

# Postoperative analgesia in children: getting it right

Lee CA, MBBCh, FCA

Department of Anaesthesiology, Charlotte Maxeke Academic Hospital, Johannesburg

Correspondence to: Dr Clover-Ann Lee, e-mail: cloverann@doctors.org.uk

Keywords: postoperative analgesia, children, paracetamol, NSAIDs, ketamine, opioid analgesics

## Abstract

The management of postoperative pain in children has historically been poor, but advances have been made in the last decade. As pain is a complex phenomenon, a multimodal approach to treatment is required. This article aims to give a brief overview of the practical aspects of postoperative pain management in children, including non-opioid as well as opioid analgesics, and the salient features of regional anaesthesia.

© SASA

South Afr J Anaesth Analg 2011;17(6):359-361

## Introduction

The management of postoperative pain in children has historically been poor. This was likely due to insufficient knowledge of paediatric pain and pain pathway development, uncertainty about appropriate dosages of analgesics in children, fear of serious drug-related side-effects, and the difficulty of assessing both pain and adequacy of analgesia in children, especially preverbal children.

Advances have been made in all these areas in the last decade. Assessment tools have been developed and validated, paediatric pharmacokinetic and dynamic data for commonly used drugs continue to be published (though we would do well to remember that children do not drive the pharmaceutical market, and that over 50% of the medicines used in paediatrics have not been specifically tested on or validated in children), and the increasing use of modalities such as ultrasound for regional techniques has allowed for improved block quality and reduced opiate use.

One thing is clear: if acute postoperative pain is not well managed, a child is at risk of forming “pain memory” and chronic pain, which has long-term physical, psychological, social and developmental consequences.

Postoperative analgesia should achieve three main goals:<sup>1</sup>

- Pain control.
- Prevention and early treatment of therapy-related side-effects.
- Early return to normal daily activities.

As pain is such a complex phenomenon, involving peripheral nociceptors, peripheral nerves, the spinal cord, the cerebral cortex and other regions in the brain, such as the thalamus and limbic system, it makes sense to use a multimodal approach to treating pain. This means the use of multiple therapies that act at different points along the pain pathway. Analgesics with additive or synergistic effects are used to improve analgesia and to minimise side-effects of individual drugs or techniques.

Good postoperative analgesia starts with a good preoperative plan. An understanding of the surgical anatomy allows for planning of appropriate regional techniques. Any regional technique should be discussed with patients and their parents, as should ideally the use of patient-controlled analgesia (PCA), where appropriate. (Any child who has a PlayStation or Game Boy can use a PCA!) Get parental consent for the use of suppositories.

## Non-opioid analgesics

Non-opioid analgesics should be started intraoperatively and continued *regularly* in the postoperative period, both to prevent the recurrence of severe pain and to reduce opiate requirements and opiate-related side-effects.

## Paracetamol

Paracetamol exerts its analgesic effects by blocking central prostaglandin synthesis, reducing substance P-induced hyperalgesia, and modulating the production of hyperalgesic

nitric oxide in the spinal cord.<sup>2</sup> It can be given intravenously (Perfalgan®, 15 mg/kg), orally [loading dose 20 mg/kg, then 15 mg/kg four times a day (qds)] or rectally (loading dose 30–40 mg/kg, then 15 mg/kg qds).

Exposure to paracetamol in the first year of life has been linked to the development of asthma and atopy in children. There is no clear causal relationship and it needs to be investigated further, but it has led to a warning about the uncritical and overzealous use of over-the-counter paracetamol. However, there is no clear evidence to suggest that our perioperative use of paracetamol in current practice should be changed.<sup>3</sup>

### Nonsteroidal anti-inflammatory drugs

Nonsteroidal anti-inflammatory drugs (NSAIDs) inhibit the enzyme cyclo-oxygenase, reducing prostaglandin synthesis at the site of injury and diminishing the inflammatory cascade.<sup>4</sup> There is no clear advantage of using one NSAID over another. Contraindications and side-effects apply to the class (Table I).

Postoperatively, NSAIDs should be given regularly, not on a *pro re nata* basis. Try to avoid suppositories (parents and children dislike them), and avoid any intramuscular or subcutaneous injection.

The use of NSAIDs in tonsillectomy is controversial. Although a Cochrane review found that the use of NSAIDs did not cause any increase in bleeding requiring a return to theatre, some authors have cautioned against the use of ketorolac as the NSAID of choice for a tonsillectomy.

NSAIDs have not been shown to increase the risk of fracture non-union in children, and are extremely effective analgesics for bone pain.

### Opioid analgesics

Opioid analgesics are indicated for the treatment of moderate to severe pain after surgery (Table II).

The use of PCA in children is increasing. PCA offers a child flexibility and control over his pain management. In an environment of nursing shortages, it is probably wise to avoid a background infusion if PCA morphine is chosen. Rather use a 10 µg/kg bolus per “click” with a 6–10 minute lockout, and ensure that the parents are told not to press the PCA.

Any child receiving an opioid should receive an anti-emetic (dexamethasone 0.15 mg/kg and/or ondansetron 0.1 mg/kg).

### A brief word on ketamine

A single intraoperative dose of ketamine as part of an analgesic regimen has not been shown to improve postoperative analgesia in children, and its routine use is not warranted. As we do not have preservative-free ketamine in South Africa, it should not be used as a caudal additive.

### Local or regional anaesthesia

Every child should receive some form of local or regional anaesthesia, unless there is a specific reason not to. This is the overwhelming consensus from The Society of Pediatric Anesthesia and other similar bodies.

**Table I:** Commonly used nonsteroidal anti-inflammatory drugs in children

Agent	Dose (mg/kg)	Route	Frequency	Comments
Ibuprofen	10	Oral	Twice daily	Over three months of age Present in Myprodol® at 100mg/5 ml
Diclofenac	1	Oral/rectal	Two or three times daily	Children and parents dislike suppositories
Ketorolac	0.3–0.5	Slow intravenous infusion	Three times daily	Possible increased risk of bleeding ?Avoid in tonsillectomy
Parecoxib (Rayzon®)	?0.5–1.0	Slow intravenous infusion	Daily	No clear dosage guidelines in children

**Table II:** Oral opioids in common usage

Agent	Dose (mg/kg)	Frequency	Comments
Codeine	0.5–1.0	4–6 hourly	Myprodol® 5 mg/5 ml Stopayne® 5 mg/5 ml
Tramadol	1.0	4–6 hourly	Also intravenous infusion
Tilidine (Valoron®)	1.0	4–6 hourly	2.5 mg/drop Dose to weight rather than age

Local anaesthesia:

- Provides the most effective analgesia.
- Reduces the stress response to surgery more effectively than any other analgesic, by blocking both afferent and efferent pain pathways.
- Reduces the requirement of opioids and thus opioid-related side-effects.
- Possibly reduces the incidence of chronic pain.

Local or regional procedures are best performed prior to surgery (even though the concept of pre-emptive analgesia is admittedly controversial), and supplemented with local infiltration of the surgical site at the end of the procedure if required.

Central neuraxial blocks via the caudal route remain popular in children as they are safe (no permanent adverse outcomes in a series of 18 050 children), effective and easy to perform. The drawback of a “single-shot” caudal is its short duration (up to four hours at best). Currently available additives in South Africa include the opiates and clonidine, which both prolong the duration and improve the quality of the block, though the use of an epidural opiate mandates postoperative monitoring for respiratory complications. Caudal catheters are easy to advance in young children and offer advantages in long surgery (e.g. Kasai procedure).

Peripheral nerve blocks of, for example, the sciatic, femoral, saphenous or popliteal nerves in orthopaedic surgery (using a nerve stimulator or ultrasound guidance), offer several advantages over caudal analgesia:

- The block works in a targeted area.
- Side-effects of caudal analgesia are minimised (e.g. extremity weakness, urinary retention).

- The total dose of local anaesthetic is reduced.
- There is no risk of spinal anaesthesia.

The use of peripheral nerve catheters allows for prolonged analgesia, even post-discharge.

Plexus blocks such as paravertebral blocks, are extremely useful for abdominal surgery that does not cross the midline (e.g. nephrectomy).

Trunk blocks, such as ilioinguinal, rectus sheath and transversus abdominis plane (TAP) blocks, are easy to perform with ultrasound and provide effective analgesia for several procedures.

## Conclusion

In summary, effective pain management in children hinges on getting the basics right (paracetamol and NSAIDs), using regional techniques wherever possible, and using opioids as rescue therapy. An analgesic plan may contribute to not only an improved perioperative experience for a child and his parents, but could potentially have far-reaching effects on that child’s behaviour and neurodevelopment.

## Bibliography

1. Messerer B, Gutmann A, Weinberg A, Sandner-Kiessling A. Implementation of a standardized pain management in a pediatric surgery unit. *Pediatr Surg Int.* 2010;26:879-889.
2. Vergheze S, Hannallah R. Acute pain management in children. *J Pain Res.* 2010;3:105-123.
3. Dharmage S, Allen K. Does regular paracetamol ingestion increase the risk of developing asthma? *Clin Exp Allergy.* 2011;41:459-460.
4. Kokki H. Nonsteroidal anti-inflammatory drugs for postoperative pain - a focus on children. *Pediatr Drugs.* 2003;5:103-123.

More references are available on request.