, n=14). After euthanasia, the axillary region was dissected and nerves identified by a blinded evaluator. Success was defined as 3/4 nerves stained, or presence of dye in the tissue immediately surrounding the plexus. There were no significant differences between groups when total nerve count, adjacent staining, success rate (92.8-100 per cent), or rate of haematoma were evaluated. The musculocutaneous nerve was significantly more targeted in B4 than E1 and E2, but not E3. Electrostimulator-guided BPB using lower volumes of injectate had similar success rate as the blinded technique using higher volume, thus, lower volumes can be used without compromising success. When an ES is not available, the blind technique with 1 ml/kg is also acceptable. However, when performing an ES-guided BPB, volumes as low as 0.2 ml/kg can be used. As volume is increased, the musculocutaneous nerve becomes more likely to be targeted.

DOI: 10.1136/vr.101876
PMID: 24158326 [PubMed - indexed for MEDLINE]

Retrospective comparison of two peripheral lumbosacral plexus blocks in dogs undergoing pelvic limb orthopaedic surgery.

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OBJECTIVES: To compare the lateral pre-iliac approach to the lumbar plexus combined with lumbar paravertebral sciatic nerve block, and the dorsal paravertebral approach to the lumbar plexus combined with sciatic nerve block in
METHODS: Retrospective examination of case records of dogs that received the blocks and underwent pelvic limb orthopaedic surgery between 2010 and 2012. Success rate (intraoperative fentanyl consumption <2·1 µg/kg/hour), type and dose of local anaesthetic used, multiple of minimum alveolar concentration of volatile anaesthetic agent administered, incidence of intraoperative hypotension, postoperative methadone administration, postoperative contralateral limb paralysis and neurological complication at 6 weeks re-examination were analysed.

RESULTS: Ninety-six and 95 records were retrieved in which lateral pre-iliac - lumbar paravertebral sciatic nerve and dorsal paravertebral - sciatic nerve were used, respectively. Success rates were 82·3% in lateral pre-iliac - lumbar paravertebral sciatic nerve and 74·7% in dorsal paravertebral - sciatic nerve groups. Bupivacaine, levobupivacaine and ropivacaine were used. Total local anaesthetic doses, intraoperative hypotension and postoperative methadone administered were similar between groups; minimum alveolar concentration multiple was significantly (P<0·001) lower in lateral pre-iliac - lumbar paravertebral sciatic nerve group. No neurological complications were noted.

CLINICAL SIGNIFICANCE: Although success rates and perioperative analgesic requirements were not significantly different, the different exposure to anaesthetic agents suggests that the two techniques may not be equivalent.

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DOI: 10.1111/jsap.12146
PMID: 24151941 [PubMed - indexed for MEDLINE]


Peripheral nerve stimulation under ultrasonographic control to determine the needle-to-nerve relationship.

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OBJECTIVE: To determine the needle-to-nerve distances during electrical nerve location in dogs at different currents and pulse duration using a peripheral nerve stimulator (PNS) under ultrasound control (US), and the minimal electrical thresholds (MET) necessary to obtain a motor response (MR) after achieving needle-to-nerve contact.

STUDY DESIGN: Prospective in vivo experimental trial in a clinical setting.

ANIMALS: Thirty dogs, scheduled for locoregional anaesthesia of the sciatic nerve.

METHODS: Needle-to-nerve distance was measured ultrasonographically after obtaining the MR of sciatic nerve with 2, 1 and 0.5 mA and pulse duration 0.1 ms (NS0.1). Thereafter the needle was placed in contact with the nerve and MET was
The procedure was repeated with 0.3 ms (NS0.3). Finally the needle was reintroduced to contact the sciatic nerve guided only by US, thus MET-US was determined. Data were analysed using Kruskal-Wallis or Mann-Whitney tests.

RESULTS: Needle-to-nerve distances were greater when MR was obtained with 2 mA than with 1 and 0.5 mA at 0.1 and 0.3 ms. No significant differences were observed between the needle-to-nerve distances using 0.1 or 0.3 ms. The MET [median (range)] was 0.4 (0.18-1.3) mA in NS0.1, 0.32 (0.12-0.8) mA in NS0.3; while MET-US was 0.7 (0.32-1.5) mA. When the needle contacted the nerve, the MR achieved with currents below 0.3 mA was obtained in 17.2, 40 and 0% of cases using NS0.1, NS0.3 and US respectively.

CONCLUSIONS AND CLINICAL RELEVANCE: The electrical current necessary to obtain a MR decreased as the needle moved towards the nerve. However when the needle tip contacted the nerve, an MR with low current intensity could not be obtained. Thus the absence of motor response at currents below 0.3 mA cannot rule out needle-epineurium contact. When ultrasound is combined with PNS, it is more important to assess the correct needle position than searching for an MR at low currents.

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DOI: 10.1111/vaa.12066
PMID: 23829787 [PubMed - indexed for MEDLINE]


Evaluation of electrical nerve stimulation for epidural catheter positioning in the dog.

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OBJECTIVE: To evaluate the accuracy of epidural catheter placement at different levels of the spinal cord guided solely by electrical nerve stimulation and resultant segmental muscle contraction.

STUDY DESIGN: Prospective, experiment.

ANIMALS: Six male and two female Beagles, age (1 ± 0.17 years) and weight (12.9 ± 1.1 kg).

METHODS: Animals were anesthetized with propofol and maintained with isoflurane. An insulated epidural needle was used to reach the lumbosacral epidural space. A Tsui epidural catheter was inserted and connected to a nerve stimulator (1.0 mA, 0.1 ms, 2 Hz) to assess positioning of the tip at specific spinal cord segments. The catheter was advanced to three different levels of the spinal cord: lumbar (L2-L5), thoracic (T5-T10) and cervical (C4-C6). Subcutaneous needles were previously placed at these spinal levels and the catheter was advanced to match
the needle location, guided only by corresponding muscle contractions. Catheter position was verified by fluoroscopy. If catheter tip and needle were at the same vertebral body a score of zero was assigned. When catheter tip was cranial or caudal to the needle, positive or negative numbers, respectively, corresponding to the number of vertebrae between them, were assigned. The mean and standard deviation of the number of vertebrae between catheter tip and needle were calculated to assess accuracy. Results are given as mean ± SD.

RESULTS: The catheter position in relation to the needle was within 0.3 ± 2.0 vertebral bodies. Positive predictive values (PPV) were 57%, 83% and 71% for lumbar, thoracic and cervical regions respectively. Overall PPV was 70%. No significant difference in PPV among regions was found.

CONCLUSION AND CLINICAL RELEVANCE: Placement of an epidural catheter at specific spinal levels using electrical nerve stimulation was feasible without radiographic assistance in dogs. Two vertebrae bodies difference from the target site may be clinically acceptable when performing segmental epidural regional anesthesia.

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DOI: 10.1111/vaa.12051
PMID: 23742668 [PubMed - indexed for MEDLINE]


Ultrasound guided mid-humeral block of the radial, ulnar, median and musculocutaneous (RUMM block) nerves in a dog with traumatic exposed metacarpal luxation.

Portela DA, Raschi A, Otero PE.

DOI: 10.1111/vaa.12046
PMID: 23710939 [PubMed - indexed for MEDLINE]


Assessment of maxillary and infraorbital nerve blockade for rhinoscopy in sevoflurane anesthetized dogs.

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OBJECTIVE: To investigate the efficacy of maxillary and infraorbital nerve blocks
for prevention of cardiovascular and qualitative responses to rhinoscopy, as well as response to skin clamping after assigned nerve block placement.

STUDY DESIGN: Randomized, blinded, placebo-controlled cross-over experimental study.

ANIMALS: Eight random-source mixed breed dogs > 1 year old and weighing between 13 and 22 kg.

METHODS: Within three anesthetic episodes, separated by at least 3 days, dogs were assigned to receive either 1 mL lidocaine 2% maxillary nerve block (ML); 0.5 mL lidocaine 2% infraorbital nerve block (IOL); or equal amounts of saline for maxillary or infraorbital nerve block combined as control treatment (S).

Monitoring included temperature, respiratory rate, end-tidal CO2, ECG, heart rate (HR), systolic, diastolic and mean arterial pressure (SAP, DAP, MAP).

Posterior (pR) and anterior rhinoscopies (aR) were performed and scored. Differences from baseline for outcome parameters HR, SAP, DAP, MAP were analyzed using repeated-measures anova, and results reported as mean ± SD. Binary scores for rhinoscopy were analyzed using logistic regression, and odds ratio was reported.

RESULTS: Changes from baseline for HR and SAP were significant for all treatments, besides ML for pR. Difference in changes from baseline among treatments was statistically significant for HR during pR with ML < S, and for SAP, DAP and MAP in right and left aR with ML < S and IOL > ML, except for DAP in left aR with only IOL > ML. Analysis of the binary score showed that the probability of a response for S and IOL treatments was nearly triple that of the ML treatment. None of the dogs, regardless of the treatments applied, responded to skin clamping.

CONCLUSION AND CLINICAL RELEVANCE: Cardiovascular parameters do not seem to reflect the occurrence of adverse reactions during rhinoscopy. The maxillary nerve block is superior to the infraorbital nerve block, as applied in this study, in preventing adverse reactions during posterior rhinoscopy.

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DOI: 10.1111/vaa.12032
PMID: 23534860 [PubMed - indexed for MEDLINE]


Intraoperative antinociception and postoperative analgesia following epidural anesthesia versus femoral and sciatic nerve blockade in dogs undergoing stifle joint surgery.

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OBJECTIVE: To compare analgesic efficacy of preoperative epidural anesthesia with efficacy of femoral and sciatic nerve blockade in dogs undergoing hind limb orthopedic surgery.

DESIGN: Prospective randomized blinded clinical study.

ANIMALS: 22 dogs requiring stifle joint surgery.

PROCEDURES: Dogs were premedicated with acepromazine and morphine, and anesthesia was induced with diazepam and propofol and maintained with sevoflurane in oxygen. Prior to surgery, a combination of 1.0% lidocaine solution with 0.25% bupivacaine solution was administered either into the lumbosacral epidural space (11 dogs) or perineurally along the femoral and sciatic nerves (11). Intraoperative nociception was assumed if heart rate or systolic blood pressure increased by >10% from baseline, in which case fentanyl (2 μg/kg [0.9 μg/lb], IV) was administered as rescue analgesia. Following recovery from anesthesia, signs of postoperative pain were assessed every 30 minutes for 360 minutes from the time of local anesthetic administration via the modified Glasgow pain scale. Patients with scores > 5 (scale, 0 to 20) received hydromorphone (0.1 mg/kg [0.05 mg/lb], IV) as rescue analgesia and were then withdrawn from further pain scoring.

RESULTS: Treatment groups did not differ significantly in the number fentanyl boluses administered for intraoperative rescue analgesia. Time to administration of first postoperative rescue analgesia was comparable between groups. Furthermore, there was no significant difference between groups in baseline pain scores, nor were there significant differences at any other point during the postoperative period.

CONCLUSIONS AND CLINICAL RELEVANCE: Femoral and sciatic nerve blocks provided intraoperative antinociception and postoperative analgesia similar to epidural anesthesia in dogs undergoing stifle joint surgery.

DOI: 10.2460/javma.241.12.1605
PMID: 23216035 [PubMed - indexed for MEDLINE]


A cadaver study comparing two approaches for performing maxillary nerve block in dogs.

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OBJECTIVE: To compare the success by inexperienced anaesthetists of using a modified infraorbital approach to the maxillary nerve with the traditional percutaneous approach.

STUDY DESIGN: Prospective, randomized, blinded controlled study.

ANIMALS: Heads from 37 euthanized Beagle and Beagle cross dogs.

METHODS: Four anaesthetists were recruited to perform two different approaches to block the maxillary nerve of the cadavers. The infraorbital (I) approach advanced
an intravenous catheter along the infraorbital canal. Earlier measurements from scans of similar heads were used to assess suitable catheter size. The percutaneous (P) approach introduced a needle percutaneously just below the ventral border of the zygomatic arch. The side of the head where the technique was to be performed was randomized. A total volume of 0.5 mL methylene blue was injected in each approach. After completion of injections, head dissections were performed by an investigator unaware of the approach used and staining of the maxillary and pterygopalatine nerves was evaluated. Chi squared analysis examined the relationship between the methods (p < 0.05). Complications related to the techniques, such as intravascular/intraneural injection and location of the dye, were evaluated macroscopically.

RESULTS: Maxillary nerve staining >6 mm was found in 64.9% (I) versus 21.6% (P) attempts; staining <6 mm was found in 27% (I) versus 21.6% (P); and no nerve staining 8.1% (I) versus 56.8% (M). Pterygopalatine nerve staining was found in 70% (I) versus 21% (P). The infraorbital approach demonstrated significantly higher maxillary and pterygopalatine nerve staining compared to the percutaneous approach (p = 0.001 for both nerves). No evidence of intravascular/intraneural injections was found.

CONCLUSION AND CLINICAL RELEVANCE: The infraorbital approach was more successful than the percutaneous approach when performed by inexperienced anaesthetists. No macroscopic complications were observed.

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DOI: 10.1111/j.1467-2995.2012.00781.x
PMID: 23016595 [PubMed - indexed for MEDLINE]


Transient Horner's syndrome after paravertebral brachial plexus blockade in a dog.

Viscasillas J, Sanchis-Mora S, Hoy C, Alibhai H.

DOI: 10.1111/j.1467-2995.2012.00770.x
PMID: 22978801 [PubMed - indexed for MEDLINE]


Use of electrical stimulation to monitor lumbosacral epidural and intrathecal needle placement in rabbits.

Otero PE(1), Portela DA, Brinkyer JA, Tarragona L, Zaccagnini AS, Fuensalida SE, Ceballos MR.
OBJECTIVE: To determine the minimal electric threshold of neurostimulation dorsally and ventrally to the interarcuate ligament in the lumbosacral area necessary to cause muscle contraction of the hind limb or tail and determine whether a continuous electrical stimulation applied to an insulated needle during lumbosacral epidural needle placement could be used to distinguish the epidural from the intrathecal space in rabbits.

ANIMALS: 24 New Zealand white rabbits.

PROCEDURES: Rabbits received iohexol (0.2 mL/kg) either dorsally (group 1) or ventrally to the interarcuate ligament in the lumbosacral area (groups 2 and 3). Correct placement of the needle was determined by use of the loss of resistance to injection technique (group 2) or a continuous electrical stimulation (group 3) and confirmed by examination of the iohexol distribution pattern on radiographs.

RESULTS: In all rabbits of group 1, iohexol was injected in the lumbosacral area, outside the epidural space. In groups 2 and 3, iohexol was injected intrathecally. No pure iohexol epidural migration of iohexol was observed. Mean ± SD minimal electric threshold to elicit a motor response was 1.2 ± 0.3 mA, 0.3 ± 0.1 mA, and 0.3 ± 0.1 mA in groups 1, 2, and 3, respectively.

CONCLUSIONS AND CLINICAL RELEVANCE: Neurostimulation was a useful technique to determine correct intrathecal needle placement in rabbits but failed to detect the lumbosacral epidural space when the common technique, used in dogs and cats for the lumbosacral epidural approach, was used.

DOI: 10.2460/ajvr.73.8.1137
PMID: 22849672 [PubMed - indexed for MEDLINE]


Ultrasound-guided 'two-in-one' femoral and obturator nerve block in the dog: an anatomical study.

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OBJECTIVE: To evaluate the dye extent and distribution at the lumbar plexus (LP) of three volumes of local anaesthetic-methylene-blue solution administered close to the femoral nerve (FN) by the use of a ventral ultrasound (US)-guided suprainguinal approach (SIA).

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Twenty mongrel canine cadavers weighing 17.7 ± 3.8 kg (mean ± SD).

METHODS: The left and right LP of two cadavers were dissected to identify the FN, obturator nerve (ON) and lateral femoral cutaneous nerve (LFCN). The extent and
distribution of dye at the LP of each of three volumes of injectate of 0.2, 0.4 and 0.6 mL kg(-1) administered close to the FN by a ventral US-guided SIA then were studied in a further 18 dog cadavers (n = 6 per group). Staining of ≥2 cm along the target nerves was indicative of sufficient spread to produce a nerve block.

RESULTS: The ventral US-guided SIA allowed the observation of the FN within the iliopsoas muscle (IPM) in a total of 17 cadavers. The assessment of the dye extent and distribution revealed a similar pattern regardless of the injected volume. From the injection site, the spreading of injectate occurred in cranial, lateral and caudal directions. The FN and ON were effectively stained in all the cases. The LFCN was not effectively stained in any case.

CONCLUSIONS AND CLINICAL RELEVANCE: A volume of 0.2 mL kg(-1) administered close to the FN by a ventral US-guided SIA produced a sufficient distribution of the injectate within the IPM to produce effective staining of the FN and ON. This US-guided technique may be an appropriate alternative to previously reported techniques based on electrolocation to block the FN and ON in the dog.

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DOI: 10.1111/j.1467-2995.2012.00750.x
PMID: 22805301 [PubMed - indexed for MEDLINE]


Femoral nerve block: a novel psoas compartment lateral pre-iliac approach in dogs.

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OBJECTIVE: To describe a new approach to block the femoral nerve and to evaluate the distribution of a dye injected into the psoas compartment using a new femoral nerve block approach; to assess its clinical application, when combined with a sciatic nerve block, for surgical anaesthesia/analgesia of the pelvic limb in dogs.

STUDY DESIGN: Prospective anatomical, research and clinical study.

ANIMALS: Two dog cadavers; two dogs that had to be euthanized for reasons unrelated to this study, and 15 dogs undergoing pelvic limb orthopaedic surgery.

METHODS: Phase 1: anatomical dissections were performed to determine a simple method to approach the femoral nerve within the psoas compartment. Phase 2: 0.1 mL kg(-1) of a lidocaine-new methylene blue solution was injected bilaterally after successful electrolocation of the femoral nerve in two anaesthetized dogs. Colorant spread was evaluated through femoral nerve dissections after euthanasia.
Phase 3: in 15 dogs undergoing pelvic limb orthopaedic surgery under light general anaesthesia with isoflurane, intra-operative analgesic effect (cardiovascular responses) and early post-operative pain score, of the novel femoral nerve block combined with a sciatic nerve block as the sole analgesic protocol, were evaluated.

RESULTS: Phase 1: a needle inserted from the lateral aspect of the lumbar muscles, cranially to the iliac crest and with a 30-45° caudo-medial direction, reaches the femoral nerve in the caudal portion of the psoas compartment. Phase 2: Four femoral nerves were stained >2 cm. Phase 3: this novel lateral pre-iliac approach, combined with the sciatic nerve block, blunted the intra-operative cardiovascular response to surgical stimulation in 13 out of 15 anaesthetized dogs. In addition, rescue analgesia was not required in the early post-operative 2-hour period.

CONCLUSION AND CLINICAL RELEVANCE: The lateral pre-iliac femoral nerve block technique may provide adequate intra- and early post-operative pain relief in dogs undergoing pelvic limb surgery.

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DOI: 10.1111/j.1467-2995.2012.00765.x
PMID: 22765834 [PubMed-indexed for MEDLINE]


Ultrasound guidance to approach the femoral nerve in the iliopsoas muscle: a preliminary study in the dog.

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OBJECTIVE: To describe the location of the femoral nerve within the iliopsoas muscle and determine the feasibility and potential complications of an ultrasound-guided block.

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Sixteen adult dogs, median weight 14.3 (range 3-37) kg.

METHODS: Phase I. Computed tomographic images of the iliopsoas muscle and femoral nerve were analyzed in two dogs. Phase II. The location of the femoral nerve within the iliopsoas muscle was determined via ultrasonography in 11 healthy anaesthetized dogs. Phase III. Peripheral nerve stimulation and ultrasound were combined to perform femoral nerve blocks in three dogs.

RESULTS: Using computed tomography, the femoral nerve and its L4-L5 roots were identified within the iliopsoas muscle. The nerve itself was traced until it
branched off into the quadriceps femoris muscle. Using ultrasonography, it was possible to observe the femoral nerve in nine dogs (82%). Starting at the dorsal third of the iliopsoas muscle, its path was traced in a caudo-ventro-lateral direction, emerging from the iliopsoas muscle shortly before passing through the muscular lacuna where it became very difficult to identify. An ultrasound-guided femoral nerve approach was carried out successfully in all three dogs.

CONCLUSIONS: It is possible to approach the femoral nerve using combined ultrasound guidance and peripheral nerve stimulation to a closer proximal point than previously described.

CLINICAL RELEVANCE: The ultrasound-guided approach of the femoral nerve within the iliopsoas muscle has the potential to become an additional approach.


DOI: 10.1111/j.1467-2995.2012.00731.x
PMID: 22642451 [PubMed - indexed for MEDLINE]
projections at different times. Positive injection was confirmed when the paravertebral space was occupied by iohexol in both projections.

RESULTS: NMB was distributed in the T(5) paravertebral space. In the experimental study, when the needle tip reached the respective paravertebral space, intercostal twitching was obtained in 80% of the total injections with a stimulating current of 0.5 mA. The incidence of positive cases when the intercostal twitch was obtained with 0.5 mA was 83.3%. The main distribution pattern observed was cloud like without longitudinal diffusion. CONCLUSION AND CLINICAL RELEVANCE: Intercostal muscular responses obtained with a stimulating current of 0.5 mA could be useful to locate thoracic spinal nerves in dogs and in our study the injected solution was confined to one thoracic paravertebral space.

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DOI: 10.1111/j.1467-2995.2012.00729.x
PMID: 22642438 [PubMed - indexed for MEDLINE]


Use of mid-humeral block of the radial, ulnar, musculocutaneous and median (RUMM block) nerves for extensor carpi radialis muscle biopsy in a conscious dog with generalized neuro-muscular disease.


DOI: 10.1111/j.1467-2995.2012.00724.x
PMID: 22574755 [PubMed - indexed for MEDLINE]


Peripheral nerve blocks of the pelvic limb in dogs: a retrospective clinical study.

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OBJECTIVE: To evaluate the success rate and complications of lumbar plexus (LP) and femoral nerve (FN) blocks, each combined with a sciatic nerve (SN) block, in dogs undergoing pelvic limb orthopaedic surgery.

DESIGN: Retrospective clinical study.
PROCEDURE: The intra-operative and postoperative clinical records of dogs that underwent orthopaedic surgery of the pelvic limb were reviewed. Dogs were divided into two groups according to the analgesic technique used during surgery: dogs that received a peripheral nerve block (group PNB) and dogs in which opioid analgesia alone was used (group C).

RESULTS: The PNB and C groups included 265 and 31 dogs, respectively. Complete statistical analysis was performed in 115/265 dogs of PNB group. The overall success rate of the PNB performed was 77% (89/115): 76% (72/95) and 85% (17/20) for LP-SN and FN-SN blocks, respectively. In group PNB, the prevalence of intra-operative hypotension was 7.8% (9/115). Only one (out of 95 [1.05%]) LP-SN block manifested transient postoperative bilateral pelvic limb paralysis. None of the 265 dogs in group PNB manifested neurological complications at six weeks postoperatively.

CONCLUSION: The success rate and the absence of neurological complications obtained support the use of LP-SN and FN-SN for loco-regional anaesthesia and analgesia in dogs undergoing orthopaedic surgery of the pelvic limb.

DOI: 10.3415/VCOT-11-08-0111
PMID: 22535493 [PubMed - indexed for MEDLINE]


Comparison of intra-operative analgesia provided by intravenous regional anesthesia or brachial plexus block for pancarpal arthrodesis in dogs.

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The aim of this study was to compare intravenous regional anesthesia (IVRA) and brachial plexus block (BPB) for intra-operative analgesia in dogs undergoing pancarpal arthrodesis (PA). Twenty dogs scheduled for PA were intramuscularly sedated with acepromazine (0.03 mg/kg), general anesthesia was intravenously (IV) induced with thiopental (10 mg/kg) and, after intubation, maintained with isoflurane in oxygen. In 10 dogs (GIVRA) IVRA was performed on the injured limb administering 0.6 ml/kg of 0.5% lidocaine. In 10 dogs (GBP) the BPB was performed at the axillary level with the help of a nerve stimulator and 0.3 ml/kg of a 1:1 solution of 2% lidocaine and 1% ropivacaine was injected. During surgery fentanyl (0.002 mg/kg IV) was administered if there was a 15% increase of HR and/or MAP compared to the values before surgical stimulation. All the standard cardiovascular and respiratory parameters were continuously monitored during surgery. The duration of surgery and the time of extubation were recorded. Data were compared with a 1-way ANOVA test (P<0.05). No patients required fentanyl administration during surgery. All the recorded parameters were similar in the two groups. The two techniques were similar in providing intra-operative
analgesia in dogs undergoing orthopaedic surgery.

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DOI: 10.1016/j.rvsc.2012.03.001
PMID: 22464864 [PubMed - indexed for MEDLINE]


Procedural sedation combined with locoregional anesthesia for orthopedic surgery of the pelvic limb in 10 dogs: case series.

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HISTORY: Ten dogs weighing 36 (21.4-75) kg [median (min-max)] and aged 3 (1-9) years scheduled for orthopedic surgery involving the stifle and structures distal to it.
PHYSICAL EXAMINATION: Patients were classified as ASA I or II based on physical examination and basic hematology and biochemistry.
MANAGEMENT: Each dog was managed using combined femoral and sciatic nerve blocks and procedural sedation with an intravenous infusion of propofol (0.07-0.15 mg kg(-1) minute(-1)) and dexmedetomidine (1 μg kg(-1) hour(-1)). None of the patients required conversion to general anesthesia as a result of response to surgical stimulation. The level of sedation was considered adequate in all patients and was characterized by occasional head lifting, thoracic limb stretching, yawning, lingual movements and swallowing. The eye position ranged from central to partial ventromedial rotation and was accompanied by spontaneous blinking. Intra-operative cardiovascular and ventilatory variables were considered within acceptable limits. Muscle relaxation at the surgical field was adequate and surgical conditions were indistinguishable from those produced by general anesthesia. Intraoperatively, no additional analgesics were considered necessary. The quality of the recoveries was considered excellent in all cases.
FOLLOW UP: No additional pain relief was required in any of the dogs within the 10 hours following blockade. All dogs ate 5.5 (3.5-12) hours after recovery. Ambulation occurred at 4 (2-6) hours. No evidence of esophagitis or aspiration pneumonitis has been reported during a period of 1 year after the procedures in any of the dogs.
CONCLUSION: When combined with femoral and sciatic nerve blocks, procedural sedation has the potential of being an alternative to general anesthesia for orthopedic surgery involving the stifle and structures distal to it in the dog.

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Area of desensitization following mental nerve block in dogs.

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Regional nerve blocks are commonly used to provide analgesia for dental and oral surgical procedures. The purpose of this study was to demarcate the areas of the mandible that would be desensitized by application of the mental nerve block. Seven healthy mixed-breed dogs were anesthetized for an annual dental examination and professional teeth cleaning procedure. Bupivacaine HCl (0.4 ml/ m2) was administered at one middle mental foramen based on previously described techniques for the mental nerve block. A noxious stimulus was applied at 23 predetermined ipsilateral mandibular locations using pressure from a mosquito hemostat on the mucocutaneous junction (MCJ) and a dental curette on the vestibular mucogingival line (MGL) at the incisor canine, and premolar teeth; and, the mesial and distal aspects of the first molar tooth. A thermal stimulus using a refrigerant spray on a cotton ball was applied to the ipsilateral canine, third premolar and fourth premolar teeth; and, the mesial and distal aspects of the first molar tooth. Demonstration of nociception or anesthesia was noted and the responses tabulated. The area of desensitized tissues was smaller than expected and highly variable within the study group. In conclusion, the unilateral mental nerve block does not reliably provide generalized desensitization to tissues of the incisive and rostral regions of the mandible. Although the mental nerve block is recommended, other modes of analgesia should be emphasized for surgical and dental procedures involving these areas.
OBJECTIVE: To compare success and complication rates, based on staining of nerves and other structures, among three techniques of paravertebral brachial plexus blockade (PBPB) in dogs.

STUDY DESIGN: Prospective randomized design.

ANIMALS: A total of 68 thoracic limbs from 34 dogs.

METHODS: Limbs were randomly assigned to blind (BL) (n = 24), nerve stimulator-guided (NS) (n = 21) or ultrasound-guided (US) (n = 23) technique. Injections were made with 0.3 mL kg(-1) of lidocaine mixed with new methylene blue. Time to perform each block and current used during NS technique were recorded. Dogs were anesthetized during the blocks and euthanized once completed. Dissections were performed to evaluate staining of nerves, spinal cord, mediastinum, pleura and vessels. An anova and Tukey adjustment for time, logistic regression for association between current and nerve staining and a generalized linear mixed model for staining of different structures were used. Significance was considered when p ≤ 0.05.

RESULTS: The median (range) number of nerves stained was 2 (0-4) with BL, 1 (0-3) with NS and 1 (0-4) with US guided technique. No significant differences in staining of C6, C8 and T1 or other structures were found among techniques. Nerve C7 was more likely to be stained by BL (p = 0.05). Time to perform the blocks was significantly different among techniques, with mean ± SD duration in minutes of 3.6 ± 1.8 with BL, 6.3 ± 2.7 with US and 12.2 ± 5 with NS. The most common complication was staining of the spinal cord (29%, 38% and 39% with BL, NS and US, respectively).

CONCLUSIONS: Success rates were low and complication rates were relatively high, based on staining, with the three techniques.

CLINICAL RELEVANCE: The use of more advanced techniques for PBPB in dogs is not justified according to this study. Clinical significance of the complications encountered in this study should be evaluated.

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DOI: 10.1111/j.1467-2995.2011.00677.x
PMID: 22117891 [PubMed - indexed for MEDLINE]


Comparison of bupivacaine femoral and sciatic nerve block versus bupivacaine and morphine epidural for stifle surgery in dogs.

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OBJECTIVE: To evaluate the efficacy of combined femoral and sciatic nerve blocks as an alternative to epidural anesthesia and analgesia in dogs undergoing stifle surgery under general anesthesia.

STUDY DESIGN: Prospective, blinded, randomized, clinical comparison.

ANIMALS: Twenty dogs weighing 37 ± 11 (mean ± SD) kg, aged 3 (1-8) [median (minimum-maximum)] years undergoing elective unilateral tibial-plateau leveling osteotomy.

METHODS: Dogs were assigned randomly to receive either epidural anesthesia (bupivacaine 0.5%, 0.5 mg kg(-1) + morphine 0.1%, 0.1 mg kg(-1), in 0.2 mL kg(-1); EPID) or femoral and sciatic nerve blocks (Bupivacaine 0.5%, 0.1 mL kg(-1), was administered at each site; F + S) guided by electrolocation. All patients received a standard general anesthesia technique. Pain and sedation were scored (on scales of 0-10 and 0-3, respectively) pre-operatively, at extubation, and at 1, 4 and then every 4 hours thereafter up to 24 hours. Postoperatively, hydromorphone was administered to any patient with a pain score of >5 or whenever the blinded caregiver determined that more hydromorphone was necessary. Intraoperative heart rate (HR), mean arterial pressure (MAP), end tidal isoflurane (FE'ISO), body temperature, post-operative pain scores, time to first hydromorphone dose after surgery, time to first feeding, time to first drinking, time to first urination, time to first ambulation (walk on a lead) and cumulative dose of hydromorphone were recorded.

RESULTS: Intra-operatively, FE'ISO and MAP were significantly lower in the EPID group (p = 0.05 and p = 0.04, respectively). Postoperatively, the cumulative hydromorphone consumption (p = 0.04) and the incidence of urinary retention (p = 0.03) were higher in the EPID group.

CONCLUSION AND CLINICAL RELEVANCE: F + S is a practical alternative to EPID that produces less urine retention and reduces opioid consumption in the 24 hours after surgery. EPID might be associated with a lower isoflurane requirement and lower systemic blood pressure.

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DOI: 10.1111/j.1467-2995.2011.00673.x
PMID: 22117792 [PubMed - indexed for MEDLINE]


Proximal mandibular nerve block, using electrolocation, for rostral mandibulectomy in a geriatric dog.

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We describe a case of proximal mandibular nerve block with ropivacaine, using electrolocation, for perioperative pain management in a geriatric dog undergoing rostral mandibulectomy. The patient did not require intraoperative analgesia or analgesic supplementation for 8 h after the end of the surgery.

PMCID: PMC3078005
PMID: 22043072 [PubMed - indexed for MEDLINE]


Ventral ultrasound-guided suprainguinal approach to block the femoral nerve in the dog.

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This prospective study assessed a ventral ultrasound-guided suprainguinal approach to block the femoral nerve (FN) in dogs. The anatomical features of the FN were evaluated in four canine cadavers. In another five cadavers, the FN was located by ultrasound-guidance and the accuracy of this technique was evaluated by injection of black ink and posterior evaluation of the degree of staining of the nerves. In five live dogs, the FN was blocked with 2% lidocaine. The distribution of lidocaine around the nerve and the presence of motor deficit were evaluated. The FN was easily located and accurately blocked in all cases. This new ultrasound-guided approach was reliable for blocking the FN and might be a suitable alternative to the traditional approaches described to block the FN in the dog.

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DOI: 10.1016/j.tvjl.2011.06.043
PMID: 22015137 [PubMed - indexed for MEDLINE]


Ultrasound-guided transversus abdominis plane block in the dog: an anatomical evaluation.

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OBJECTIVE: To describe the ultrasound-guided technique to the transversus abdominis plane (TAP) block in the dog and evaluate the spread of a local anesthetic/methylene blue solution.

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Ten adult Beagle cadavers weighing 11.1 ± 1.1 kg (mean ± SD).

METHODS: Transversus abdominis plane (TAP) blocks were performed bilaterally by a single trained individual on unpreserved cadaver dogs using 10 mL of methylene blue/bupivacaine solution per site. Dissection of the abdominal wall was performed within 15-55 minutes of block to determine distribution of injectate and nerve involvement in the transversus abdominis fascial plane.

RESULTS: The transversus abdominis fascial plane was adequately visualized via ultrasound and injected in twenty hemi-abdominal walls. Segmental branches of T11, T12, T13, L1, L2, and L3 were adequately stained in 20%, 60%, 100%, 100%, 90%, and 30% of injections, respectively.

CONCLUSIONS AND CLINICAL RELEVANCE: This anatomical study suggests that the transversus abdominis plane (TAP) block would provide adequate regional anesthesia of the abdomen, potentially extending to the cranial and caudal limits of the abdomen. This supports the clinical potential of this block in veterinary medicine.

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DOI: 10.1111/j.1467-2995.2011.00612.x
PMID: 21492393 [PubMed - indexed for MEDLINE]


Efficacy and side effects of intraoperative analgesia with intrathecal bupivacaine and levobupivacaine: a retrospective study in 82 dogs.

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OBJECTIVE: To evaluate spinal (intrathecal) anaesthesia (SA) in addition to general anaesthesia in dogs, and report the incidence of side effects and cardiovascular response (CR) to surgery.

STUDY DESIGN: Retrospective clinical study.


METHODS: Records of anaesthetized dogs that had received SA with bupivacaine or levobupivacaine 0.5%, together with morphine or fentanyl were reviewed. Success rate of SA, complication rate and incidence of CR were recorded and examined in relation to the dose of local anaesthetic administered and the type of surgery. Univariate and Cusum analysis were performed to identify independent predictors...
of response to surgical stimulation and characterize the learning curve for the technique, respectively.

RESULTS: Eighty-two dogs received successful SA. The Cusum plot suggested that a failure rate of 10% is achieved when the procedure is performed more than 66 times. Median local anaesthetic dose related to weight was 0.40 mg kg(-1) (0.3-0.5), and to spinal cord length 0.1 mg cm(-1) (0.07-0.12). Morphine was added to the local anaesthetic in 56 and fentanyl in 22 dogs. CR post-stimulus occurred in 29 cases: 11 of 22 ovariohysterectomies, 14 of 33 hindlimb-surgeries, 2 of 10 caudal-abdominal-surgeries and 2 of 17 Caesarean sections. Anaesthetic dose related to weight was not a predictor of CR. Bradycardia occurred in seven, hypotension in 24, urinary retention in four and hypersalivation in 6 of 82 dogs.

CONCLUSIONS: SA was practicable to apply, but in this study did not totally block CR. Side effects were minimal, with an incidence similar to that in humans. CLINICAL RELEVANCE: SA can be used in clinical cases with few side effects although monitoring of and ensuing treatment of hypotension is required. Comparative prospective studies are required to establish efficacy and a reliable dose.

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DOI: 10.1111/j.1467-2995.2011.00608.x
PMID: 21492390 [PubMed - indexed for MEDLINE]


Cardiovascular effects of epidural administration of methadone, ropivacaine 0.75% and their combination in isoflurane anaesthetized dogs.

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OBJECTIVE: To compare the cardiovascular effects of four epidural treatments in isoflurane anaesthetised dogs.
STUDY DESIGN: Prospective, randomized. experimental study.
ANIMALS: Six female, neutered Beagle dogs (13.3±1.0 kg), aged 3.6±0.1 years.
METHODS: Anaesthesia was induced with propofol (8.3±1.1 mg kg(-1)) and maintained with isoflurane in a mixture of oxygen and air [inspiratory fraction of oxygen (FiO(2))=40%], using intermittent positive pressure ventilation. Using a cross-over model, NaCl 0.9% (P); methadone 1% 0.1 mg kg(-1) (M); ropivacaine 0.75% 1.65 mg kg(-1) (R) or methadone 1% 0.1 mg kg(-1) + ropivacaine 0.75% 1.65 mg kg(-1) (RM) in equal volumes (0.23 mL kg(-1)) using NaCl 0.9%, was administered epidurally at the level of the lumbosacral space. Treatment P was administered to five dogs only. Cardiovascular and respiratory variables, blood
gases, and oesophageal temperature were recorded at T-15 and for 60 minutes after epidural injection (T0).

RESULTS: Mean overall heart rate (HR in beats minute(-1)) was significantly lower after treatment M (119±16) (p=0.0019), R (110±18) (p<0.0001) and RM (109±13) (p<0.0001), compared to treatment P (135±21). Additionally, a significant difference in HR between treatments RM and M was found (p=0.04). After both ropivacaine treatments, systemic arterial pressures (sAP) were significantly lower compared to other treatments. No significant overall differences between treatments were present for central venous pressure, cardiac output, stroke volume, systemic vascular resistance, oxygen delivery and arterial oxygen content (CaO(2)). Heart rate and sAP significantly increased after treatment P and M compared to baseline (T-15). With all treatments significant reductions from baseline were observed in oesophageal temperature, packed cell volume and CaO(2). A transient unilateral Horner's syndrome occurred in one dog after treatment R.

CONCLUSIONS AND CLINICAL RELEVANCE: Clinically important low sAPs were observed after the ropivacaine epidural treatments in isoflurane anaesthetised dogs. Systemic arterial pressures were clinically acceptable when using epidural methadone.

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DOI: 10.1111/j.1467-2995.2011.00595.x
PMID: 21303446 [PubMed - indexed for MEDLINE]


Combined paravertebral plexus block and parasacral sciatic block in healthy dogs.

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OBJECTIVE: To evaluate the effectiveness of paravertebral lumbar plexus block combined with parasacral sciatic block to anesthetize one hind limb in awake dogs.

STUDY DESIGN: Randomized, controlled, blinded experimental study.

ANIMALS: Eight healthy mongrel dogs weighing 12.4 ± 4.5 kg and aged 7 ± 2.33 years.

METHODS: After sedation with medetomidine, dogs received B1: bupivacaine 0.25%, 0.2 mL kg(-1), B2: bupivacaine 0.5%, 0.2 mL kg(-1), B3: bupivacaine 0.25% 0.4 mL kg(-1), P1: NaCl 0.2 mL kg(-1), P2: NaCl 0.4 mL kg(-1). The lumbosacral plexus was blocked through a paravertebral block of the fourth, fifth and sixth lumbar nerves combined with a parasacral block. The relevant nerves were located using a nerve stimulator and injections of each treatment were administered. Degree and durations of sensory blockade were determined through the response to a Halsted
clamp pressure on the skin innervated by the saphenous/femoral and lateral cutaneous femoral nerves (lumbar dermatomes) and by the peroneal and tibial nerves. The degree and duration of motor blockade was assessed evaluating the ability to walk normally and proprioception.

RESULTS: P1 and P2 treatments did not show any grade of sensory or motor blockade. The B2 treatment produced a higher degree of sensory blockade compared to B1 and B3 for both lumbar and sciatic dermatomes. There was no significant difference in the degree of sensory blockade comparing B1 to B3. The B2 treatment had greater motor blockade compared to B1 and B3. The duration of sensory and motor blockade was longer in B2 compared to B1 and B3.

CONCLUSION AND CLINICAL RELEVANCE: When the nerve stimulator is used to perform the lumbosacral plexus block, the concentration of the bupivacaine has a more important role than the volume to produce a more solid and longer block.

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DOI: 10.1111/j.1467-2995.2010.00572.x
PMID: 21040377 [PubMed - indexed for MEDLINE]


Plasma concentration and cardiovascular effects of lidocaine during continuous epidural administration in dogs anesthetized with isoflurane.

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The cardiovascular effects of continuous epidural administration (CEA) of lidocaine were investigated in anesthetized dogs. Loading epidural injections of 2, 4, or 6 mg/kg of lidocaine were followed by CEA with 1, 2, or 3 mg/kg/hr lidocaine, respectively, for 2 hr under 2.0% isoflurane anesthesia. Heart rate, direct blood pressure, cardiac index, and stroke volume decreased dose-dependently during CEA, whereas systemic vascular resistance did not significantly differ with dose, and no characteristic changes were observed in any groups. Plasma lidocaine concentration reached a steady state during CEA and increased in a dose-dependent manner. Circulatory suppression caused by lidocaine CEA was not attributable to peripheral vasodilation, but rather to the direct cardiac action of systemic lidocaine absorption from the peridural space.

PMID: 21048393 [PubMed - indexed for MEDLINE]

Comparison of bupivacaine, ropivacaine, and levobupivacaine in an equal dose and concentration for sympathetic block in dogs.

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BACKGROUND AND OBJECTIVES: The aim of this study was to compare the potency of bupivacaine, ropivacaine, and levobupivacaine in an equal dose and concentration for sympathetic block.

METHODS: We measured mean arterial pressure, heart rate (HR), and right and left brachial artery blood flow (BABF) before and after cervicothoracic sympathetic block in 24 dogs. The experimental protocol was designed as follows: (1) left cervicothoracic sympathetic block with 1.0 mL of 0.25% bupivacaine (n = 8), (2) left cervicothoracic sympathetic block with 1.0 mL of 0.25% ropivacaine (n = 8), and (3) left cervicothoracic sympathetic block with 1.0 mL of 0.25% levobupivacaine (n = 8).

RESULTS: Mean arterial pressure and heart rate did not change significantly throughout the study in either group. Left cervicothoracic sympathetic block with 0.25% bupivacaine increased left BABF significantly from 5 to 100 mins after the block (baseline, 100%; peak at 20 mins after the block, 218% +/- 48%; P < 0.01). Left cervicothoracic sympathetic block with 0.25% ropivacaine increased left BABF significantly from 5 to 100 mins after the block (baseline, 100%; peak at 10 mins after the block, 254 +/- 38%; P < 0.01). Left cervicothoracic sympathetic block with 0.25% levobupivacaine increased left BABF significantly from 5 to 80 mins after the block (baseline, 100%; peak at 20 mins after the block, 183 +/- 38%; P < 0.01).

CONCLUSIONS: Ropivacaine may induce a greater increase in vasodilation than bupivacaine and levobupivacaine at the same dose and concentration for sympathetic block in dogs.

DOI: 10.1097/AAP.0b013e3181e6acf1
PMID: 20814280 [PubMed - indexed for MEDLINE]


Ultrasound-guided nerve blocks of the pelvic limb in dogs.

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OBJECTIVES: To evaluate the efficacy of ultrasound-guidance in nerve blockade of the sciatic and saphenous nerves in dogs and to determine if this technique could allow lower anaesthetic doses to be used with predictable onset and duration of effect.

STUDY DESIGN: Prospective randomized (for dose and leg) blinded experimental crossover trial with 10 day washout period.

ANIMALS: Six healthy female Hound dogs aged 12.3 +/- 0.5 (mean +/- SD) months and weighing 18.7 +/- 0.8 (mean +/- SD) kg.

METHODS: An ultrasound-guided, perineural injection was used with saline at 0.2 mL kg(-1) (Sal) or bupivacaine 0.5% at 0.05 (low dose; LD), 0.1 (medium dose; MD), or 0.2 (high dose; HD) mL kg(-1), divided 2/3 at the sciatic nerve and 1/3 at the saphenous nerve. Blocks were performed using dexmedetomidine sedation with atipamezole reversal immediately after completion of the injections.

Motor/proprioceptive and sensory functions were scored using a 0-8 and a 0-2 scale, respectively. Clinically relevant blocks were defined as a motor score > or =2 and sensory score > or =1. Nonparametric methods were used for statistical analysis.

RESULTS: No adverse effects were noted. There was a significant difference between the treatments with bupivacaine and the saline control, but not between the three bupivacaine treatments. Success rates of clinically relevant sciatic and saphenous blocks were both 67% (CI 95% 0.22-0.96). Onset and duration of the blocks were variable; 20-160 and 20-540 minutes, respectively.

CONCLUSION AND CLINICAL RELEVANCE: None of the bupivacaine doses was significantly superior, though there was a tendency for a better block with the high bupivacaine dose. Either the technique or the doses used need further modification before this method will be useful in clinical practice.

DOI: 10.1111/j.1467-2995.2010.00560.x
PMID: 20712613 [PubMed - indexed for MEDLINE]
and median nerves (RUMM block) was evaluated using cadaver limbs. Eight purpose-bred, research dogs were anesthetized; a RUMM block was performed on each thoracic limb. One limb from each dog randomly received 0.5% bupivacaine and the opposite limb was assigned to receive sterile saline solution as a control. After recovery from anesthesia, skin sensation at selected dermatomes was evaluated for 24 hours using a mechanical stimulus. Weight-bearing, conscious proprioception, and withdrawal reflex were also evaluated. One month after initial testing, each dog was reanesthetized and each limb received the opposite treatment.

RESULTS: Sensory thresholds were significantly increased over baseline measurements when compared with control limbs for all nerves. Complete sensory block was achieved in radial (15/16), ulnar (3/16), musculocutaneous (8/16), and median (11/16) nerves, using a mechanical stimulus of analgesia. Complete simultaneous block of all nerves was only obtained in 1 of 16 limbs.

CONCLUSION: RUMM block resulted in desensitization of the skin in the associated dermatomes for 4-10 hours. Complete sensory block of the dermatomes supplied by the radial nerve was most consistent.

CLINICAL RELEVANCE: RUMM block may be an effective technique to provide adjunctive analgesia for dogs undergoing surgery of the distal aspect of the thoracic limb.

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DOI: 10.1111/j.1532-950X.2010.00712.x
PMID: 20673276 [PubMed - indexed for MEDLINE]

Ultrasound-guided approach for axillary brachial plexus, femoral nerve, and sciatic nerve blocks in dogs.

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OBJECTIVE: To describe an ultrasound-guided technique and the anatomical basis for three clinically useful nerve blocks in dogs.

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Four hound-cross dogs aged 2 +/- 0 years (mean +/- SD) weighing 30 +/- 5 kg and four Beagles aged 2 +/- 0 years and weighing 8.5 +/- 0.5 kg.

METHODS: Axillary brachial plexus, femoral, and sciatic combined ultrasound/electrolocation-guided nerve blocks were performed sequentially and bilaterally using a lidocaine solution mixed with methylene blue. Sciatic nerve blocks were not performed in the hounds. After the blocks, the dogs were euthanatized and each relevant site dissected.

RESULTS: Axillary brachial plexus block Landmark blood vessels and the roots of the brachial plexus were identified by ultrasound in all eight dogs. Anatomical
examination confirmed the relationship between the four ventral nerve roots (C6, C7, C8, and T1) and the axillary vessels. Three roots (C7, C8, and T1) were adequately stained bilaterally in all dogs. Femoral nerve block Landmark blood vessels (femoral artery and femoral vein), the femoral and saphenous nerves and the medial portion of the rectus femoris muscle were identified by ultrasound in all dogs. Anatomical examination confirmed the relationship between the femoral vessels, femoral nerve, and the rectus femoris muscle. The femoral nerves were adequately stained bilaterally in all dogs. Sciatic nerve block. Ultrasound landmarks (semimembranosus muscle, the fascia of the biceps femoris muscle and the sciatic nerve) could be identified in all of the dogs. In the four Beagles, anatomical examination confirmed the relationship between the biceps femoris muscle, the semimembranosus muscle, and the sciatic nerve. In the Beagles, all but one of the sciatic nerves were stained adequately.

CONCLUSIONS AND CLINICAL RELEVANCE: Ultrasound-guided needle insertion is an accurate method for depositing local anesthetic for axillary brachial plexus, femoral, and sciatic nerve blocks.

DOI: 10.1111/j.1467-2995.2009.00518.x
PMID: 20230565 [PubMed - indexed for MEDLINE]


Bupivacaine 0.25% and methylene blue spread with epidural anesthesia in dog.

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OBJECTIVE: To evaluate the extent sensory and motor blocks produced by the epidural injection of different volumes of 0.25% bupivacaine (Bu) with methylene blue (MB), in dogs.

STUDY DESIGN: Prospective experimental trial.

ANIMALS: Twenty healthy adult mongrel dogs, weighing 9.9 +/- 1.9 kg.

METHODS: Dogs were randomly allocated into one of four groups that received 0.2, 0.4, 0.6 or 0.8 mL kg(-1) of an epidural solution containing 0.25% Bu and MB. Sensory block was evaluated against time by pinching the tail, hind limb interdigital web, toenail bases and the skin over the vertebral dermatomes. Motor block was assessed by ataxia, hind limb weight-bearing ability and by loss of muscle tone of the tail and pelvic limbs. Data were collected at 2, 5, 10, 15 and 30 minutes after the end of epidural injection. After the final time point, dogs were euthanatized and laminectomies were conducted to expose the extent of the dural dye staining.

RESULTS: The volumes 0.2, 0.4, 0.6 and 0.8 mL kg(-1) of 0.25% Bu and MB blocked a mean of 5, 14.2, 20.2 and 21 dermatomes, respectively. The extent of the sensory block increased up to a volume of 0.6 mL kg(-1). Motor block was longer-lasting and more intense than sensory block. Complete dyeing of the spinal cord with MB was achieved in some dogs at 0.4 mL kg(-1) and all dogs at 0.6 mL kg(-1).
CONCLUSIONS: The volume of anesthetic injected into the epidural space plays an important role in the quality of the epidural anesthesia. At 0.25%, bupivacaine provided an efficient sensory block at 0.6 mL kg(-1).

CLINICAL RELEVANCE: Relatively high volumes (0.6 mL kg(-1)) of 0.25%, BU and MB were needed to produce an effective sensory and motor block caudal to the umbilicus, but all spinal cord segments were reached by MB at this dose.

DOI: 10.1111/j.1467-2995.2009.00493.x
PMID: 20017821 [PubMed - indexed for MEDLINE]


Ultrasound guidance for the performance of sciatic and saphenous nerve blocks in dogs.

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The aim of this study was to investigate the use of ultrasound (US) guidance to perform sciatic and saphenous nerve blocks in dogs. Five dogs were sedated with medetomidine and butorphanol. A high-resolution US transducer was used to locate the nerves, guide placement of the needle and visualise the perineural injection of lidocaine 2%. Electrostimulation was used to confirm correct placement prior to the sciatic block. Nerve functions were evaluated over a 3 h period following administration of atipamezole. Successful identification of the nerves and the quality of the blocks were recorded. Location of the nerves, complete sensory block of the saphenous nerve, and partial to complete sensory and motor blocks of the sciatic nerve were achieved in all dogs. The resultant US guidance is potentially valuable for blocking the sciatic and saphenous nerves in dogs, although further work will be required to ensure a complete block of the sciatic nerve.

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DOI: 10.1016/j.tvjl.2009.10.016
PMID: 19919902 [PubMed - indexed for MEDLINE]


Relative nerve blocking properties of bupivacaine and ropivacaine in dogs undergoing brachial plexus block using a nerve stimulator.

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In the present study, the efficacy of a nerve stimulator in performing brachial plexus block (BPB) in dogs was investigated. The nerve blocking effects of bupivacaine and ropivacaine for BPB were also compared. Twelve beagles were allocated to groups based on the following treatments: conventional BPB with 0.5% bupivacaine (0.5% BupiM group) or BPB with 0.5% bupivacaine, 0.5% ropivacaine or 0.75% ropivacaine and a nerve stimulator (the 0.5% BupiS, 0.5% RopiS and 0.75% RopiS groups, respectively). After BPB, nerve blocking effects were assessed based on sensory blockade in several cutaneous areas and knuckling. The ratio of full block (blockade in all cutaneous areas) for 0.5% BupiM was 25%, and that for 0.5% BupiS was significantly higher, 75% (p<0.05). For the 0.5% BupiS, 0.5% RopiS and 0.75% RopiS groups, the average duration of full block was 387, 184 and 275 min, respectively, and the average duration of knuckling was 703, 460 and 421 min, respectively. The duration of full block and knuckling for the two ropivacaine groups was shorter compared with that of the 0.5% BupiS group. In conclusion, when using bupivacaine and ropivacaine for BPB in dogs, it is worth noting that there are differences in onset time and duration and that effective perioperative analgesia can be achieved depending on the intended use.

PMID: 19887731  [PubMed - indexed for MEDLINE]


Use of wound soaker catheters for the administration of local anesthetic for post-operative analgesia: 56 cases.

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OBJECTIVE: To describe the administration of local anesthetic through wound soaker catheters for post-operative veterinary patients and to characterize complications.
STUDY DESIGN: Retrospective study of hospital records.
ANIMALS: Records of patients in which a wound soaker catheter was placed post-operatively between November 1, 2004 and July 1, 2006 at a veterinary teaching hospital. Records in which a limb amputation was performed between January 1, 2002 and August 1, 2007 and in which a wound soaker catheter was not placed were reviewed for historic control.
RESULTS: A total of 56 cases were identified in which a wound soaker catheter was placed post-operatively including 52 dogs, 2 cats, and 2 goats. Twenty canine cases were identified in which limb amputation was performed and no wound soaker catheter was placed. The majority of surgical procedures for which a wound soaker catheter was placed included thoracic limb amputation (46.4%) and pelvic limb
amputation (35.7%). Wound soaker catheters remained in place for an average of 1.6 +/− 0.5 days. Feline and caprine patients received intermittent bupivacaine boluses every 6 hours. Canine patients received continuous lidocaine infusions. Complications included disconnection of the catheter from the infusion (7.7%), one seroma, and one suspected lidocaine neurotoxicity. Incisional infections were noted in 3/56 (5.3%) limb amputations with wound soaker catheters placed which was not higher than the incisional infection rate found in the historic control cases 3/20 (15%).

CONCLUSION AND CLINICAL RELEVANCE: Use of the wound soaker catheter was a viable means of providing local analgesia in post-operative veterinary patients. Studies are needed to evaluate efficacy of pain management, and to further investigate techniques for catheter placement and maintenance which may help to optimize the analgesia achieved using this technique.

DOI: 10.1111/j.1446-2995.2009.00487.x
PMID: 19845933 [PubMed - indexed for MEDLINE]


Ultrasound-guided block of the sciatic and femoral nerves in dogs: a descriptive study.

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Ten canine cadavers were used to investigate the anatomy and ultrasonographic approaches to the sciatic (ScN) and femoral (FN) nerves and to assess the accuracy of an ultrasound (US) guided technique to locate and block these nerves in the dog. The nerves of four sedated dogs were sought using US, blocked with 1% lidocaine and successful location confirmed by peripheral neurostimulation. The ScN was identified by US in all cases whereas the FN was not located in all cases. This study validates the usefulness of the US-guided technique to locate and block the ScN at the midfemoral level but the acoustic window of the inguinal region was less successful for locating and blocking the FN.

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DOI: 10.1016/j.tvjl.2009.08.005
PMID: 19758827 [PubMed - indexed for MEDLINE]


Evaluation of extradural pressure waves and the 'lack of resistance' test to confirm extradural needle placement in dogs.
This study aimed to evaluate the use of extradural pressure (EDP) waves to confirm extradural needle placement in clinical practice. Lumbosacral extradural anaesthesia was performed in 98 dogs, of which 85 were included for statistical analysis. The extradural space was identified using conventional methods and, after testing lack of resistance to injection of saline, a pressure transducer was connected to the needle. EDP and the occurrence of pressure waves were recorded before and following injection of local anaesthetic. Successful administration of the drug was confirmed by clinical assessment. Extradural anaesthesia was successful in 88% of the dogs. Pressure waves were present in 89% of the animals with successful extradural puncture, but in 35% of dogs the waves occurred following extradural injection but not before. In 11% of dogs no EDP waves were observed. EDP prior to administration of the local anaesthetic was 0.4+-/1.0 kPa but following the injection values were significantly higher (4.7+-/2.9 kPa) and there was no difference between pressures following successful and unsuccessful punctures. It was concluded that EDP waves can be used to confirm correct needle placement in dogs in clinical practice and measurement is most reliable following extradural injection.
anesthesia or sedation. No complications were related to the combined local anesthesia. Combined local anesthesia for NM-to-superotemporal bulbar conjunctiva flap may be a time- and cost-effective method that produces both analgesia of the surgical site and akinesia of the eyelid.

DOI: 10.5326/0450164
PMID: 19570898 [PubMed - indexed for MEDLINE]


Nerve stimulator-guided paravertebral lumbar plexus anaesthesia in dogs.

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DOI: 10.1007/s11259-008-9135-x
PMID: 18709436 [PubMed - indexed for MEDLINE]


Post-operative analgesic effects, after orthopaedic surgery in the dog, of loco-regional ropivacaine and bupivacaine blockade using the nerve locator technique: 159 cases.

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DOI: 10.1007/s11259-008-9129-8
PMID: 18685980 [PubMed - indexed for MEDLINE]