Intermittent epidural boluses vs continuous epidural infusion for labour analgesia: which is superior?

Epidurals are considered the gold standard for labour analgesia. The possibility of newer pumps reducing staff workload has reignited interest in the advantages of the intermittent bolus technique, but is this superior to a continuous epidural infusion?

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Since they were introduced, labour epidurals have been subject to much controversy and debate. Nevertheless, epidurals are considered the gold standard for labour analgesia, with uptake in the UK currently around 30% of all births. Over the past four decades, research has optimised the combination of local anaesthetic and opioids used (Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK, 2001). Now, attention turns to how the anaesthetic is best delivered: either by a continuous epidural infusion or regular boluses. Most UK maternity units use a combined approach of a continuous infusion of 0.1% levobupivacaine with 2 mcg/ml fentanyl with additional patient-controlled epidural administrations as required. However, recent advances mean that infusion pumps are capable of administering a bolus at a faster rate and higher pressure, similar to that of a clinician. The possibility of pumps reducing staff workload has reignited interest in the advantages of the intermittent bolus technique. Considering the many variables associated with the complexity of labour analgesia, is it possible to determine which approach is superior?

Continuous epidural infusion

The traditional method of a constant epidural infusion is easy to provide, requiring only a regular infusion pump. It achieves analgesic efficacy without compromising haemodynamic stability and is used widely across the UK. Yet, comparisons with intermittent epidural boluses have identified disadvantages relating to the amount of local anaesthetic used and lability of adequate analgesia (Barbe et al, 2019).

An effective epidural provides sensory block to spinal nerve roots between the levels of T10 and S5. However, too much local anaesthetic, or a pooling, can cause an undesirable additional motor block and further labour difficulties. Continuous infusions are associated with significantly higher consumption of local anaesthetic than intermittent epidural bolus. This is likely to contribute to the increased incidence of motor block found in women receiving constant epidural infusions (Hussain et al, 2020). Motor block complications may result in reduced pelvic floor tone and are associated with many side effects; the second stage of labour may be prolonged, necessitating instrumental delivery, and rates of shoulder dystocia are higher. Motor blocks can also be distressing and uncomfortable for women, as reflected in lower overall maternal satisfaction scores in constant epidural infusion groups.

Currently, there is no standard method of choosing the correct infusion rate, with most units delivering between 5 and 15 ml/h. Inadequate flow rates will reduce the spread of local anaesthetic across spinal nerve roots and cause regression of the sensory block level. This increases anaesthetic workload as parturients require assessment and additional 'rescue top-up' epidural boluses. Despite the addition of patient-controlled epidural administration to help maintain the level of block, evidence still indicates that intermittent epidural bolus requires fewer rescue doses (Carvalho et al, 2016).

Intermittent epidural bolus

This technique delivers boluses of local anaesthetic into the epidural space at timed intervals either by clinicians or, more recently, by sophisticated pumps. The higher volume and

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increased pressure at which the local anaesthetic is delivered is thought to result in a larger, more uniform spread over a greater number of nerve roots. Additionally, in vitro models have shown that whereas continuous infusions use only the proximal port of an epidural catheter, a bolus at higher pressure results in better flow through all orifices (Hogan, 2002).

A meta-analysis (Hussain et al, 2020) confirmed superiority of analgesic effect with this approach. Maternal satisfaction scores, relating to overall care, including efficacy of analgesia, sense of control and ability to push when delivering, were found to be higher in women receiving intermittent epidural bolus. Additionally, the risk of breakthrough pain was reduced by 38%, lessening the burden on anaesthetists having to re-assess the quality of sensory block. However, provision of intermittent epidural bolus will require new and expensive pumps. An alternative is midwife-led boluses, which remain controversial. While midwives are more involved with the patient and therefore likely more conscious of their pain, midwife-led boluses are more labour intensive. It is also important to note that the constant opening of the system to administer the bolus increases the risk of contamination.

Conclusions

Evidence suggests that intermittent epidural boluses have several benefits when compared with continuous infusions. There is demonstrable improvement in epidural drug consumption, pain scores, breakthrough pain, maternal satisfaction and the degree of motor block. This has been found despite heterogeneity in bolus regimens used, suggesting that fluid dynamics and the anatomy of the spinal cord are fundamental to the advantages of intermittent epidural boluses. Further research into bolus timings and volumes is underway. It is proposed that an infusion, combined with automated boluses, may allow for even greater advances in maternal analgesia. Is it now time for maternity centres to change old habits and invest in new pumps?

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