

Post Caesarean Delivery Analgesia

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POST CAESAREAN DELIVERY ANALGESIA

Aims of this presentation

- Intrathecal morphine (100mcg) is safe and should be used in patients going to regular wards
- Dexamethasone decreases post-operative pain
- Ketamine may have a role in decreasing chronic pain
- Non-steroidal anti-inflammatory drugs are not contra-indicated post delivery

Introduction

Caesarean section (CS) is a common procedure and the most common major surgical procedure worldwide.(1) CS rates vary worldwide, ranging from approximately 10% in Sweden (2) to about 80% in private-sector hospitals in Brazil. (3) In the Saving mothers triennial report of 2011 to 2013, there were 2 831 066 deliveries of which 23,1% were by caesarean delivery. This means that 655686 women had surgery for the delivery of their child, requiring an anaesthetic and post-operative pain management. In kwaZulu Natal this number is 166336 of 576816 deliveries. (4) In the United States in 2014, 1.28 million women underwent caesarean delivery, accounting for 32% of all births. In the private sector in Durban in 2009, the rate was 60%. (5)

Table 1 The number of caesarean section per province

(as modified from: Moodley J, Pattinson R, Fawcus S, Schoon M, Moran N, Shweni P. The confidential enquiry into maternal deaths in South Africa: a case study. BJOG: An International Journal of Obstetrics & Gynaecology. 2014; 121(s4):53-60)

		Numbers of deliveries and Caesarean sections				Caesarean section rate (%)				CS deaths
		2011	2012	2013	Total	2011	2012	2013	Total	
Eastern Cape	CS	28851	30097	30188	89136	24,8	25,4	26,2	25,5	174
	Deliveries	116414	118414	115095	349923					
Free State	CS	10495	11817	11798	34110	21,8	24,1	25,1	23,7	74
	Deliveries	48052	48964	47056	144072					
Gauteng	CS	48611	51659	54083	154353	23,7	24,6	25,5	24,6	253
	Deliveries	204745	209831	212167	626743					
KwaZulu Natal	CS	53905	55018	57413	166336	28,0	28,5	30,0	28,8	273
	Deliveries	192284	192941	191591	576816					
Limpopo	CS	18850	19338	20709	58897	14,8	15,1	16,2	15,4	188
	Deliveries	127554	128034	127889	383477					
Mpumalanga	CS	12215	12749	13357	38321	16,3	16,5	17,4	16,7	117
	Deliveries	74765	77420	76981	229166					
Northern Cape	CS	3951	4024	4089	12064	18,7	19,3	18,6	18,9	20
	Deliveries	21138	20871	21974	63983					
North West	CS	9594	9841	10777	30212	16,4	16,6	18,3	17,1	71
	Deliveries	58448	59127	58836	176411					
Western Cape	CS	22588	23328	26341	72257	24,1	25,1	28,1	25,8	73
	Deliveries	93886	92777	93812	280475					
South Africa	CS	209060	217871	228755	655686	22,3	23,0	24,2	23,2	1243
	Deliveries	937286	948379	945401	2831066					

This makes it essential that anaesthetist knows exactly how to best treat these patients to ensure minimisation of short and long term sequelae. For obstetric anaesthesia providers looking after women undergoing Caesarean delivery, the delivery of effective postoperative analgesia is of primary importance for the following reasons. Firstly, pain, or the avoidance thereof intra and postoperatively, is of ranked of highest importance in woman undergoing caesarean delivery.(6) Secondly, acute pain post operatively may develop into persistent pain which may result in hampered functional recovery, increased opioid use and increased risk of postpartum depression. (7) Thirdly, ensuring adequate post-operative analgesia improves bonding between mother and child.(8)

An ideal method of pain relief after Caesarean section should be cost effective, safe for the mother, require minimal monitoring and use drugs that are not secreted into breast milk. The mother should not be sedated or hampered by equipment that prevents her from moving freely and caring for the new-born. Minor side effects, acceptable in the general population, like nausea and vomiting, pruritus and shivering may interfere with care of the new born, leading to less maternal satisfaction. Drug availability, maternal health conditions, patient preferences and availability of medical expertise and trained support staff also play a role in choice of analgesic method. (9)

Innervation

Post caesarean pain has at least two components to it: visceral and somatic. Visceral pain stimuli from the uterus return via afferent nerve fibres that ascend through the inferior hypogastric plexus and enter the spinal cord via the T10-L1 nerves. Bowel, innervated by spinal levels T8-12 has stretch receptors which when manipulated also causes patient discomfort. Somatic pain arises from nociceptors within the abdominal wound and has superficial and deep components to it. It is transmitted within the anterior divisions of the spinal segmental nerves – usually T10-L1 for a Pfannenstiel incision- and run laterally in the abdominal wall between layers of transversus abdominis and internal oblique muscles. The level will change according to the type of incision – lower midline mini laparotomy would include up to level T9/10, whereas a full laparotomy could include up to T6. To cover all pain sources, skin, muscle and intraperitoneal structures must be considered. (10)

Indications for Caesarean section

Indications for delivery by caesarean section can be divided into maternal, foetal and maternal-foetal factors where both would benefit from a caesarean delivery. (11) They are numerous

Maternal

- Repeat caesarean delivery
- Obstructive lesions in the lower genital tract, including malignancies, large vulvovaginal condylomas, obstructive vaginal septa, and leiomyomas of the lower uterine segment that interfere with engagement of the foetal head
- Pelvic abnormalities that preclude engagement or interfere with descent of the foetal presentation in labour
- Certain cardiac conditions that preclude normal Valsalva done by patients during a vaginal delivery
- Request of mother

Foetal

- Situations in which neonatal morbidity and mortality could be decreased by the prevention of trauma
- Malpresentations (e.g., preterm breech presentations, non-frank breech term foetuses)
- Certain congenital malformations or skeletal disorders
- Infection
- Prolonged acidaemia

Both mother and foetus benefit

- Abnormal placentation (e.g., placenta previa, placenta accreta)
- Abnormal labour due to cephalopelvic disproportion
- Situations in which labour is contraindicated

Acute and chronic pain after caesarean delivery

The International Association for the Study of Pain (IASP) defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”. Chronic pain is more complicated and has various classifications and definitions. The IASP defines chronic pain as “pain without apparent biological value that has persisted beyond the normal tissue healing time usually taken to be 3 months.” (12)

Research in the last few years has allowed us to predict mothers at risk of pain and their consequent analgesic needs. Important predictive factors of acute post-operative pain include anxiety, maternal expectation and surgical duration. (13)

Chronic incisional and pelvic pain may occur after caesarean delivery. In a survey of 220 patients, Nikolajsen et al.(14), in a found that 12.3% of patients, at six months, experienced pain that was severe enough to influence infant care. The incidence of persistent daily pain at one year was 6%. Other studies found varying incidences for need for analgesia at six months ranging from 1-18%. Chronic pain can contribute to postpartum depression. (15) Compared to vaginal delivery, the risk of chronic pain and impaired function is higher in the caesarean delivery population.(16) However, the incidence of chronic pain appears to be lower in the caesarean population when compared to non-obstetric surgeries.

Interventions to decrease the incidence and severity of the development of chronic pain have had mixed results. This could be due to the complex nature of chronic pain and multiple aetiologies. Risk factors include psychosocial factors such as anxiety, pain, catastrophising and depression. (17) Severe acute post-operative pain is one of that factors most commonly associated with persistent pain after caesarean section. (7, 14, 18, 19) Therefore, it is of utmost importance to control pain in the acute phase, to treat it aggressively to reduce the risk of chronic/persistent pain and identify those women with severe acute pain as high risk for developing chronic pain in the future and treat them adequately.

Several approaches to reduce the likelihood of chronic post-operative pain have been recommended. Regional and/or neuraxial techniques may be associated with a lower incidence of persistent pain post caesarean section and hysterectomy when compared with general anaesthesia. (14, 20) Multimodal perioperative analgesia including ketamine and neuraxial clonidine may reduce central sensitisation leading to a reduction of chronic pain incidence. (21) de Brito et al randomised 443 patients into five different groups each receiving intrathecal sufentanil 2,5mcg, morphine 100mcg and between 8mg and 15mg 0,5% bupivacaine. All but one group received post-operative NSAIDs. Patients receiving a 8mg bupivacaine as well as those without post op NSAIDS showed an eight time increase in development of chronic pain compared to patients receiving a higher dose of bupivacaine 12.5mg as well as NSAIDS. (22)

Anaesthetic techniques

Caesarean sections can be performed under three main types of anaesthesia: general, epidural and spinal. Various factors influence the choice used. Patient preferences and expectations, anticipated surgical duration and difficulty and the preference and experience of the anaesthetist. Hospitals may also be limited to certain methods due to staff education, training, workload or drug availability. On the other hand, some methods are contra indicated in certain obstetric conditions, including patient refusal, bleeding diatheses and local infection. Thus, the analgesic options are numerous for post-operative care and the original choice of anaesthetic must be taken into consideration.

An ideal method of pain relief should be cost effective, safe for the mother and infant, require minimal monitoring, minimal to no secretion in breast milk and easy to administer. The techniques should be non-sedative, and not hamper the mother from moving around freely to care for her new-born. Another consideration is that minor side effects that may be tolerated in the general

population such as nausea, pruritus and shivering may interfere with the care the new-born resulting in decreased maternal satisfaction.

Neuraxial techniques

The American Society of Anaesthesiologists and the American Pain Society recommend neuraxial anaesthesia as the preferred modality for caesarean delivery. More than 90% of caesarean sections performed in district hospitals in South Africa are under spinal anaesthesia. When looking at anaesthesia related deaths, many occur due to airway complications, which neuraxial techniques avoid. (4) The use of spinal anaesthesia is also possibly protective for the development of chronic or persistent pain. The importance is what is added to the intrathecal injection to optimise the outcome.

Intrathecal Opioids

Neuraxial opioids provide a high quality of post-caesarean delivery analgesia. Intrathecal opioids act principally on the mu-opioid receptors in the substantia gelatinosa. Intrathecal administration of lipophilic opioids such as fentanyl and sufentanil are both widely given for their intraoperative analgesic effect. However, unless given in high doses (fentanyl 40-60mcg) their effect is short lived. In a systematic review of randomised control trials, Dahls et al. found that ten to twenty five micrograms of intrathecal fentanyl improves intra operative analgesia but only has a median effect of 4 hours.(23) It has little effect on the 24-hour opioid consumption post operatively. Many hospitals in KZN use 18mg bupivacaine mixed with dextrose and 10mcg fentanyl.

Continuing with the review by Dahl et al.(23) looked at the time to first analgesic doses dependant on various opioid use via the intrathecal route. The median time to first administration of analgesic with local anaesthetic alone (control) was 2 h (range, 1–4 h) in 10 studies with bupivacaine, and 1 h and 8 h in two studies with lidocaine and tetracaine, respectively.

Belzerana et al (24) studied 100 healthy women given varying doses of intrathecal fentanyl (0-75mcg). Surgical anaesthesia was improved in all the fentanyl groups. They showed a dose response relationship as intrathecal fentanyl was increased ranging from 197min+-77min in the control to 787min+161min in the 75mcg group.

Dahl et al (23) evaluated the data for other studies of intrathecal fentanyl. Except for four comparisons with 2.5 µg, 5 µg, 10 µg, and 25 µg fentanyl, respectively, all comparisons with doses of fentanyl > 6.25 µg increased time to first administration of analgesic.

By comparison, hydrophilic opioids such as morphine exhibit a longer duration of action in the intrathecal space. Intrathecal morphine was first used in obstetric analgesia after caesarean section in the 1980's. In the same systematic review by Dahl (23) in 1999 morphine was evaluated in four studies. Morphine at doses of 0.1 mg and 0.2 mg increased the time to first administration of analgesic in all five comparisons, whereas a 0.05-1mg dose had no significant effect on this outcome in one study. In a study by Uchiyama et al. (25) they looked at 80 patients, randomised into 4 groups of 20. Administration of 0.05 mg, 0.1 mg, and 0.2 mg morphine showed no clear dose–response relationship, but doses above 100mcg showed an increase time to first request for analgesia.

Palmer et al randomised a hundred women to receive 5 different doses of morphine between 0 – 500mcg. Figure 1 shows time to first postoperative analgesic for the different doses. Median time to first analgesic with the various effective doses of morphine was 27 h (range, 11–29 h).

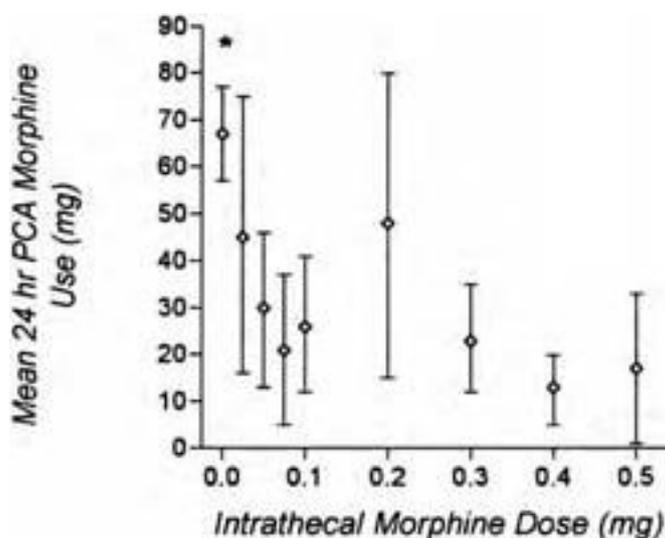


Figure 1: Mean (95% CI) 24-hour patient-controlled morphine use with increasing doses of intrathecal morphine demonstrating continued use of intravenous morphine even at high doses of intrathecal morphine. * $P < 0.05$. From: Palmer et al. *Anesthesiology* 1999; 90:437-444. (26)

Sultan et al (27) repeated a meta-analysis on the outcomes of intrathecal morphine dose on outcomes after a caesarean section. Their primary objective was to compare low dose (LD) (50-100mcg) with high dose (HD) (100-250mcg) intrathecal morphine to time of request of supplementary analgesia. They found 7 suitable studies that included data on 294 subjects in total. The range of mean times for first request for additional analgesia in the LD group were 9.7-26.6 hours and in the HD group was 13.8-39.5 hours. This is a significant increase from the short duration of action of intrathecal fentanyl. This would also allow the patients to nurse their babies as well as mobilise without pain after delivery.

The mean time to requirement of supplemental analgesia was in the HD was 4,5 hours longer than in the LD. There was little dose response in the range of 0-125mcg, and comparatively no added side effects in this group. No difference was found in the HD and LD pain scores and morphine consumption in 24 hours, most studies did not follow the patients up longer than this. Problems highlighted in the studies that used pain scores and morphine use as surrogate markers of intrathecal opioid analgesic duration, included regional differences in pain scales and opioid use, postpartum maternal avoidance of opioids despite presence of pain to minimise breastfeeding related neonatal drug exposure.

Side effects of intrathecal morphine are much more dramatic than those of fentanyl. Side effects include pruritus (most commonly), nausea and vomiting, reactivation of oral herpes simplex, urinary retention and delayed respiratory depression. In the same meta-analysis, Sultan et al (27) found that in the high dose (more than 100mcg) group of intrathecal morphine, the number needed to harm for pruritus and severe pruritus was 5,9 and 7 respectively was higher than in the low dose morphine group with an odds ratio of 0,44 (95%CI, 0.27, 0.73). Similarly, the odds ratio of nausea and vomiting in the HD group was 0,34 (95%CI, 0.20, 0.59). Anti-emetic use was higher in the HD group (52% vs 24%). When using 100mcg morphine, 43% of women will experience pruritus, 12% vomiting and 10% nausea. (13) Of the eight studies that investigated maternal respiratory depression, none reported any in the 24 hours that patients were monitored. This included both the LD and HD groups. (Respiratory depression was defined as the following: respiratory rate less than ten or eight breaths per minute, or decreased oxygen saturation of less than 93% with a respiratory rate of less than ten). (27) A suggested explanation is that

physiological changes in pregnancy, specifically the higher respiratory rate associated with elevated progesterone levels may provide an increased margin of safety in comparison to other patient populations. (13)

An online survey by the Society of Obstetric anaesthesia and Perinatology members demonstrated that the majority used intrathecal morphine in a dose between 50mcg and 250mcg with the most common being 200mcg (38%). It seems that 100mcg of morphine lessens side effects and still has a decent duration of analgesia to offer to the patient without the need for a high care bed.

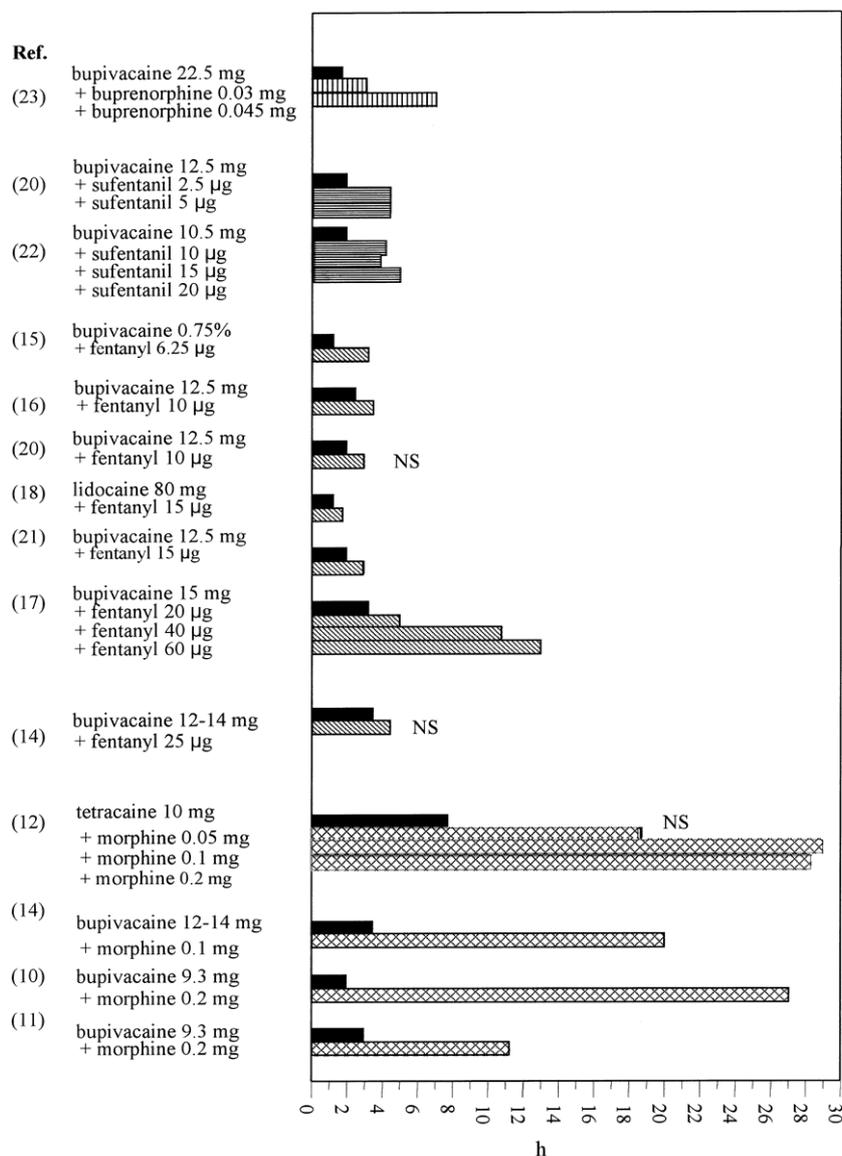


Fig. 2 Time to first administration (hours) of postoperative supplemental analgesics in patients receiving spinal anaesthesia with local anaesthetic alone (solid bars) or local anaesthetic combined with buprenorphine, sufentanil, fentanyl, or morphine in varying doses (various bars). NS = no statistically significant difference from control. (27)

Epidural opioids

For woman with labour epidurals that require intrapartum caesarean delivery, it is recommended that morphine is added to the epidural for post-operative analgesia. Sultan et al (27) found that there was a dose dependant response to the addition of morphine to the epidural with little benefit being gained of doses more than 3,75mg. 2-3mg of morphine in the epidural space has been likened to 75-200mcg of intrathecal morphine.(28) A median time to request for first request for analgesia was 19 hours when morphine was added.

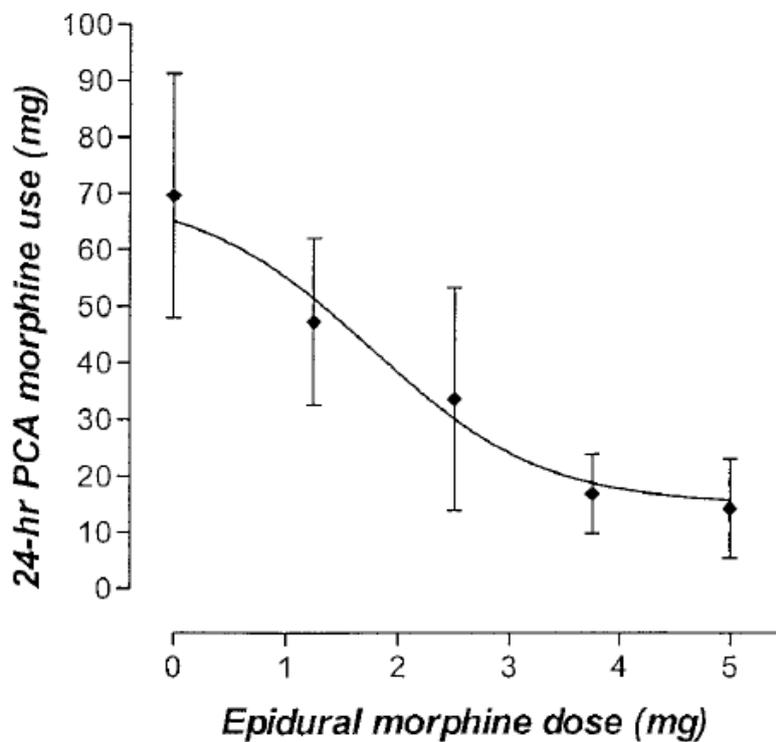


Figure 3: Dose-response curve predicting patient-controlled morphine use (mean 95% CI) after different doses of epidural morphine. From: Palmer CM et al. *Anesth Analg* 2000; 90:887-891. (29)

Clonidine and neostigmine

In a review by *Roelants et al* (30) the addition of adjuvants to neuraxial blocks was examined. The addition of 30mcg clonidine intrathecally caused severe hypotension but improved post-operative analgesia. It also has a FDA black box warning for use in obstetrics due to its haemodynamic instability. It is suggested that it should be reserved for carefully considered patients with chronic pain syndromes. The American Pain Society advises against the use of neostigmine due to its lack of clear benefit, insufficient evidence of safety and side effect profile of severe nausea and vomiting. (31)

Continuous post-operative patient controlled epidural infusions

Continuous epidural infusion may be considered as an analgesic approach in the post-operative period. It has several disadvantages that must be considered: 1) a reduction in maternal mobility due to the need to carry an infusion pump; 2) post-operative pharmacothromboprophylaxis may become complicated; 3) nursing load is increased and the epidural requires a high dependency ward; 4) hospital and patients costs are increased. (32) Once again, patients with chronic pain may benefit from the added comprehensive analgesic effects of a patient controlled epidural infusion and therefore this option should still be available if needed.

Intravenous, Intramuscular and Oral analgesics

Opioids

Patient controlled intravenous opioids are well liked after caesarean delivery due to convenience, safety and consistently high levels of patient satisfaction. Although they offer inferior analgesia to neuraxial opioids, they may be rated more favourably by patients due to increased autonomy that comes with a patient controlled analgesia (PCA). (13) Morphine is popular and is often the standard to which other remedies are compared to. Alfentanil has been added to morphine which may be beneficial in terms of the speed of onset. Fentanyl is also used. Pethidine is rarely used due to accumulation of its active metabolite in breastmilk and adverse effects to the new-born. PCA have several advantages. These include accommodating a wide interpatient variation in terms of analgesic requirements and decreasing the staff workload. More stable drug plasma concentrations will also allow for more reliable pain relief although higher plasma concentrations may lead to increased side effects. There is also a potential for device malfunctions and programming errors leading to patient dissatisfaction.

Nurse administered intramuscular and subcutaneous opioids are very commonly used in South Africa. Although cheap and simple to administer, there are several disadvantages. Blood levels of the drug are likely to vary considerably, the injection is painful, it is labour intensive for staff, and patients may be reluctant to request further doses even though still being in pain. These methods are rarely used in clinical studies and therefore poorly reported in the literature. (13)

Oral opioids have been traditionally used as “step down” treatment after neuraxial or injectable opioids. The South African Acute Pain Guidelines, published by The South African Society of Anaesthesiologists (SASA) recommend codeine 14-40mg 4-6 hourly to be administered as a step-down analgesic.

Oxycodone, a mu-opioid receptor antagonist as well as tramadol, a weak mu opioid receptor agonist with centrally acting noradrenergic, serotonergic and GABAergic activity are other available options of alternative “step down” oral analgesics.(33)

Opioid sparing analgesic options

A multimodal approach to analgesia is important for optimising post-operative pain control and decreasing the requirements of oral or intravenous opioids. This is important as 1 in 300 women who had previously not had any opioids become persistent users of opioids after caesarean delivery. (34) This means that in the three years from 2011 to 2013, 2000 women in South Africa developed some degree of chronic pain requiring opioids after their caesarean sections. The use of multimodal analgesia provides superior pain relief and decreases the need for opioids when compared to a single analgesic approach.

Non-steroidal anti-inflammatories

NSAIDS are key in a multi modal approach. They are particularly useful against the visceral pain that arises from the uterine incision and involution following caesarean delivery. (13) Various studies have shown a 30-50% opioid sparing effect which reduce the opioid-related adverse effects after surgery. For healthy women undergoing an uncomplicated caesarean section, NSAIDs should be given routinely in the post-partum period. Ketorolac has an FDA black box warning for obstetric use because of concerns on effect of neonatal exposure. NSAIDs have minimal transfer to breast milk (less than 1%). See table 2.

Traditional NSAIDS have well documented effects on platelet, renal and gastrointestinal function. They are relatively contraindicated in the post-partum period in women suffering from pre-eclampsia with a potential to compromise renal blood flow, worsen hypertension or even cause a hypertensive crisis. There is much concern about NSAIDS causing uterine atony in the post-

partum period with case reports of severe uterine atony associated with ketorolac. (35) Although there is very little evidence to suggest a causal relationship the use of NSAIDS in women at high risk of post-partum haemorrhage must be carefully considered.

The cyclooxygenase-2 (COX2) inhibitors have been shown to be of little added benefit in limited studies examining their efficacy. Therefore, they should be reserved for patients who are intolerant of the non-selective NSAIDS. (27)

Table 2: Breastmilk Transfer Potential for Commonly Used Analgesics after Caesarean Delivery as Measured by the Relative Infant Doses
Analgesic Relative Infant Dose (%)
Opioids
Morphine 5.8-10.7
Fentanyl 0.9-3
Oxycodone 1.5-8
Hydrocodone 1.6-3.7
Tramadol 2.4-2.9
Non-opioid analgesics
Ibuprofen 0.1-0.7
Ketorolac 0.2-0.4
Celecoxib 0.3
Acetaminophen 1.3-6.4
Dexamethasone No data
Gabapentin 1.3-6.5

The relative infant dose (RID) is expressed as a percentage and is weight-adjusted for the infant, normalizing that amount of drug to which the neonate is exposed relative to the mother's dose. A RID greater than 10% is concerning in terms of infant exposure (34)

Paracetamol

Paracetamol has several proposed mechanisms of action including increased descending serotonergic activity COX 3 and prostaglandin H2 synthetase inhibition and possible cannabinoid mediated mechanisms. (36)

In the peri-operative setting, paracetamol has an approximately 20% opioid sparing effect. It provides effective analgesia, few side effects and minimal transfer to breastmilk. Although often prescribed "as needed" for breakthrough pain, a scheduled regimen is recommended. Valentine et al found that the often prescribed "as needed" paracetamol and opioid for breakthrough pain is inferior to scheduled paracetamol regimens. (37) This approach also decreases the likelihood of patients receiving toxic doses of paracetamol.

Paracetamol and NSAIDS have additive analgesic effects and therefore it is recommended that both are prescribed in the post-operative period. Prescription and administration of intravenous paracetamol results in increased cost and labour intensity. There is a lack of clear evidence to support its use and therefore oral route is recommended in those patients who can tolerate oral medication (e.g. vomiting patients). (27)

Dexamethasone

Glucocorticoids have an antiemetic, analgesic and anti-inflammatory effects. Waldron et al performed a systematic review and meta-analysis of 5796 patients receiving between 1.5 and 20mg dexamethasone. They showed that single pre-operative dose has been shown to reduce post-operative pain in patients undergoing general anaesthesia. Problems with dexamethasone

is the marginal increase in blood glucose at 24 hours post operatively and should therefore be avoided in the insulin resistant population. A single dose does not impair wound healing or increase risk of infection.(38) In a double-blinded and randomised, placebo-controlled trial, Cardoso et al. looked at 70 ASA 1 and 2 patients undergoing caesarean delivery receiving intrathecal bupivacaine 15mg with 60mcg morphine. They showed improved post-operative analgesia and decreases the incidence of nausea and vomiting in women that received dexamethasone 10mg on induction. (39) Doses between 1,25 and 20mg have been described but the optimal dose not yet determined.

Gabapentin

The mechanism of gabapentin has not been fully described. It is thought to act by modulating glutamate decarboxylase and branched chain aminotransferase thereby increasing GABA concentrations. It also interacts with calcium channels, NMDA receptors, protein kinase C and inflammatory cytokines to modulate pain. (36) Gabapentin has been of interest in pre-emptive analgesia as well as supplementing post-operative analgesia. It has been shown to decrease opioid associated vomiting and pruritus. It unfortunately comes with side effects of sedation and dizziness, high transfer rate to foetus and breast milk, causing similar side-effects in the new born. As there is a lack of strong evidence to support significant maternal analgesic effect, it is not recommended for routine use. However, the risk benefit ration may be favourable in some patients with a history of chronic pain or post-operative pain not relieved by standard protocols. A dose of 600mg orally an hour pre-operatively has been shown to improve post-caesarean delivery pain and improve maternal satisfaction. There was no difference in development of persistent pain. (40) It is therefore not effective as a rescue drug but rather for pre-emptive strategies.

Ketamine

Ketamine, an NMDA antagonist, has been widely used in the perioperative setting as an analgesic. It has side effects of hallucinations, visual effects, disturbing dreams, light headedness and dizziness.(36) Administration of 10mg intravenous ketamine showed no difference in acute pain scores in patients receiving intrathecal morphine.(41) However, patients that did not receive intrathecal morphine showed an improvement in perioperative pain scores. (42) Interestingly, a single dose of ketamine intraoperatively has been associated with lower pain scores two weeks post-delivery. (43)

LOCAL ANAESTHETICS

Wound infiltration

In the setting of intrathecal morphine with non-steroidal anti-inflammatories and paracetamol for analgesia, wound infiltration has limited use. However, if this is not an option, pre- and post-incisional infiltration provides superior analgesia when compared to each one alone. Logically then, continuous wound infiltration via catheter based techniques is preferable to a single dose at time of surgery. In their systematic review of 2141 patients, Liu et al found that insertion of wound catheters decreases pain scores, opioid use and associated nausea and vomiting. (44) Sub-fascially cited catheters provide better analgesia than supra-fascial or sub-cutaneous catheters. These catheters only provide pain relief for somatic pain and multimodal regimens are still needed to cover the intra-abdominal sources of pain. A variety of adjuncts have been added to the continuous infusion catheters including NSAIDS, dexamethasone and magnesium sulphate. Some of the study results suggest improvement in analgesia and decreased wound inflammation. However, these have not been compared to systemic administration of these drugs and safety data are lacking.

Transversus abdominis plane (TAP) blocks

Innervation of the anterolateral abdominal wall arises from the anterior rami of spinal nerves T7 to L1. These include the intercostal nerves (T7-T11), the subcostal nerve (T12), and the iliohypogastric and ilioinguinal nerves (L1). (45)

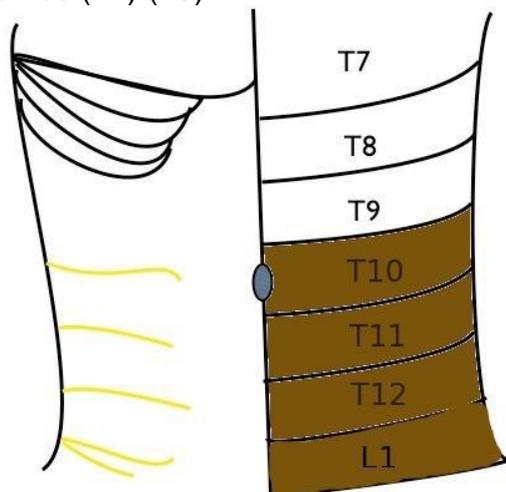


Fig 4. Cutaneous innervation of the abdominal wall. Coloured region is mostly blocked by a single injection posterior TAP block. (45)

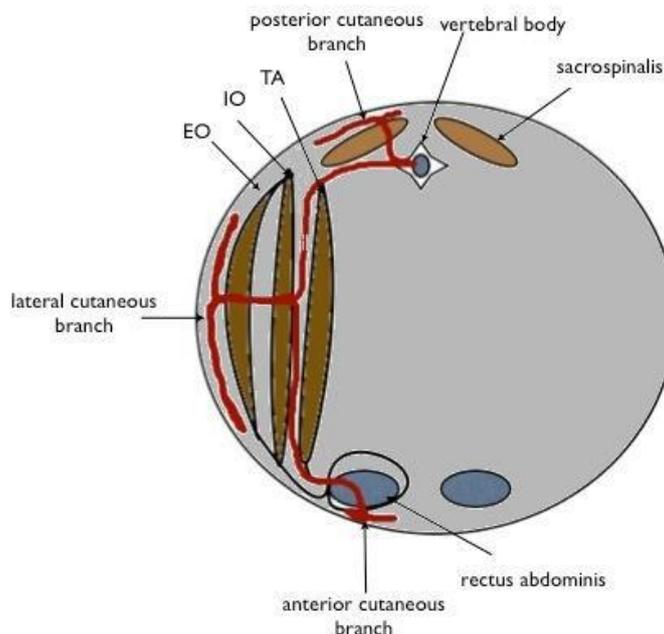


Fig 5. T7 to T12 spinal nerves pathway and branches in the abdominal wall. EO – external oblique, IO- internal oblique, TA- transversus abdominis. (45)

In a systematic review and meta-analysis of 312 patients in five trials, Abdallah et al found TAP blocks at time of surgery decreases post-operative pain in patients that undergo general anaesthesia as well as patients that receive neuraxial anaesthesia without morphine. (46) Therefore they are indicated in the patient who receives a general anaesthetic. The typical duration of sensory blockade with a TAP block is 6-12 hours with a mean duration of 9 hours. It is also useful as a rescue technique in severe postoperative incisional pain not responding to opioid therapy. Once again, catheter based techniques may be used for patients requiring increased duration of analgesia. When compared to wound site infiltration, results are similar in delivery of analgesia for somatic pain. (47) Adjuncts added to the injected local anaesthetic (opioids, clonidine) do not add to its analgesic effect. When compared to intrathecal morphine, TAP blocks resulted in inferior analgesia due to increased visceral pain. Local anaesthetic toxicity has also been reported.

Summary

Intrathecal morphine should be offered in all caesarean sections with the expertise to administer it. Dexamethasone and ketamine could add to the benefit of reduction in chronic pain development. "Round the clock" post-operative analgesia with NSAIDs and paracetamol rather than on demand should be given for 2-3 days. Systemic opioids should be prescribed as needed for breakthrough pain not responding to simple analgesia. In this case, oral opioids such as oxycodone, tramadol, hydrocodone are recommended. Due to its variable pharmacogenomics, codeine is not recommended. Intravenous opioids should be reserved for those patients not tolerating the oral route.

Special consideration must be given to women at increased risk of postoperative pain – general anaesthesia, chronic pain, extensive vertical incision. Options include patient controlled analgesia, patient controlled epidural analgesia, TAP or incision site catheter infusions, ketamine and dexamethasone. TAP blocks may also be used as rescue analgesia.

Conclusion

Caesarean delivery is so common that the details of care are often over looked. Having a comprehensive, multimodal approach to early control of pain may lead to decreased morbidity from this common procedure.

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