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REVIEW

Post-caesarean analgesia

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SUMMARY

Post-caesarean section analgesia is centred on the concept of multimodal analgesia. The analgesic regimen should provide optimal pain relief with minimal maternal side effects and minimal infant exposure via breastfeeding. Neuraxial opioids (morphine, diamorphine, fentanyl, pethidine) are utilized since regional techniques are commonly administered during caesarean section. Systemic analgesia using opioid based patient controlled analgesia (morphine, fentanyl) is commonly used when general anaesthesia is administered during caesarean section. To reduce opioid adverse effects, paracetamol and non-steroidal anti-inflammatory agents are commonly prescribed concomitantly. Increasingly, local anaesthetic blocks are used such as the transversus abdominis plane block to improve analgesia especially when general anaesthesia is administered or neuraxial morphine is not used.

1. Introduction

Management of post-operative pain is critical in mothers undergoing caesarean delivery, as adequate pain relief is required for mothers to quickly regain mobility and begin to care for the newborn. Failure to do so may increase the maternal risk for thromboembolic events, and may adversely affect the success of breast feeding. In addition, severe acute pain after caesarean delivery may progress to chronic pain and therefore requires effective management.[1] An ideal analgesia regimen would provide optimal pain relief with minimal maternal side effects and minimal infant exposure via breast milk, and is easy to administer. While the approach to post-caesarean pain has evolved significantly over the years encompassing a wide variety of analgesics, techniques, and regimens, the current trend is towards the use of a balanced, multimodal analgesia. This review will examine the evidence for commonly used drugs and techniques, as well as new developments in post-caesarean analgesia.

2. Multimodal analgesia

Multimodal analgesia utilizes analgesics acting on different aspects of the pain pathway. Hence patients can receive the benefits of a variety of analgesics with differing mechanisms of action which in combination can have additive or even synergistic effects but with a reduction in side effects experienced as lower doses of each class of drug are needed.[2] For example, non-steroidal anti-inflammatory drugs (NSAIDs) are routinely prescribed alongside neuraxial morphine as the combination has been shown to provide improved post-operative analgesia.[3–6] Huang et al. demonstrated that NSAIDs are particularly effective at reducing the visceral pain of uterine cramps that may follow delivery.[6]

3. Neuraxial analgesia

Regional anaesthesia accounts for 91.8% of caesarean delivery in 2011 in the United Kingdom.[7] It provides a safe and effective method of administering neuraxial opioid analgesia with a well-defined side effect profile. Several large reviews and studies have concluded that neuraxial opioids provide higher quality analgesia compared with the intravenous route.[8–11] A number of opioids are currently in use and they differ in their potency, duration of action and side effects. Intrathecal fentanyl and sufentanil whilst providing excellent intra-operative conditions have short-lived analgesic effects due to their high lipid solubility and rapid uptake into the dorsal horn; therefore they provide little post-operative analgesia. In contrast, morphine has low lipid solubility and penetrates neural tissue slowly resulting in a longer duration of action. However, its rostral spread within the subarachnoid space by bulk flow could lead to complications such as delayed respiratory depression.

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3.1. Intrathecal opioids

Opioids administered into the subarachnoid space act on the mu receptors in the substantia gelatinosa of the dorsal horn by suppressing excitatory neuropeptide release from C fibres.[12] Intrathecal morphine has been given in doses ranging from 0.075 mg[13] to 0.5 mg[14] providing highly effective post-operative analgesia. However, there appears to be a ceiling analgesic effect demonstrated by several studies. A meta-analysis of intrathecal opioids revealed high quality analgesia provided by 0.1–0.2 mg of intrathecal morphine but no additional benefit above 0.2 mg.[9] Median time to first request for supplemental analgesia was 27 h (range 11–29 h). Additionally, intrathecal morphine at doses of 0.05, 0.1 and 0.2 mg reduced pain scores and decreased consumption of supplemental analgesia from 0 to 24 h postoperatively in all comparisons. Palmer et al. randomized 108 women undergoing elective caesarean section to receive 1 of 9 different doses of intrathecal morphine ranging from 0.025 to 0.5 mg with intravenous (IV) patient controlled analgesia (PCA) consumption as primary outcome.[13] The authors demonstrated the 0.075 mg group used 45.7 mg less morphine compared with the control group but there was no significant difference in PCA use with doses above 0.075 mg. Cardoso et al. concluded that a 0.1 mg dose of intrathecal morphine was optimal but also found doses of 0.025–0.05 mg combined with a non-steroidal anti-inflammatory drug to be effective.[3] However, there are studies which have reported that in a small percentage of women, doses of 0.1 mg may be inadequate. Swart et al. found that in women who were given 0.1 mg intrathecal morphine during their elective caesarean section, the majority used less than 10 mg of PCA morphine in the post-operative period but 10% of them used more than 40 mg.[15] Although intrathecal morphine is an effective form of analgesia, monitoring of pain scores, a dedicated acute pain service and provision of multimodal analgesia is still required.

Despite superior analgesia, the significant adverse effects of pruritus, nausea and vomiting, reactivation of herpes simplex, urinary retention, sedation and delayed respiratory depression, which have a higher incidence with intrathecal morphine compared with parenteral opioids, may contribute to lower patient satisfaction scores.[9–11] Dahl et al. estimated that if a 0.1 mg dose is used, 43% of the patients will have pruritus, 12% will suffer from vomiting and 10% from nausea; all of whom would not have experienced these side effects without treatment. Pruritus is often cited as the most frequent and unpleasant adverse event. One randomized prospective study[16] showed significantly higher incidences of pruritus and nausea in doses of 0.25 mg of morphine compared to 0.1 mg.

Respiratory depression is a rare but serious complication of which the incidence in the post-caesarean population is likely to be low.[9] Morphine is highly ionized and does not penetrate into lipid-rich tissues and has an extended duration in the cerebrospinal fluid. Morphine spreads cephalad in the spinal space from bulk flow reaching the trigeminal nerve distribution in about 6–9 h after intrathecal injection in volunteers.[17] Abouleish et al. performed a prospective study investigating the analgesic and side effect profile of 0.2 mg in 856 parturients and found respiratory depression (defined by a SpO2 <85% or a respiratory rate of <10 breaths per minute) in eight patients (0.93%) all of whom were morbidly obese.[18] Hence, women who are at higher risk of respiratory complications, for example those with obstructive sleep apnoea or who are obese should be closely monitored.

3.2. Epidural morphine

Epidural analgesia may provide post-operative analgesia as either a bolus or continuous infusion. Morphine is the most common drug used via this route as a bolus. There are limited studies comparing the efficacy of the epidural versus intrathecal route. Sarvela et al. compared intrathecal morphine 0.1 mg or 0.2 mg with 3 mg epidural morphine. They found no difference in the quality of analgesia but rescue analgesia was requested more often in the 0.1 mg group.[19] Palmer et al. performed a dose response study and administered saline or one of four doses of morphine (1.25, 2.5, 3.75 or 5 mg) and found no difference in PCA morphine for doses above 3.75 mg i.e. no difference in analgesic effect.[20] The duration of analgesic effect was about 18–26 h.

Extended release epidural morphine or Depodur in which morphine is encapsulated in lipid foam particles results in prolonged drug delivery and extended dose-dependent half-life. Extended release epidural morphine at 10 mg and 15 mg has been shown to have less pain in the first 48 h after caesarean delivery when compared to standard epidural morphine 5 mg.[21] Another study compared extended release epidural morphine 10 mg with conventional epidural morphine 4 mg and found that the extended release formulation had lower pain scores with a similar side effect profile.[22]

3.3. Epidural diamorphine

Diamorphine is popular via the epidural route for post-caesarean analgesia in the United Kingdom and is predominantly administered as a bolus. Bloor et al. used diamorphine doses ranging from 2 mg[23,24] to 5 mg.[25] Hallworth et al. compared intrathecal (0.25 mg) with epidural (5 mg) diamorphine in 50 parturients undergoing elective caesarean section in addition to intrathecal bupivacaine 10 mg using a combined spinal-epidural technique. Both groups produced similar durations of post-operative analgesia, quality of analgesia and degree of pruritus but the intrathecal group had a significantly lower incidence of post-operative nausea and vomiting. However, one could argue that Bloor et al.'s study[24] is more relevant as they used more standard doses. They compared 3 mg of epidural diamorphine with 0.3 mg of intrathecal diamorphine and found a similar quality of analgesia but a higher incidence and severity of pruritus in the intrathecal group. The epidural group also had a shorter duration of action (as defined by the time to first request of supplementary analgesia) but a lower incidence of nausea and vomiting.

3.4. Epidural fentanyl

Fentanyl is highly lipid soluble compared to morphine and therefore has a faster onset and shorter duration of action. Therefore, it is commonly given as an epidural infusion rather than as a bolus for post-operative analgesia. However, arguments against epidural infusion include increased risks of infection and haematoma formation associated with prolonged in situ epidural catheters, as well as reduced mobility. There are relatively sparse published data looking into the role of epidural fentanyl in post-operative analgesia. Cohen et al. investigated IV versus epidural fentanyl infusion after elective caesarean section.[26] The groups given IV rather than epidural fentanyl required higher rates of infusion and larger total doses of the drug, reported more pain and experienced more adverse events such as sedation, nausea and vomiting. Cooper et al. reported improved analgesia with patient controlled epidural fentanyl compared to IV morphine with less nausea and drowsiness.[27]

3.5. Epidural pethidine

Epidural pethidine is commonly administered as patient controlled epidural analgesia with 20 mg bolus with a lockout of