

# The management of acute pain after gynaecological surgery

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## Abstract

We have an improved understanding of the pathophysiology and impact of perioperative pain. Targeted interventions to prevent and manage nociception are effective in improving patient satisfaction and surgical outcome. There are many alternatives, each with its own profile of benefits, risks and side-effects. A logical, stepwise, balanced approach utilising multiple modalities is effective, scales easily to the type of surgery, can adapt to changing requirements and resources, and promotes a seamless transition from theatre care to the ward and patient self-reliance.

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## Introduction

The pathophysiology of pain is complex. Fortunately, the management of pain need not be. In this brief overview only acute perioperative pain will be considered, and not the equally important (and more prevalent) problem of chronic or cyclical pain.

The prevention and treatment of acute pain is important. The modern emphasis on managed care and shorter hospital stays has focused surgeons' attention on elements of patient care that can be improved.<sup>1</sup> Reducing or even eliminating postoperative pain, without introducing excessive sedation, promotes rapid mobilisation and return to autonomy.<sup>2</sup> Targeted multimodal pain management can reduce post-operative ileus and other adverse reactions to analgesics.<sup>3</sup> The psychological effect of perioperative pain or discomfort is difficult to gauge, and is dependent on many factors, including patient expectations, individual tolerance, sense of self-determination, previous exposure, gender, age, culture and beliefs and many others.<sup>4,5</sup> Pain or related complications will distract from the patient's satisfaction with her management.<sup>6</sup> A clear plan for analgesia will improve satisfaction, even though pain is not completely avoided.<sup>7</sup>

## Harmful effects of pain

Pain has a profound impact on the patient's morale and normal functioning. It creates a detrimental cycle

of sleep deprivation, immobilisation and anxiety, which may aggravate and perpetuate pain. In addition, the pathophysiological effects of pain on the cardiovascular, respiratory, gastrointestinal and other organ systems may lead to significant morbidity and mortality.<sup>8</sup> In obstetric surgery, these effects may also impact on the newborn.<sup>9</sup>

In addition, unopposed nociceptor input will lead to an activity-dependent increase in the excitability of the neurons in the dorsal horn of the spinal cord, causing an alteration in the perception of painful (and later even normal) stimuli. Low-threshold mechanical receptors may be recruited and even normal touch may eventually contribute to pain, a phenomenon called allodynia.<sup>8</sup> These processes are complex and incompletely understood, but this neural wind-up implies that pain will precipitate more pain. This paves the way for chronic pain syndromes.<sup>2</sup> Some of these neuropathic pain syndromes, e.g. complex regional pain syndrome (also known as causalgia or reflex sympathetic dystrophy), are notoriously difficult to treat.<sup>10</sup> Effective, early analgesia may prevent chronic pain syndromes.<sup>2</sup>

## Pathophysiology of acute pain

The pathophysiology of pain is a popular focus of current research, and we have gained significant new insights. Pain is a complex physiological process that has mechanical, neurological, humoral and

psychological limbs. There is only room for a short summary here, in order to illustrate the importance of a multi-tiered approach to management.<sup>1,3,11</sup>

Pain manifests via several pathways, including the direct effect of mediators on nerve endings, the amplification of other pain signals and humoral mediators.

The early, local responses to tissue injury due to acute surgical trauma include the release of potassium, serotonin and histamine from damaged cells, and bradykinin from damaged vessels.<sup>8</sup> This initiates prostaglandin release at nociceptive endings, leading to nociceptor sensitisation, an increase in vascular permeability, and primary hyperalgesia. Normal nerve conduction along pain fibres results in the release of substance P in and around the site of injury, and increased secretion of noradrenaline. Substance P triggers further release of bradykinin, histamine from mast cells and 5-hydroxytryptamine from platelets, exacerbating the inflammatory response.<sup>8</sup>

Inflammation in itself is painful.<sup>11</sup> In turn, pain will also induce inflammation via humoral mediators. The presence of pain therefore may have a physiological effect similar to the initial injury, and may even induce an identical or exaggerated inflammatory injury in an uninjured limb, as seen in reflex sympathetic dystrophy. An important principle has been established: pain is difficult to control without controlling ongoing inflammation.

### Balanced analgesia

When considering optimal analgesia, one would wish for an easily titratable agent that provides comfort for the patient, without harmful or unpleasant side-effects, and allows early mobilisation and rapid discharge. All this should ideally be achieved at a low cost and low logistical overhead (e.g. not requiring special skills or qualification to administer, and freely available).

Unfortunately no such panacea is currently available, and some of the ideal benefits need to be traded off against an improved safety profile. Common analgesic options all carry risks that may include death (by respiratory depression or anaphylaxis), severe discomfort (like nausea and vomiting or pruritis) or serious collateral organ damage (renal failure, bleeding, respiratory depression, liver damage, gastrointestinal ulceration, ileus) or sedation. Avoidance of these risks has traditionally led to undertreatment of pain. Patient safety is paramount. Yet it is important to realise that death by analgesia is rare, and mostly associated with the inappropriate administration of opiates.<sup>2</sup>

There are several alternative treatment options to consider. In addition, synergism, when combining

drugs from different classes, allows the limitation of side-effects by significantly lowering the dose requirements of individual drugs.<sup>2,12-14</sup> By titrating combinations of analgesics to the patient's individual needs and the surgical "landscape", analgesia can be practical, achievable and safe.

Successfully managing pain does not mean merely picking a suitable analgesic drug. A balanced, comprehensive approach is advocated. First, the individual patient should be considered. The scale of the surgery and the patient's pain threshold, expectations and circumstances are relevant. Next, consider alternative means to limit or treat pain. These may include a less invasive surgical approach, local infiltration or nerve blocks, electrical stimulation, application of heat therapy or even acupuncture or hypnosis. An analgesic plan should always include patient counselling. A realistic expectation about the severity, duration and planned management of their perioperative discomfort may decrease patients' consumption of strong analgesics.

A neglected tool is the use of standardised pain scales to guide therapy. It can be very difficult to judge a patient's requirements for and response to analgesia. Several such scales have been described, to suit the communication skills of the patient. A visual analogue scale "smile-o-meter" is simple, practical and reliable.<sup>7</sup>

### Multimodal pain management strategy

It is important to consider and treat all aspects of the pain axis, using all the modalities available.

#### *Before onset of painful stimuli*

- Preoperative interview.
- Establish unique requirements.
- Ameliorate anxiety and emotional component.
- Consider pre-emptive analgesia.

#### *During surgery*

- Minimally invasive techniques.
- Local analgesia at surgery site.

#### *Postoperative care*

A stepped-care approach is desirable, according to scale of surgery and patient response.

- Local and regional analgesia.
- Baseline non-opiate analgesia.
- Opiate rescue analgesia.

Such a stepped approach to postoperative analgesia has been described (Figure 1).<sup>3</sup> The practitioner should keep in mind that the severity of pain is highly subjective. It also varies with the type of surgery, and will vary over time in a given patient. The stepped-care approach may be misleading if considered chronologically: patients often start at step 3 in the immediate postoperative period, and their requirements decline over time. It is preferable to de-escalate effective analgesia (according to patients' reporting or a pain scale), rather than trying to catch up with run-away pain due to initial under-treatment.

### Local anaesthesia

Several options are available to the surgeon for intraoperative local anaesthetic supplementation of systemic analgesia. Apart from limiting tissue damage as far as possible, local anaesthetic solutions may be applied to the surgical site by nebulisation, infiltration or irrigation.<sup>15-19</sup>

The use of local anaesthetics remote from the surgical site is traditionally (but not exclusively) left in the hands of the anaesthetist. The use of such techniques varies greatly according to the practitioner's preferences and expertise. Despite numerous studies, clear evidence of survival benefit is still lacking. This may be related to the type of surgery. For example, lumbar epidural analgesia is more effective than intravenous patient-controlled analgesia after colon surgery, but not after abdominal hysterectomy,<sup>2</sup> or oncology surgery.<sup>20</sup> Nevertheless, the use of regional or axial nerve blocks greatly simplifies the anaesthetic and early postoperative care. The increased use of indwelling catheters, now also in peripheral nerve blocks, prolongs the duration of nerve

blocks almost indefinitely and may be the answer to obtain maximum benefit after major surgery.

There are numerous regional and axial techniques available that would be suitable for gynaecological surgery. Certainly, the use of epidurals and spinal anaesthesia in obstetrics is well established. A detailed discussion of these techniques is beyond the scope of this presentation, but it may be useful to mention the transverse abdominis plane (TAP) block.<sup>21,22</sup> This is a particularly simple, safe and effective technique that may provide analgesia for lower abdominal surgery for 12 hours or more. It has been shown to decrease morphine requirements by more than 50%, even after 48 hours. It is best performed with the aid of ultrasound. While it does not provide analgesia for visceral pain, the TAP block allows comfortable mobilisation without the risk of the hypotension and muscle weakness associated with the epidural techniques. For example, after abdominal hysterectomy, it effectively allows pain management similar to that achievable in a transvaginal procedure.

Generally, the anaesthetist would provide the patient's analgesic requirements during the operation and in the immediate postoperative period in the recovery ward. Some of the drugs or blocks used during this period will carry over into the first postoperative day. Often the anaesthetist would be delighted to take responsibility for the patient's care beyond this, especially if high care, ventilation or continuous infusion of analgesics or inotropes is required. For most uncomplicated cases, though, the surgeon is left to manage the patient's pain for the duration of her stay and after discharge home. Here, in particular, it is helpful to have a stepped approach that follows smoothly from the immediate perioperative period, and is adaptable to the patient's

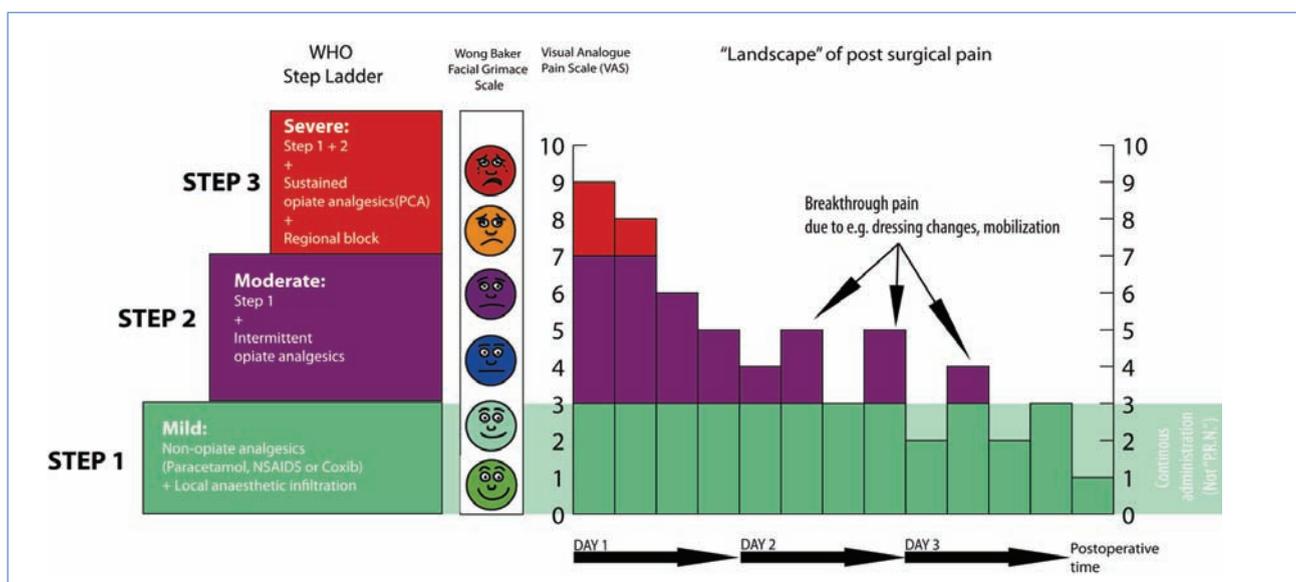


Figure 1: Stepped-care model of postoperative analgesia, showing the impact of patient-reported pain scores and postoperative pain evolution over time<sup>3</sup>

postoperative course. Normally, pain and analgesic requirements should de-escalate over the course of the first three postoperative days.

When prescribing analgesic drugs, a multimodal approach works best.<sup>3,14</sup> At least two classes of analgesics should be combined. A sustained background of a mild analgesic with anti-inflammatory properties is to be given regularly, together with a “rescue” alternative, when required, for more severe pain during mobilisation or interventions. The treating clinician should always have a backup plan.

### Non-opiate analgesics

These address mainly the peripheral, inflammatory component of pain and are ideal baseline analgesics. They are generally safe, with a low risk of life-threatening side-effects.<sup>11,13</sup> They will decrease opiate requirements, and may be sufficient as the sole agents of analgesia.<sup>23</sup> It is important to commence these before the intra-operative drugs or block wears off. They should be given regularly, not on an as-required basis.

There are two main categories of non-opiate analgesics, as summarised in Table I.

The mechanism of action of the cyclo-oxygenase (COX) inhibitors is well known, and explains the associated side-effects and contraindications (Figure 2).<sup>8</sup>

**Table I: Classification of non-opiate analgesics**<sup>8,24,25</sup>

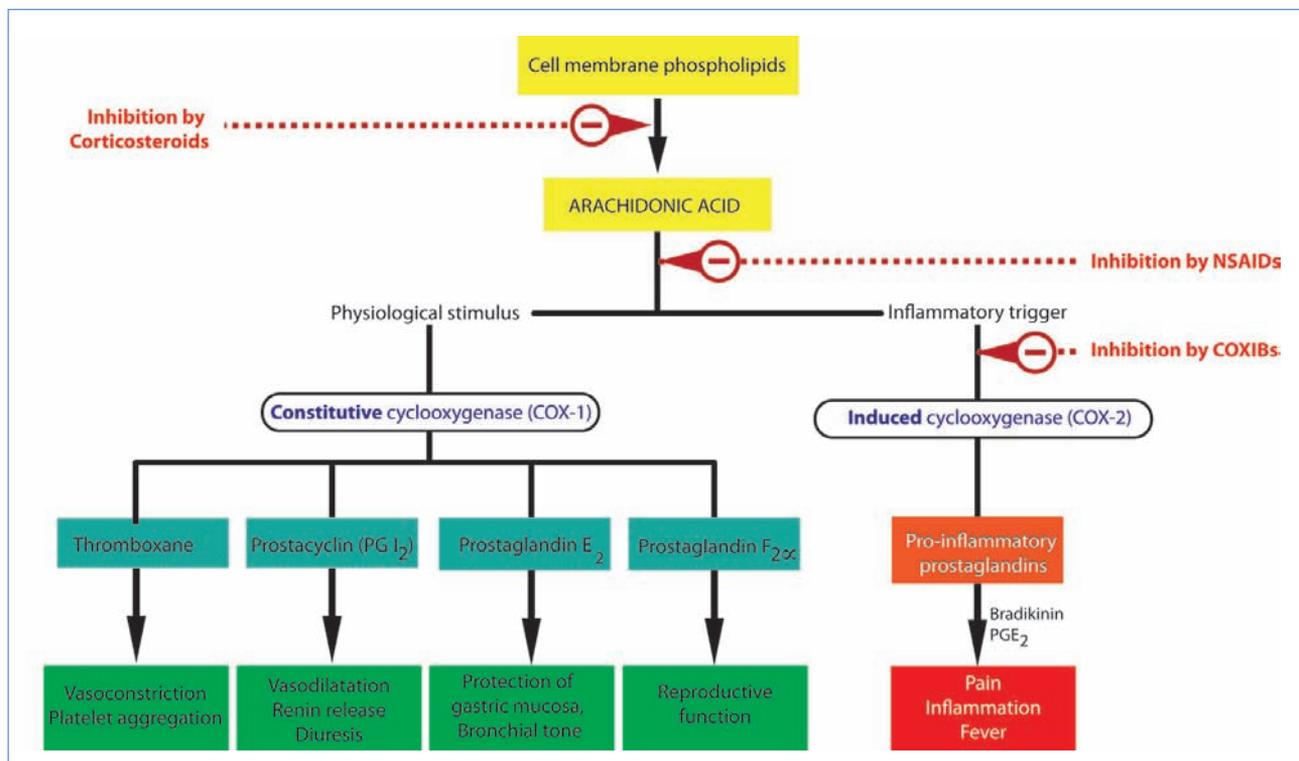
• Cyclo-oxygenase (COX) inhibitors
– Non-selective
◦ <sup>a</sup> NSAIDs
◦ Aspirin
– COX-2 selective NSAID's (Coxibs)
• Paracetamol

a = nonsteroidal anti-inflammatory drugs

COX inhibitors still have potentially serious side-effects that may limit their usefulness in the immediate perioperative period. These include gastrointestinal toxicity, renal toxicity, impaired platelet function, hepatotoxicity, bronchospasm in susceptible individuals, decreased bone metabolism and increased risk of cardiovascular adverse events (stroke or infarction).<sup>2,8</sup> Bleeding and renal toxicity secondary to hypovolaemia are the most serious adverse effects. Unfortunately both are most likely to occur just after surgery.

The above-mentioned risks may be partially circumvented by choosing a COX-2-selective agent. It is important to note that, while they are safer, they should still not be used in patients at risk of bleeding or hypovolaemia.<sup>26</sup>

A better choice may be to use paracetamol.<sup>14,24,25</sup> This



**Figure 2: Mechanism of action of cyclo-oxygenase inhibitors**<sup>8</sup>

underappreciated agent has received more attention lately, because of the availability of an intravenous (IV) formulation. Its safety profile is well established. Its reputation as a “weak” analgesic is probably undeserved and mostly due to underdosing. In an adult, it provides good baseline analgesia, given as a regular dose of 1g six-hourly IV, or four-hourly per os. It does not increase the risk of bleeding and is not harmful to the kidney in therapeutic doses. However, it should be remembered that even though it is a potent antipyretic, it does not have useful anti-inflammatory properties and should be supplemented with a nonsteroidal anti-inflammatory drug (NSAID) as soon as it is safe.

### Opiate analgesics

In addition to baseline analgesia, stronger analgesia should be provided for breakthrough pain or pain during mobilisation or interventions (e.g. dressing changes or physiotherapy).<sup>3,11</sup> Typically, an opiate drug is chosen. The need for these drugs will be greatest on the first postoperative day, and should decline rapidly thereafter. If more than three or four doses per 24 hours is anticipated or requested, it may be wise to consider a continuous infusion. Opiate infusions are associated with significant respiratory side-effects, and are best administered by a patient-controlled analgesia (PCA) pump, under the care of an anaesthetist.

Table II shows a classification of opiate analgesics.<sup>11</sup>

**Table II:** Classification of opiate analgesics<sup>11</sup>

• Alpha agonists
– Morphine, meperidine, fentanyl, methadone, codeine, oxycodone
• Agonist/antagonists
– Mixed $\mu, \kappa$
– Partial agonists, e.g. buprenorphine, nalbuphine
– Weak opiate with other effects, e.g. tramadol

There are significant differences between these agents. However, there are a few important concepts common to all:

- All opiates have serious side-effects.
- Nausea is so common that opiates should always be prescribed together with an antiemetic.<sup>11</sup>
- There is little difference in respiratory effects between morphine and meperidine.
- Tramadol is safer, but a weak analgesic with a high incidence of postoperative nausea and vomiting.<sup>11,27</sup>

Opiates may be administered by several routes. In order of efficacy, they are:

- Intrathecal: only in the intensive care unit (ICU).
- IV infusion: only in ICU.
- Intermittent IV bolus: preferably by PCA, unless in ICU.
- Intermittent bolus via subcutaneous cannula (SC).
- Intermittent bolus via intramuscular injection (IM).
- Oral (per os).
- Rectal.

For mild-to-moderate pain, occasional intermittent bolus opiates via SC cannula or IM injection is adequate.<sup>7,28</sup> If the patient is likely to require frequent boluses or infusion, referral is advised to an anaesthesiologist for PCA or to ICU.

### Other analgesics

There are other agents that may be used in multimodal analgesia. These include low-dose ketamine, dexmedetomidine, tricyclic antidepressants, gabapentin and magnesium.<sup>12</sup> However, the additional advantage of these agents is highly variable, and it is best used in theatre or under special circumstances. They require special consideration, and are best left to a pain specialist or anaesthetist.

### Pain after Caesarean section

A Caesarean section is different from other laparotomies, because the needs of the infant should be considered as well. There are two factors contributing to pain in this setting: the incision wound and uterine contractions. Pain after Caesarean section is judged poorly by nursing staff. Inadequate analgesia has a direct impact on infant nursing and health, on the mother’s mobilisation and general wellbeing, and on the risk of thrombotic complications.<sup>9</sup>

NSAIDs have been lauded as particularly effective, while avoiding sedation and other side-effects for the mother or infant.<sup>23</sup> It is a common oversight to allow the anaesthetic (in the majority of cases, a spinal anaesthetic with or without the administration of axial opiates) to wear off before commencing baseline analgesia. It is useful to commence baseline analgesia before leaving theatre. NSAIDs administered via the rectal, intramuscular or intravenous route is a popular choice.<sup>23</sup> It should be noted that this is not indicated in the presence of platelet dysfunction (i.e. the haemolysis, elevated liver enzymes and low platelet count of HELLP syndrome). Combining rectal diclofenac and paracetamol will decrease the opiate requirements postoperatively by 38%.<sup>29</sup>

### Conclusion

Analgesia matters. Death as a result of analgesia is rare,

and mostly related to the dose-related side-effects of opiates. However, this should not be a reason to withhold adequate analgesia from patients. A balanced approach to analgesia works better. Planning ahead and discussion with the patient are important. Tissue damage should be limited as much as possible, and consideration should be given to intraoperative measures. A stepped approach is beneficial in postoperative pain management. The playing field can be levelled with regular (not *pro re nata*) non-opiate analgesics. Paracetamol (IV, rectal or per os) may be the safest option immediately postoperatively if the patient is at risk of bleeding or hypovolaemia, but NSAIDs or coxibs are safe thereafter. These should be used as baseline analgesia to provide comfort and limit inflammation as soon as it is safe to do so. Opiates may be used to bridge over painful periods; any opiate will do, but vigilance is necessary to look for signs of respiratory depression, sedation and nausea. If the patient is likely to need more than three or four doses, the anaesthesiologist should be involved to help with, for example, an epidural or PCA pump.

The South African Society of Anaesthesiologists (SASA) recently published a comprehensive guideline for the management of pain.<sup>30</sup> It is highly recommended that clinicians managing acute pain familiarise themselves with the updated information it contains. The document may be downloaded free of charge from [http://www.sasaweb.com/images/SASA\\_Pain\\_Guidelines.pdf](http://www.sasaweb.com/images/SASA_Pain_Guidelines.pdf)

Postoperative pain should no longer be a source of suffering for patients or their doctors.

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