Acute pain and the Zero Pain Philosophy

Analgesic tools exist that allow us to promptly resolve acute pain in our patients and to prevent it in elective surgical cases. The use of these tools is a choice of the medical team managing that patient and involves a resolute philosophical attitude that does not tolerate pain. If the individuals in that team have a zero-tolerance attitude, then patients are likely to experience markedly less pain than when an approach whereby patients are considered adequately analgesed if an NSAID and opioid are administered without individualised monitoring.

The Zero Pain Philosophy is a culture of zero tolerance towards pain. It uses the principles of pre-emptive multimodal analgesia, continuous patient assessment, and prompt resolution when pain is found.

Ultimately pain management is a team effort. The Zero Pain Philosophy is a journey for the medical team to perform together and involves a continual process of professional growth to advance our pain management skills so that painful patients become uncommon.

The key to the Zero Pain Philosophy is two-fold:

1. Individualised monitoring of pain
2. Pre-emptive (where possible) multimodal analgesia using the mainstays of opioids, NSAIDS and local anaesthetics.

Individualised patient monitoring

When individualised monitoring is not used, painful patients may masquerade undetected despite analgesia being administered. A skeleton ‘protocol’ for pain relief is sensible, but provision of analgesia should be individualised. Regular assessment of pain, and provision of further analgesia as indicated by the patient, will provide for the individual needs of animals under our care.

Use of free pain assessment forms like the Glasgogw Composite Pain Scale (found at www.gla.ac.uk/media/media_61908_en.pdf) or the Colorado State University Feline Acute Pain Scale (found at www.csuanimalcancercenter.org/assets/files/cs_u_acute_pain_scale_feline.pdf) allow for standardised monitoring of individual patients. These tools are highly recommended for daily clinical use.

The basis to these pain assessment tools include behavioral changes (vocalisation, hiding, appearing depressed, fearful or agitated) and most importantly local hyperalgesia.

Hyperalgesia can be found if a member of the medical team manipulates or palpates the wounded area and gets an exaggerated response. It occurs when pain is felt of significant intensity for long enough that modulation occurs in the spinal cord that heightens pain awareness. This process is called ‘central sensitisation’ or ‘wind-up’ and when it occurs it requires aggressive analgesia to turn it off.
Pre-emptive multimodal analgesia

The discussion that follows provides examples of pain management tools that the authors believe work well in a New Zealand clinical setting to provide acute pain management and pre-emptive multimodal analgesia in dogs and cats.

On arrival

In an acutely painful situation, say after a road traffic accident, pure opioid agonists like morphine, methadone and fentanyl have higher analgesic efficacy than partial opioid agonists like butorphanol and buprenorphine. Opioids can be easily titrated depending on patient requirements. The simplest method is to give intravenous boluses of the chosen opioid to effect (this is not an ideal option with buprenorphine due to its slow onset of action). In dogs and cats a common initial dose is 0.3 mg/kg of morphine or methadone intravenously (IV). If analgesia is insufficient, titrate with further doses of chosen opioid with increments of 0.1 mg/kg IV.

Once a patient is comfortable, then a constant rate infusion (CRI) can be started or the patient can continue to be managed with opioid boluses while medical stabilisation and diagnostics are pursued. The most common CRIs use an opioid and ketamine. Lidocaine and/or dexmedetomidine can be added. A favourite CRI of the authors is fentanyl/ketamine CRIs.

CRIs are made easy with CRI calculators found at vasg.org which can be downloaded onto the preparation room computer. The nursing team can be encouraged to be proficient at using these calculators so they become an automated aspect of preparing for anaesthesia at the request of the supervising clinician.

NSAIDs can be given to physiologically stable dogs on arrival as long as patients to be anaesthetised will receive intraoperative blood pressure monitoring. A regional nerve block such as an epidural with morphine and bupivacaine can also be considered at this time and is discussed below.

Epidurals and nerve blocks

Local anaesthesia acts to disrupt the pain pathway and are a great way to both prevent and treat pain. The website www.zeropainphilosophy.com displays free videos demonstrating multimodal analgesia techniques with a focus on nerve blocks and epidurals.

Local anaesthetics reversibly block sodium channels in the nerve membrane which are necessary for membrane depolarisation. The conduction of the action potential is halted and thus transmission of the stimulus is prevented. They are contraindicated in areas with infection or neoplasia. Lidocaine and bupivacaine are suitable for infiltration and are most commonly used in small animal practice. Table 1 lists attributes of commonly used local anaesthetic agents. Commonly used local anaesthetic options for joint pain in small animals can be found in Appendix 1.
Pre and intraoperative management

When surgical management is indicated, pure opioid agonists are included in the anaesthetic protocol. These include premedication with morphine or methadone and continuation with intraoperative CRIs. Using intra-operative CRIs allow for a patient’s anaesthesia to be based mainly on analgesics allowing patients to be anaesthetised on around 1% isoflurane.

Regional nerve blocks are highly recommended and ensure smooth anaesthetic management. However if intraoperative pain is still recognised note that increasing the gaseous anaesthesia is not a method of providing increased analgesia. This will increase anaesthetic depth yet central sensitisation will still be occurring meaning a patient recovers from the anaesthetic with ‘pain turned on’. In this situation, increasing the rate of CRI administration is indicated or intra-operative opioid intravenous bolusing can be used when it appears that the patient is painful with 0.1mg/kg IV methadone or morphine repeated as needed.

Providing incisional bupivacaine blocks on exiting a wound is highly recommended with a total of 2mg/kg bupivacaine in dogs and 1mg/kg total in cats. This can be extended into the post-operative period with bupivacaine ‘soak’ wound catheters.

Postoperative management

CRIs can be continued in the post-operative period. NSAIDs are also continued when indicated. Gabapentin and amantadine act to turn off central sensitisation and are great additions although the efficacy of gabapentin has not been fully evaluated in small animals. Fentanyl transdermal patches can be used (which can also be placed preoperatively). Tramadol can also be considered however efficacy is still to be established.
Case example

The following is an example of analgesic management in a cat or dog presenting with pelvic trauma after a road traffic accident.

On arrival the painful animal receives 0.3mg/kg IV morphine or methadone, with more doses titrated to effect until hyperalgesia is resolved. After physiologic stabilisation (e.g. fluid therapy) the patient is managed pre-operatively with a morphine-ketamine or fentanyl-ketamine CRI. If the cardiovascular system is stable medetomidine or dexmedetomidine can be given IV to allow for epidural administration of morphine and bupivacaine. Monitoring of bladder overfilling is indicated every four to six hours. Bladder expression at the time of every epidural and at the end of surgery is recommended. Provided the epidural is successful, the patient should remain comfortable for the next 18–24 hours. The CRI can be continued if indicated. Further analgesia is provided according to pain scoring.

For surgery, the physiologically stable patient is premedicated with acepromazine and methadone. The CRI is continued during anaesthesia and a repeat epidural of morphine and bupivacaine is administered if it has been greater than 24 hours since the last epidural. The bladder is expressed.

At the end of surgery on exiting the surgical wound an incisional and intra-articular bupivacaine block is administered. NSAIDs can be started on recovery if not already given (assuming blood pressure is normal). The pet is discharged with NSAIDs ± other analgesics as indicated by the patient pain score. Physiotherapeutic management is started immediately with a trained veterinary physiotherapist.

Throughout this whole treatment process, the medical team is monitoring pain. If it is found, it is promptly resolved by increasing the level of analgesia.

Appendix 1: Local anaesthetic techniques

See the website www.zeropainphilosophy.com for free videos demonstrating many of these techniques.

Maxillary nerve

- Area desensitised: maxillary teeth, nasal planum, skin over maxilla, upper lip, palate
- Indications: maxillary tooth removal, maxillectomy, mass excision
- Volume to inject: 1–2ml
- Needle size: 23G 5/8”
- Site for injection: caudal to the zygomatic arch, around 1cm caudal to the lateral canthus direct the needle into the pterygopalatine fossa as indicated until bone is contacted.

Mandibular (inferior alveolar) nerve

- Area desensitised: mandibular teeth, mandible, skin, lower lip
- Indications: mandibular tooth removal, mandibulectomy, mass excision
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- Volume to inject: 2ml
- Needle size: 23G 1”
- Site for injection- from the lower angle of the jaw direct the needle on the medial aspect of the mandible towards the mandibular foramen which is located by intra-oral palpation. This can be performed intra-oral (less space) or extra-oral (much easier).

Infraorbital nerve

- Area desensitised: nose, upper lip skin of the muzzle rostral and ventral to injection site
- Indications: tooth removal, mass excision, surgery to the nostrils
- Volume to inject: 0.5–1ml
- Needle size: 23G 5/8”
- Site for injection: palpate the foramen half way between the zygomatic arch and the root of the canine tooth. Infiltrate around the foramen but avoid directing the needle into the canal where there is risk that the nerve may be damaged.

Mental nerve

- Area desensitised: teeth rostral to the mental foramen
- Indications: tooth removal
- Volume to inject: 0.5–1ml
- Needle size: 23G 5/8”
- Site for injection: palpate the mental foramen caudal to the mandibular canine tooth on the lateral mandible. Retract the lip and inject through the gum. Alternative is a mandibular block.

Retrobulbar block

- Area desensitised: cranial nerves II, III, IV, V and VI
- Indications: enucleation
- Volume to inject: 1–4ml
- Needle size: 23G 1”
- Site for injection: inject either through the eyelid or the conjunctiva at a 10 o’clock and 4 o’clock position

Interdigital nerves

- Area desensitised: selected digit
- Indications: digit surgery
- Volume to inject: 1–2ml
- Needle size: 23G 5/8”
- Site for injection: nerves run either side of the digit so infiltration must occur in two places interdigitally.

Brachial plexus block

By infiltrating local anaesthetic around the brachial plexus, analgesia is provided to structures distal to the elbow. A spinal needle is a useful length (22G, 2.5”). This is inserted at the point of the shoulder and advanced medial to the scapula to the level of
The first rib. This is made easier if an assistant can elevate the scapula from the rib cage. Following aspiration local anaesthetic is deposited and the needle withdrawn and the processes repeated at several sites.

Risks of this technique are haemorrhage, puncture of the thoracic cavity and damage to the brachial plexus. You are usually limited by volume in dogs so I calculate my required dose and dilute with saline.

**RUMM block**

The radius, ulnar, median and musculocutaneous nerves are blocked at a mid-humeral level with a medial and lateral injection of total dose $1.25 \text{mg/kg}$ of 0.5% bupivacaine using a 22g needle. This is a very commonly used block for surgery on structures including and distal to the elbow. A nerve stimulator is useful but this block can be performed blind. The RUMM technique is well described in the article by Trumpatori *et al.* 2010 and at www.zeropainphilosophy.com.

**Intra-articular analgesia**

The benefit of intra-articular bupivacaine has been demonstrated in dogs undergoing cruciate surgery. Analgesia will be limited to the articular structures and given that most cruciate repair techniques are extra-articular this should be performed alongside other blocks. This technique has the advantage that patients will be more comfortable in the post-operative period.

**Epidural analgesia**

Epidural analgesia (or more anatomically, extradural) is used to provide analgesia to the hind limbs but will also afford analgesia to the caudal abdomen, perineal region and at appropriate doses, the thoracic region.

The technique described is that adopted by the authors. There are several techniques and these are widely described in the literature. Table 2 lists commonly used agents for epidural analgesia.

**Table 2. Commonly used agents for epidural analgesia**

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
<th>Onset</th>
<th>Duration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine</td>
<td>4mg/kg</td>
<td>5–10 mins</td>
<td>1–2 hours</td>
<td>Risk of motor blockade Care not to exceed toxic dose</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>1mg/kg</td>
<td>15–20 mins</td>
<td>4–8 hours</td>
<td>Risk of motor blockade Care not to exceed toxic dose</td>
</tr>
<tr>
<td>Morphine</td>
<td>0.1mg/kg</td>
<td>30–60 mins</td>
<td>16–24 hours</td>
<td>Onset slow Risk of urinary retention</td>
</tr>
<tr>
<td>Morphine + bupivacaine</td>
<td>0.1mg/kg + 1mg/kg</td>
<td>15–60 mins</td>
<td>16–24 hours</td>
<td>Rapid onset, long duration</td>
</tr>
</tbody>
</table>
Morphine + lidocaine | 0.1mg/kg + 4mg/kg | 5–10 mins | 16–24 hours | Rapid onset for surgical benefit without longer term motor blockade

Some authors advocate using a limited volume (1ml/5kg) whilst others use the calculated dose. Doses may be reduced with older (fibrous tissue in epidural space), pregnant (engorged vasculature in epidural space) and obese (more fat in epidural space) patients. Preparations should be preservative-free and local anaesthetics adrenaline-free.

**Technique**

The pet is in sternal recumbency with the pelvic limbs drawn forwards. The area should be aseptically prepared, the operator gloved and the site draped. A spinal needle is used, which is advanced perpendicular to the skin until a popping sensation is felt as the ligamentum flavum is penetrated. The stylet is then removed and a drop of saline applied to the hub. Under the negative pressure of the epidural space this should be sucked in when the needle is correctly positioned. If inadvertent intra-thecal placement has occurred cerebrospinal fluid (CSF) will flow from the needle. A test injectate of saline is used to confirm placement. The solution to be injected is attached and with very gentle pressure the injection begins. Administration should be over five minutes. The needle is then withdrawn.

**Confirming correct needle placement:**

- No CSF aspirated
- Popping sensation felt once ligamentum flavum is penetrated
- Lack of resistance to injection (a test injectate of saline may be used)
- Hanging drop technique (epidural space is under slight negative pressure)

**Contraindications:**

- Infection at injection site
- Distortion of anatomy - ie pelvic fractures
- Obesity – unable to locate landmarks
- Coagulopathies

**Risks:**

- hypotension due to sympathetic blockade
- motor blockade – only with local anaesthetics; analgesia outlasts motor effects
- urinary retention – ensure the bladder is expressed before recovery from anaesthesia
- slow hair regrowth – reported in 11% of cases in two separate studies.

**A note on joint pain**

Joint pain is common to both orthopaedic and general practice and can be divided into acute and chronic pain. Although pain has a protective effect which acts to reduce further trauma it also has a marked physiological and emotional effect on patients which negatively impacts healing, reduces quality of life and extends suffering unnecessarily.
Acute joint pain has many causes including traumatic, congenital and degenerative disease. Where instability is a component of the disease (e.g. cranial cruciate ligament rupture or a traumatic joint luxation) when possible joints should be stabilised. There are many techniques available to stabilise joints and use of the acute pain treatments detailed above can be helpful in case management.

In joints that have gone on to develop a chronic pain state cure can be more difficult but pain can be managed such that quality of life is significantly improved. When indicated, stabilisation can still be very useful in joints with chronic pain, e.g. animals with cruciate disease with marked secondary osteoarthritis still often benefit from a stabilisation procedure. Joint replacement is commonly used for severe hip pain.

Other types of chronic joint pain treatments include:

- physiotherapy
- hydrotherapy
- exercise modulation
- weight modulation
- neutraceuticals (e.g. Hills JD)
- daily warm compresses
- acupuncture
- medication

The most common medication for chronic joint pain, and for good reason, are the non-steroidal anti-inflammatory drugs (NSAIDs) which act to dampen inflammation. NSAIDs can be combined with, or replaced by, other medications when required. Non-NSAID options include:

- opioids – the mainstay of acute pain management (see below) but can also be used for chronic pain.
- amantadine which has been shown to improve outcomes in dogs with osteoarthritis when used alongside an NSAID.
- paracetamol – considered to be a potent analgesic and antipyretic and a weak anti-inflammatory. Do not give to cats.
- gabapentin – down regulates neuronal transmission by binding to calcium channels in the spinal cord.
- tramadol – acts on opioid, serotonin and noradrenaline pathways.
- amitryptaline – blocks reuptake of serotonin and noradrenaline. Do not use with tramadol.

The clinical efficacy of opioids and NSAIDs in small animal practice is well established. The efficacy of the other listed analgesics is sparse or still being established.

Reference


For further information please visit: www.zeropainphilosophy.com