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Analgesia after Caesarean delivery in the 21st century

M. Vercauteren

Dept of Anaesthesia, Antwerp University Hospital, Edegem, Belgium

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Pain relief after Caesarean section varies from a single suppository to, high tech, invasive analgesia techniques for 48 h. Despite ethnic differences in pain perception, similar to postoperative pain relief in general, analgesia after Caesarean section may be severely undertreated for several reasons. Parturients are not always considered as 'patients' because there is no disease involved. Unlike a hysterectomy they receive 'something' in return which may motivate them to suffer a little. Not infrequently, pain relief is restricted because of the incorrect belief that this is the best way to avoid sedation, to optimise breast feeding and mobilise the patient eager to care for her baby while preventing thrombo-embolism. Fifteen years ago the duration of hospital stay after Caesarean section patients was approximately 10 days and the choice of analgesic modality had little effect maternal outcome. Although several hundred studies have been undertaken on analgesia after Caesarean delivery, this overview will mainly focus on studies less than 7 years old.

Breast feeding

Analgesics and sedative agents are often considered to be responsible for unsuccessful breast feeding. However, pain relief should not be blamed alone. Other important factors are anxiety, separation of the mother from her child, postpartum tubal ligation, emergency surgical delivery and social factors. Opioids and sedative agents should be titrated carefully rather than administering them in large boluses as used previously. The concentration of opioid has been measured in colostrum in several studies, but estimating their effect upon the neonate seems extremely difficult [1]. Although concentrations may be even greater than in plasma because of the small volumes delivered to the neonate and the low bioavailability of oral opioids they do not seem to affect neonatal behaviour or the quality of breast feeding. On the other hand, and probably more importantly, persistent pain will also adversely affect mother-child bonding and the success of breast feeding. A better quality of analgesia, even if obtained with parenteral morphine, has been found to reduce the incidence of premature arrest of breast feeding [2].

Systemic non-opioid and opioid analgesia

Moderate pain can be treated by simple analgesics such as paracetamol (oral or IV) and NSAIDs. As a Caesarean section requires a lower abdominal incision it may be expected that in the majority of patients the use of these substances, when used alone, may be insufficient. NSAIDs have been shown to reduce pain caused by uterine cramping [3]. Ketorolac has been given pre-operatively resulting in more stable haemodynamics, less pain, and lower cortisol levels without premature closure of the ductus arteriosus [4]. Numerous studies have demonstrated the effectiveness of these agents when used alone, or when combined, on opioid sparing, with a reduction of up to 40%, although this may not be reflected in different pain scores or less side-effects [5]. Analgesics can be given on demand or by a fixed schedule. Drugs that can be administered orally (Caesarean section patients are able to take drugs by the oral route quite early) or intravenously such as ketorolac and parecoxib merit preference over those given intramuscularly.

Although weak to strong opioids may be given as a nurse administered intermittent bolus by different routes, PCA is popular for the relief of many types of postsurgical pain. Morphine is still the most widely used opioid for intravenous PCA. The use of demand doses of 1-2 mg with a 5 min lock-out and a 1 hr limit of 5-8 mg is accepted worldwide. Alternative drugs are piritramide (0.75-2 mg per bolus), or pethidine and tramadol (both as a 20-25 mg bolus), but experience with these substances is more limited. The higher acquisition cost of PCA without a major outcome difference may partly explain the fading popularity of opioid PCA over the last few years. Morphine PCA is mostly used as a rescue technique or study tool to compare with other modalities, rather than as a standard technique.

Neuraxial analgesic techniques

Single or multiple dose epidural opioid analgesia

Opioids may be added to the local anaesthetic agent used for epidural anaesthesia during the surgical procedure. This may prolong analgesia by several hours. Morphine is still the opioid offering the longest duration of analgesia, but its onset is rather slow. Morphine (and tramadol to a lesser extent) is a highly hydrophilic substance with the risk of delayed respiratory depression, especially with doses of 5 mg or more. For pain relief after Caesarean section a dose of 3 mg or less should be sufficient. However, several thousand patients have been treated worldwide with epidural morphine administered on the surgical ward. Lipophilic opioids, on the other hand, may be more useful for intra-operative analgesia because of their rapid onset, but their duration of action is limited to a few hours only casting doubt on their real benefit in terms of outcome. Their use requires extreme vigilance during the first 20 min when plasma concentrations will be the highest and late onset of respiratory depression also seems possible. Fentanyl and sufentanil (and buprenorphine and pethidine to a lesser extent) are the most popular lipophilic substances.

For longer-lasting analgesia, opioid administration may be repeated if the catheter is kept in place postoperatively. Recently, extended release morphine has been used for relief of Caesarean section pain. Doses of 10-17 mg have been suggested but similar precautions should be used as with lower doses of conventional morphine [6].

Single dose intrathecal opioids

Intrathecal morphine offers the longest lasting benefit. Several studies have shown that the optimal dose is 100 µg, or less if combined with NSAIDs. Higher doses will not provide a dose-dependent improvement in analgesia, but will increase side-effects [7]. As the morphine doses are extremely small this modality may have the least effect on breast feeding. When the effect of the spinal morphine is fading, further analgesia can be provided by starting simple agents. Spinal morphine may reactivate oral herpes simplex more frequently than intravenous administration [8].

Fentanyl analogues are better at suppressing intra-operative and visceral pain, but prolong the interval to the first analgesic request by few hours only. Effective doses are fentanyl 6.25µg and sufentanil 2.5µg, but research to determine the optimal dose/effect ratio is lacking.

Prolonged neuraxial pain relief (CEI or PCEA)

Catheters should ideally be placed at the lower thoracic level but often this is not feasible with CSE anaesthesia being the technique of choice in many hospitals practicing low-dose spinal anaesthesia. The crucial question is whether continuous lumbar neuraxial analgesia is too 'sophisticated' a technique to manage post-Caesarean section pain. When used alone, morphine is not the agent of choice for continuous use. Lipophilic opioids, on the other hand, may result in similar dosing, plasma-concentrations, quality of analgesia and side-effects compared with the intravenous route when given as a continuous infusion. However, given by PCEA, the spinal effect seems to be maintained. As lipophilic opioids have a rather short duration of action and local anaesthetics may be of benefit for other reasons (such as thrombo-embolic prophylaxis and accelerated recovery of gastro-intestinal motility), prolonged epidural use of such a combination may, theoretically, be the best option to provide superior analgesia. Different study designs have been used to compare PCEA and CEI with other analgesic modalities including intravenous PCA. The combination of opioids with local anaesthetics may act synergistically and comparisons with IV PCA has shown that the former 'combination' regimen is the most effective. PCEA may use lower analgesic doses than continuous infusions. So far no study has shown an improved outcome with the more expensive PCA modality. In fact during the last seven years there has been no important study of continuous epidural administration for pain relief after Caesarean section.

The falling popularity of the prolonged use of epidural catheters may be attributed to the effects upon micturition and the use of LMWH with concerns about the timing of catheter removal. In addition, when using local anaesthetics, sensory loss (sometimes unilateral) and leg weakness may result maternal requests for cessation of therapy. The use of ropivacaine and levobupivacaine, with less motor block potency, has not been able to stop the decline in the use of the epidural route.

In a cost-efficiency study we compared PCEA (bupivacaine 0.06% + sufentanil 1µg.ml) with a single intrathecal dose of morphine 0.15 mg [9]. Rest and dynamic pain scores were better in the PCEA treated patients especially during the second 24 h period. This did not affect maternal satisfaction, quality of sleep or length of hospital stay (7-8 days at that time). Morphine resulted in more nausea and vomiting, probably because the dose was 50% larger than recommended. The price for the superiority of PCEA was 35 Euros mainly due to the more expensive equipment and prolonged PACU stay. However, cheaper PCA equipment is now available and patients receiving low dose bupivacaine and sufentanil intrathecally can be discharged directly to their room, bypassing the recovery unit. The cost-benefit equation may have shifted, therefore.

Wound infiltration, infusion or PCRA

Local anaesthetics may be administered by direct application to the wound. While a conventional epidural catheter can be placed subcutaneously, more sophisticated techniques consist of a multi-orifice catheter entering the wound at both sides with one part remaining subcutaneously while other arm is placed sub-fascially. However, there is still uncertainty about the optimal placement of such catheters [10]. Pain relief may not be complete because they do not treat uterine cramping or pain from peritoneal structures. The peritoneum is difficult to infiltrate although spraying may be more successful [11]. There is no consistency in the optimal concentration or hourly volume used for Caesarean section or abdominal hysterectomy. The most common concentrations reported are 0.2-0.5 % (bupi-, levobupivacaine or ropivacaine, range 0.125-0.75%) with either boluses of up to 10 ml or infusion rates up to 5 ml.h and total hourly doses of 12 mg of bupi-/levobupivacaine (range 10-25 mg) or 20 mg ropivacaine (range 10-50 mg) [10-14]. There is a lack of studies comparing wound infiltration techniques with more commonly used analgesic modalities. The few comparative studies produced contradictory results [13, 14]. The lack of success with wound techniques may be explained by less than optimal catheter placement or the choice of local anaesthetic concentration. Catheters can be used with an elastomeric pump or PCA pump delivering a preset volume either continuously or on demand. A large choice of catheter types and pumps containing a wide range of volumes and delivering variable infusion rates exist. Prices have increased significantly during recent years (up to 160 Euros), which is far too much in comparison with the questionable benefit.

Less commonly used drugs and techniques

Much concern has been raised recently concerning the development of hyperalgesia and chronic pain following Caesarean section and balanced, multi-modal analgesia may avoid under-treatment. Suggested techniques, despite a lack of studies on optimal dosing, include intravenous ketamine, epidural and intrathecal clonidine, neostigmine and midazolam and wound infusion with NSAIDs and ketamine [15-18]. With the availability of ultrasound equipment, transversus abdominis plane (TAP) blocks have been found to reduce morphine requirements by 75% [19]. Ilio-inguinal and iliohypogastric infusion techniques may also be successful [20].

Conclusions

Parturients do not feel ill and bedridden like other patients undergoing the same incision. Therefore, they dislike motor impairment - a risk with catheters placed in the lumbar area. This may increase the popularity of other modalities such as the use of simple analgesics, single-dose spinal morphine covering the first 24 h and wound-related techniques. The problems with breast feeding have been over-emphasised and require more research. Similarly, more cost-benefit studies are needed to evaluate if the pain in these patients is underestimated and to determine how outcome can be further improved and hospital discharge accelerated. With a 50% reduction in hospital stay over the last 10-15 years, the optimisation of post-Caesarean delivery pain may play a more important role, although obstetricians will need to determine discharge criteria more carefully.

Key Learning Points

- Pain after Caesarean section may be severely underestimated and undertreated, resulting in hyperalgesia, chronic pain, impaired mobility and failed breast feeding. Concentrations of opioids in colostrum are too low to affect neonatal behaviour and breast feeding success.
- Although insufficient when used alone, paracetamol and NSAIDs, preferably in combination and as part of a multi-modal technique may reduce the requirements for other analgesic agents which may have a less desirable side-effect profile.
- PCA and PCEA, for post-Caesarean analgesia are becoming much less popular and do not result in improved outcome as compared with more conventional and cheaper techniques.
- Single-dose neuraxial opioids, especially low-dose intrathecal morphine, may be sufficient during the first 12-24 h, supplemented by non-opioid adjuvant agents.
- Instillation, infusion or PCA techniques of local anaesthetics to the wound or abdominal wall have been increasingly reported. More studies are required to determine the optimal dose, concentration and catheter placement techniques. So far there is insufficient evidence that outcome is better than with other analgesic modalities.

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