Labour Analgesia for Obstetricians: Epidurals and Beyond

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Abstract

Epidurals remain the gold standard for labour analgesia, especially during the current COVID-19 pandemic. They provide superior analgesia and lower the physiological and chemical responses to labour stress. However, they are associated with higher rates of instrumental delivery, maternal pyrexia and hypotension. Less invasive substitutes include nitrous oxide and parenteral opioids such as patient-controlled analgesia (PCA) with remifentanil. Non-pharmacological methods include hypobirthing and relaxation techniques, giving the mother a less medicalised labour experience. Newer regional techniques such as erector spinae and quadratus lumborum blocks are promising alternatives in those who cannot have or do not want an epidural. This review will outline the indications and contraindications to labour epidural use, and potential alternatives to an epidural.

Introduction

Pain during labour is experienced to varying degrees by all mothers. Its perceived intensity is a complex interplay between physiological and psychosocial factors [1]. 57-65% of labouring mothers receive either analgesia or anaesthesia in the UK [2]. Analgesia can be non-pharmacological, such as hypnobirthing and acupuncture, or pharmacological. Pharmacological agents include inhaled or parenteral drugs, or administration *via* the neuraxial route. More recent techniques include a range of plane blocks using local anaesthetics. National Institute for Clinical Excellence (NICE) consensus remains that epidural anaesthesia is the most effective pain relief in labour [3]. This review aims to assist non-anaesthetists with considering different analgesic regimes for the labouring mother.

Labour epidurals

An epidural involves bathing the nerves that supply the uterus and birth canal with local anaesthetic (often in combination with an opiate like Fentanyl), as they exit the spine. The local anaesthetic is deposited just next to the sac that contains the cerebrospinal fluid (CSF). A catheter can be threaded at the same time, so that additional boluses of medication can be administered. A spinal injection is a one-off injection of local anaesthetic into the CSF. A combined spinal-epidural (CSE) is a combination of both techniques, with a small dose of medication being injected into the CSF through a spinal needle for immediate relief, followed by a catheter being left in the epidural space for continuing administration. Epidural anaesthesia is used in around 33% of labouring women in the UK [4]. Pain from the first stage of labour involves dermatomes T10-L1, spreading more caudally to include S2-S4 nerve roots during the second stage of labour.

Indications

The primary indication for a labour epidural is the provision of analgesia as per maternal request. Epidurals can also be used to reduce physiological and chemical responses to labour in certain circumstances. Epidural mediated reduction in blood pressure may be helpful in hypertensive and pre-eclamptic patients, as well as in some underlying cardiac conditions where a reduction in after load is desirable. Siting of an epidural may also be advised in patients unsuitable for a general anaesthetic, such as those with potentially difficult airways for endotracheal intubation.

Anaesthetists sometimes use the term 'early' epidural, which refers to the siting of an epidural either before labour properly commences or in the early stages of it. It is advocated in patients in whom it is desirable to have one before any anticipated difficulties in labour. These include Pre-Eclampsic Toxaemia (PET) & HELLP (Haemolysis, elevated liver enzymes and low platelets) patients, where blood results including coagulation may worsen as labour progresses, cardiac patients to reduce strain on the heart, and those with substantial risks of a General Anaesthetic (GA) (such as difficult airways or morbidly obese women).

Procedure

Prior to epidural insertion, the patient must be appropriately pre-assessed for suitability and consented for the procedure by an anaesthetist. Intravenous access must be present, as should continuous foetal and intermittent maternal monitoring. Ensuring the patient is adequately positioned is of paramount importance to the anaesthetist to improve the chances of locating the epidural space as safely as possible. Maximum lumbar flexion is desired, either in

the seated position, or in a lateral position depending on the mother or the foetus. Strict asepsis is adhered to. A suitable space between lumbar vertebrae is located through gentle palpation of the back. If the spaces are impalpable, for example in obese patients, ultrasound may be used to assist. The epidural needle is introduced after infiltration of the surrounding skin with local anaesthetic. The needle is advanced until it is gripped by the spinal ligaments. The stylet is removed and a special loss of resistance syringe, filled with either saline or air, is attached to the end. The epidural needle is advanced, with pressure mainly applied through the syringe. The syringe is designed to be of very low resistance. This ensures that when the epidural space is located, the plunger releases, with the syringe's contents entering the space, the needle does not advance any further, thus reducing the risks of a dural puncture. A small catheter is then threaded through the epidural needle. The needle is then withdrawn, leaving the catheter in the epidural space. It is secured and a small test dose of epidural mix is given. This is to ensure the catheter has not inadvertently entered into the intrathecal space.

Different centres use varying epidural mixes and bolus regimes. A dose of 5-10 mL of bupivacaine, levobupivicaine or ropivicaine (0.125-0.25%) is sufficient to begin analgesia. Subsequently, boluses may be intermittent to maintain analgesia, or a continuous infusion of 8-12 mL/hr of 0.0625%-0.1% bupivacaineor 0.1% ropivicaine, often combined with low dose opiate such as fentanyl 1-2 mcg/mL or sufentanil 0.3-0.5 mcg/mL.

Different pump designs have been developed that theoretically aid in epidural spread. These include automated regular intermittent boluses as opposed to continuous low volume infusion as a background. This is an area of continuous research and new innovations [5].

Benefits

A functional epidural substantially reduces pain scores in all stages of labour. However, no significant differences have been noted in overall patient satisfaction during labour [6]. One significant advantage is a resultant reduction in opiate exposure for the foetus.

Epidurals are commonly run as PCEA (Patient-Controlled Epidural Anaesthesia), whereby the mother presses a button, which delivers a bolus of analgesic mixture when she requires further relief. This gives the mother a degree of control over her analgesia and labour. It is associated with lower doses of local anaesthetic being required during labour compared to continuous infusions [7]. 'Low-dose' epidural mixes spare motor function while providing good sensory analgesia. These are often referred to as mobile epidurals. While traditionally, epidurals have been associated with an increased likelihood of instrumental delivery, use of these mixtures has negated this [8].

Conversion to surgical anaesthesia for emergency Lower Segment Caesarean Section (LSCS) can be more rapid with an epidural top up, with an operating room to incision time of up to 11 minutes. It is advantageous as the top up process may be commenced in the delivery room, provided the anaesthetist accompanies the patient into theatre. This is compared to 13 minutes for a single shot spinal. This can result in more rapid delivery in instances of foetal distress [9]. A general anaesthetic is more rapid (6minutes) [9], however is associated with significant other risks, such as aspiration, failed intubation and uterine atony [10].

For babies, when measuring umbilical cord pH, epidurals are associated with less acidosis compared to mothers who had not had one. However, there have been no identifiable differences in APGAR score or longer-term outcomes [6].

Contraindications

Patient refusal and coagulopathy are absolute contraindications to performing an epidural. Additionally, allergy to the local anaesthetic and infection overlying the injection site are contraindications. Coagulopathy risks epidural haematoma formation, with subsequent mass effects [11]. Patients suffering from PET and gestational thrombocytopenia are particularly at risk. Mothers with these conditions need platelet count and coagulation screens within 6 hours of the epidural insertion. Care must be taken in patients receiving Low Molecular Weight Heparin (LMWH) and antiplatelets, such as those with antiphospholipid syndrome, pre-eclampsia and inpatients. Neuraxial techniques should not be attempted if LMWH prophylaxis has been administered within 12hours, or 24hours for treatment dose, allowing at least 4 hours since spinal puncture or catheter removal before re-administration [12]. For coumarins such as warfarin, the INR must simply be <1.5, while clopidogrel requires a gap of at least 7 days prior to neuraxial [12]. Table 1 summarizes the time after anticoagulant dosing for insertion and removal of epidural catheters.

Epidural insertion in septic patients is controversial. In labour, the picture is often blurred due to raised White Cell Counts (WCC) and pyrexia being found in 1/3 of non-septic labouring women. Insertion of an epidural catheter in a septic patient may introduce blood borne pathogens into the epidural space, as well as lead to physiological instability in the case of relative hypovolaemia and hypotension associated with systemic infection. Severe sepsis may lead to disseminated intravascular coagulopathy (DIC), increasing the risk of epidural haematoma formation.

Epidurals in the context of raised intracranial pressure should be avoided due to the risks of cerebral herniation, should the CSF space be accidentally entered. Pre-existing CNS disorders such as Multiple Sclerosis, Motor Neuron Disease and spina bifidas may be considered reasons for not performing epidurals. Complications may occur due to difficulties in anatomy and potential worsening of neurology and the dangers of compromising respiratory function. Previous back surgery and back injuries traditionally have been listed as a relative contraindication due to the difficulties surrounding insertion, exacerbation of pre-existing deficits and increased likelihood of failed and inconsistent blocks.

Whilst epidural anaesthesia may be helpful in some cardiac patients, due to the lowering of physiological stress and a reduction in the after load, patients reliant on pre-load such as those with aortic stenosis and hypertrophic obstructive cardiomyopathy may become compromised after epidural siting. Bradycardias and hypotension are poorly tolerated in this population. More invasive monitoring may be required during the time of epidural insertion and usage, to ensure adequate cardiovascular homeostasis.

Risks

Epidural anaesthesia can be associated with an increased incidence of instrumental delivery, ranging between 9-40% of women, depending on the study and the concentration of local anaesthetic used [15]. There is also a two-fold increased risk of perineal lacerations, including 3rd and 4th degree tears. There is no increased risk of requiring a Caesarean Section however. They are also associated with higher oxytocin doses required for augmentation of labour [3].

Epidurals are not always 100% effective in providing adequate labour analgesia. Incomplete analgesia may occur when dermatomal segments are missed or the block is more unilateral. Indeed, it may fail completely and require re-siting. Breakthrough pain may require

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2

Table 1: A table summarizing the timing of inserting and removing epidural catheters in mothers taking anticoagulants.

Agent	Time before puncture or catheter removal	Time after puncture or catheter removal	Notes
Aspirin	None	None	
Clopidogrel	7 days	None	Platelet function testing may be required as 10-20% have Clopidogrel resistance [13]
Coumarins (e.g., Warfarin)	INR<1.5	None	Reversal with vitamin K begins immediately, but takes 24-48 hrs to fully reverse. More rapid with higher doses and IV administration [14]
LMWH (prophylaxis)	12 hours	4 hours	Anti-factor Xa levels may be measured to ensure therapeutic targets reached, however very little evidence on safe levels FXa levels for neuraxial insertion
LMWH (treatment)	24 hours	4 hours	
UFH (prophylaxis)	4-6 hours	1 hour	
UFH (treatment)	4-6 hours (IV) 8-12 hours (SC)	1 hour 1 hour	
NSAIDs	None	None	

supplemental medication. Sacral sparing may occur when the epidural is sited later in labour due to the lack of spread more caudally due to the pressure of the foetal head [16].

Dural puncture may occur when the large-bore epidural needle passes through the epidural space into the subarachnoid space, creating a hole. Through this, there is potential for passage of the analgesic mixture into the CSF. This may result in the level of the block progressing too high or sympathetic blockade leading to profound hypotension. Even without tapping the dura, epidurals can lower blood pressure significantly due to sympathetic blockade and a reduction in circulating catecholamines [17]. This can lead to foetal distress. For this reason, ensuring the patient has secure IV access prior to siting the epidural, and ensuring they are euvolaemic, are essential pre-requisites. Continuous CTG monitoring is also strongly advised.

Neuraxial analgesia has been associated with development of maternal fevers, which in general, are not clinically significant [18]. Hyperthermia can, however, result in maternal tachycardia and increased oxygen consumption. This may be disadvantageous in some cardiac patients. Pyrexia in labour is associated with a higher intervention rate, both operative vaginal and Caesarean Section [19]. It can lead to an increased number of newborns being kept under observation and treated for possible sepsis [15].

Post-procedural risks include a severe headache that manifests between 2-5days after insertion, though may occur immediately, as a result of a CSF leak, putting traction on the meninges in the skull as the patient sits up. The quoted risk is between 1:100 to 1:50 [20]. Urinary retention is common, so mothers are often catheterised during labour. There is no increased risk of back pain following an epidural [6]. Epidural haematomas or abscesses are significant complications that may occur [21]. The most alarming risks for patients are that involving nerve damage, which may be temporary or permanent [22]. These risks are thankfully very low, in the order of 1.6 per 10,000 epidurals [23].

Other considerations involve the requirements for one-to-one midwife care whilst an epidural is in situ. Evidently, there is also a necessity for anaesthetic cover.

Figure 1 outlines a decision tree to help clinicians decide when to offer an epidural, and which patients should have an alternative technique administered.

Nitrous Oxide (Entonox)

Inhaled analgesia involves using sub-anaesthetic concentrations of inhaled Nitrous Oxide, to maintain consciousness and the laryngeal reflex. At present, it is used by 50-75% of women in labour in the UK [24]. It is delivered intermittently either *via* facemask or mouthpiece. A 50:50 mixture of nitrous oxide and air is the most commonly used. This comes as a pre-mixed formula (Entonox) or created *via* a splitting device (e.g., Nitronox).

It has been found to offer a significant reduction in labour discomfort compared to placebo [25]. Principally, it is a non-invasive therapy. It can be administered easily at very short notice, with relatively rapid onset of analgesia (30 to 60 seconds). Washout time is similarly rapid (4 to 5 breaths).It may also be used alongside epidural anaesthesia for bridging pain relief. Use of it does not increase the chances of an operative delivery. Nitrous oxide in analgesic quantities has minimal effects on the cardiovascular system and carries a very low risk of toxicity to both mother and foetus. It has no effects on uterine tone unlike other volatile anaesthetics.

Nausea and dizziness are the most common side-effects. Theoretical risks of uterine relaxation, hepato- and renal-toxicity exist but are not seen at analgesic levels [26]. There have been no reported significant effects to the foetus and APGAR scores at birth [27].

Concerns regarding prolonged exposure to healthcare staff, including hepato- and renal toxicity, and subfertility have been raised. In practice, these are not significant; however guidelines exist regarding the safe levels of exposure to healthcare workers. Nitrous oxide is a greenhouse gas thus raises environmental concerns [28].

Opioids

Pethidine and diamorphine

Parenteral opioids are given either intramuscularly or intravenously. 34% of women use an opioid during labour in the UK, 95% of UK hospitals offer IM pethidine or diamorphine and 50% offer PCAs [29]. NICE recommendations are, however, that parenteral opioids have a limited effect on pain in labour, regardless of the opioid or route of administration [3].

Parenteral opioids may be beneficial as less invasive alternatives to neuraxial analgesia [30]. Most midwives are qualified to administer
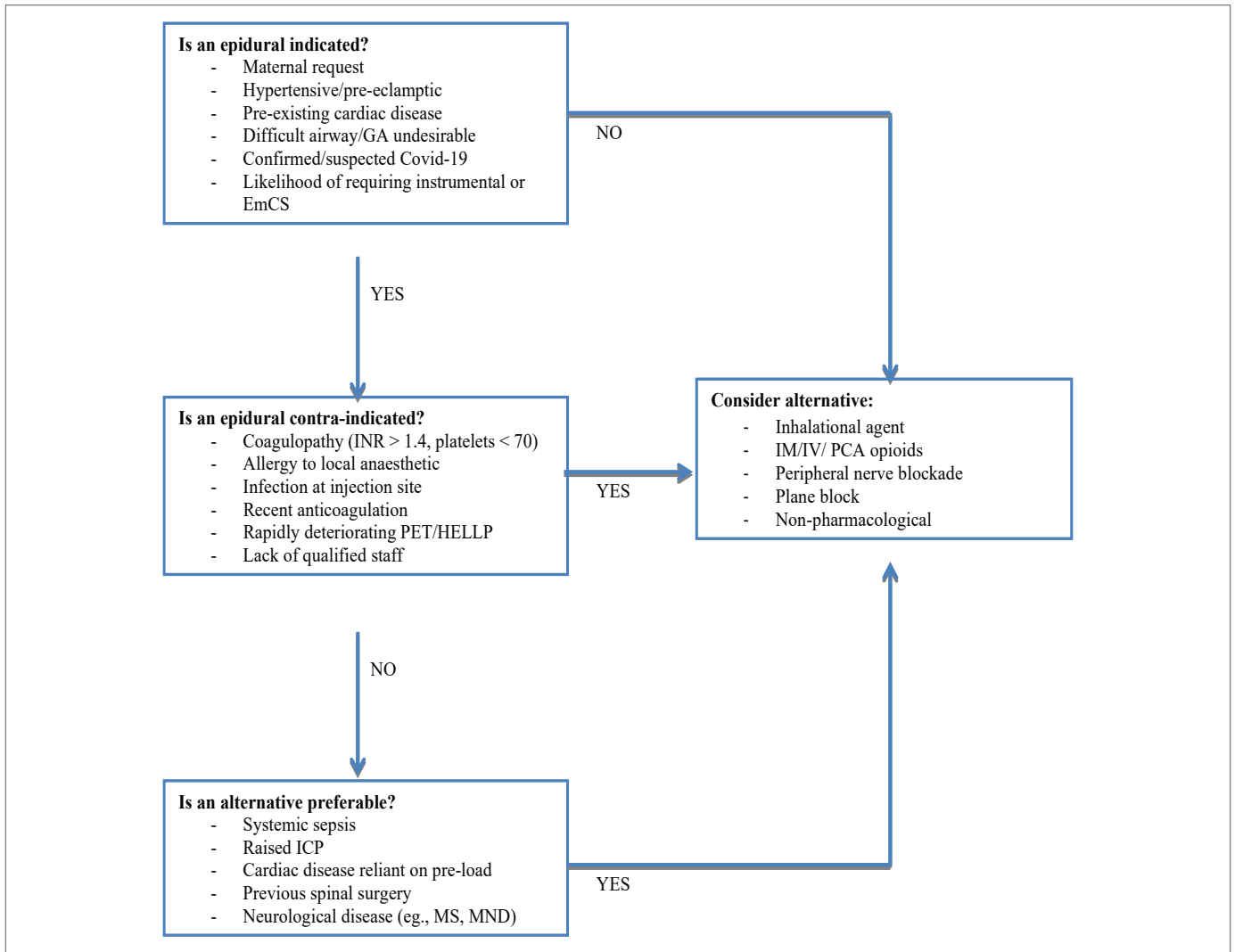
Figure 1: A decision tree to help clinicians decide the most appropriate labour analgesia technique to offer.

IM pethidine or diamorphine in the UK. These are therefore available on midwife led units. They may also be given rapidly, without having to wait for an anaesthetist. This option is also helpful for those where neuraxial analgesia is technically difficult, has failed or is contraindicated.

Opioids are associated with sedative effects on both mother and foetus. These may result in impaired capacity to engage in care decisions and preclude entry into birthing pools. Drowsiness results in a reduction in mobilising, which can prolong labour and make it more painful. More importantly, it can lead to respiratory depression, requiring airway support. Uncomfortable side effects include nausea, vomiting and pruritus. Opioids delay gastric emptying, which can carry significant additional risk should general anaesthesia be required. With respect to the foetus, opioids pass readily through the placenta and may persist in the newborn for 3 to 6 days [31]. Systemic opioids have been associated with a worse acid-base status in the foetus compared to epidural anaesthesia [32] and can have profound effects on foetal heart rate (FHR) [33]. Drowsiness in the newborn can lead to a delay in breastfeeding in the perinatal period [34].

RCTs have shown a slight improvement in analgesia with diamorphine over pethidine, though labour was generally prolonged with diamorphine administration [35]. Adverse effects were comparative, apart from vomiting occurring more frequently with pethidine. APGAR scores are lower with pethidine for the first minute but show no significant differences at five minutes [36]. The breakdown product norpethidine can accumulate and potentially lower seizure threshold, although data in foetuses and new-born babies is lacking [37].

Remifentanil

The most commonly offered PCA in labour is Remifentanil based. This is a very short acting opioid which is given IV. Its effects are fast acting and easily titratable [38]. Alternatives include fentanyl and morphine, however morphine is mainly used in cases of intrauterine death (due to its longer duration of action). Remifentanil has reduced foetal-placental transfer and rapid elimination from the foetus, including in preterm infants, due to its metabolism [39]. This gives it substantial benefit over other drugs. Fentanyl has lower rates of maternal respiratory depression but significantly higher rates in the new-born [40]. However, there is significant heterogeneity in the

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4

literature regarding the effectiveness of Remifentanil in providing analgesia, which leads to difficulties in drawing conclusions [41]. The latest Cochrane consensus is that Remifentanil PCAs provide inferior analgesia compared to epidurals [42].

As with other opioids, maternal sedation, respiratory depression and apnoea have been widely reported [43]. As a result, they create a significant midwife workload, as constant 1:1 observation is required, as well as the presence of an experienced anaesthetist. Supplemental oxygen is required in around 50% of those receiving remifentanil [44], and its constant administration is advocated whilst the patient is receiving the PCA. Furthermore, some concerns have been raised that administration of opioids can lead to hyperalgesia following their cessation [45]. However, there is no published literature regarding subsequent hyperalgesia following Remifentanil administration in the labouring patient.

Peripheral Nerve Blocks

A paracervical block involves a submucosal injection of local anaesthetic into the vaginal fornix near the neural fibres innervating the lower uterus, cervix and upper vagina (T10-L1), as they pass through the uterovaginal (Frankenhauser's) plexus. They are rarely used now due to the increased incidence of foetal bradycardia, particularly with use of bupivacaine [46].

Blocking the pudendal nerve anaesthetises S2-S4 which supplies the vaginal vault, perineum and rectum. It is easily blocked transvaginally as the nerves loop around the ischial spines. It provides effective pain relief for the 2nd stage when instrumental delivery is required [47], but often discomfort is still felt as the upper floor of the vagina is largely innervated by lumbar fibres. Unfortunately, it also has no effect during the first stage of labour. It may, however, be used as an adjunct to an epidural where sacral sparing has occurred.

Non-Pharmacological Approaches

Transcutaneous Electrical Nerve Stimulation (TENS) uses a device that passes a low voltage through the skin to stimulate the nerves at various frequencies and intensities. The mechanism of action is unclear, but it is thought to work through Melzack's Gate Theory of Pain [48], whereby transmission of pain is blocked by the large afferent sensory inputs. It may also work through distraction and allowing the patient a sense of greater control. A Cochrane Review concluded some benefits over placebo [6]. There are no reported significant adverse effects from using TENS.NICE, however concluded that there is no evidence TENS has analgesic benefit in established labour [3].

Hypnosis involves the mother being taught to enter into a semi-meditative state, whereby some experiences are prevented from reaching conscious perception, such as fear, tension and pain during childbirth [49]. Immersion in warm water has been shown to help alleviate discomfort in labour, as well as increase uterine perfusion, reduce blood pressure and optimise the progression of the labour itself. Aromatherapy through the use of essential oils is thought to increase secretion of the body's own sedative, stimulant and relaxing neurotransmitters, which, although has no measurable physiological effects, can demonstrate a psychological improvement in mood and anxiety [50]. Acupuncture and acupressure involve either the insertion of fine needles or the application of pressure to specific parts of the body. It is unknown how its effects are produced, but it has been suggested to involve modulation of pain stimuli through the Gate Theory, or by stimulating the body to release endorphins. Reflexology works on a similar principle, involving the application of gentle pressure or manipulation of special reflex points on the body.

Massage uses manipulation of body tissues to release tension and relax and soothe the patient. It may also inhibit the sensory pathways as a gateway, and improve blood flow and oxygen to the tissues.

New Innovations

Erector spinae block

An erector spinae block is a plane block that utilizes the fascial plane beneath the muscle in the back, which contains the ventral and dorsal rami of the spinal nerves. The erector spinae muscles are composed of iliocostalis, longissimus and spinalis muscle. The ultrasound transducer is placed in the sagittal direction, around 2cm off the midline. Three longitudinal muscle groups are visible; trapezius being the most superficial, followed by the rhomboids, with the erector spinaes beneath. The transverse processes of the ribs will be visible underneath. The needle is inserted in plane, until it reaches the transverse processes. Large volume local anaesthetic is injected into this area, achieving significant spread within the fascial plane, which can lead to analgesia at many dermatomal levels [51].

Whilst traditionally it has been used for chest wall surgery and rib fracture relief, it has more recently been used effectively for abdominal surgery [52]. Case reports exist of its use in women who were unable to have epidurals, and other forms of analgesia were insufficient during labour [53]. They have also been used to good effect in the post-operative period for Caesarean Sections [54]. The planes do not extend bilaterally, so require catheters to be inserted on both sides of the back. Although erector spinae blocks are likely to be less effective than traditional epidurals, they may have a place in patients unable to have epidurals. Although it does not sit in the epidural space, given its proximity to the spine, caution should be exercised with deranged clotting.

Quadratus lumborum blocks

Posterior quadratus lumborum blocks were first used in 2007. Local anaesthetic is injected into the posterior abdomen, around the quadrates lumborum muscle, to create a plane block along the transversalis facia. Spread of the anaesthetic reaches the more caudal erector spinae muscles, as well as the iliohypogastric, ilioinguinal and subcostal nerves. Anaesthesia can be achieved from T4-L1, with both somatic and visceral blockade. The patient is positioned in a lateral position, with the transducer in the axial plane on the flank in the mid-axillary line. The probe is moved in a posterior direction until the transversus abdominal muscle aponeurosis is visible under the latissimus dorsi muscle. Depending on the approach, the needle is advanced to just below the aponeurosis above the transversalis facia. Injection of local anaesthetic into this plane spreads to encircle the quadratum lumborum muscles.

There has been considerable evidence for their use as post-operative analgesia for elective caesarean sections. A recent systematic review has demonstrated a significant reduction in requirements for post-operative opioids, when an intrathecal opioid has not been administered. However, there was insufficient evidence to show significant improvement when intrathecal morphine had been given [55]. There is very little evidence for motor blockade following quadrates lumborum blocks, which is of additional value considering the importance of mobilization post-partum [56]. It has been used for labour analgesia [57]. However, due to its distribution, it only provides analgesia for the first stage of labour. It remains, however, an option for patients unable to have neuraxial procedures.

At the time of writing, there were no randomised controlled trials registered on ClinicalTrials.gov to be taking place to examine either

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5

Table 2: A table to summarise the advantages, disadvantages and effects on mother and foetus of various analgesic regimes during labour.

Technique	Advantages	Disadvantages	Effects on mother	Effects on foetus	COVID Considerations	Comparison to labour epidural
Nitrous Oxide	Non-invasive Rapid administration & effects Does not require an anaesthetist	Side effects Staff exposure	Nausea & dizziness	Nil	No increased risk	Inferior analgesia
IM/IV opiates	Less invasive Does not require an anaesthetist May be given when epidural contraindicated	Side effects May prevent entry to birthing pools	Drowsiness & respiratory depression Nausea & pruritus	Sedation Delayed feeding	Respiratory depression ill-advised due to risks of intubation	Inferior analgesia
Remifentanil PCA	Effective analgesia Less invasive May be given when epidural contraindicated	Requires trained nursing/ midwifery care Requires supplemental O_2 Side effects	Drowsiness & respiratory depression	Nil	Respiratory depression ill-advised due to risks of intubation	Inferior analgesia
Pudendal & Paracervical	Does not require an anaesthetist No systemic effects Rapid & good effects for instrumentals & episiotomies	No effect on 1st stage	Painful insertion	Foetal bradycardia	No increased risk	Inferior analgesia

erector spinae or quadrates lumborum blocks in the labouring patient. These would be interesting studies to conduct prior to more widespread use of the techniques. Their use in caesarean section is currently under investigation through a number of studies [58,59].

COVID-19

At present, there is limited evidence regarding safety of epidurals during the pandemic. Early epidural insertion has been advised to reduce the risks of converting to a GA, which is an aerosol-generating procedure. Additional time is also required for donning PPE should an emergency delivery be required under a GA. Adequate analgesia is essential to avoid exacerbating any respiratory symptoms in a patient suffering from COVID 19 [60]. However, epidurals have been associated with profound hypotension during caesarean section in patients with concurrent COVID19 infection compared to GA [61]. Theoretical risk exists regarding seeding virus into the epidural space, however, at present there have been no reports pertaining to this.

Whilst use of nitrous oxide during the pandemic was initially considered as a potential risk for disease spread due to aerosolisation, there is currently insufficient evidence regarding this [62]. Use of IV opioids such as remifentanil has been discouraged due to the risks of respiratory depression, and subsequent potential need for intubation [63,64].

Conclusions

Epidural anaesthesia remains the Gold Standard for the labouring mother, due to its efficacy and the benefits of rapid top-up for facilitating instrumental delivery or Caesarean Section. During the current global pandemic, the use of neuraxial blocks has gained further momentum in our efforts to reduce aerosol-generating procedures (AGPs).

As this paper highlights, however, there are many factors that must be considered prior to their insertion (see Figure 1). Ensuring adequate coagulation and platelet count is vital to reduce the risk of spinal haematomas. Careful deliberation is required when maternal sepsis

is suspected. Pre-existing neurological disorders require additional patient counselling and discussion prior to an epidural insertion.

Alternatives, whilst providing inferior labour analgesia, are less invasive and may be given when epidurals are contraindicated or declined by the mother (see Table 2). Nitrous oxide is often the first line agent due to its ease of administration and relative safety. Parenteral opioids are less invasive approaches, however, their side effects for both the mother and foetus must be considered. Remifentanil PCAs are gaining popularity due to their minimally-invasive nature and minimal effects on the newborn. Nevertheless, their use must be strictly monitored by appropriately trained staff due to the dangers of maternal respiratory depression.

Non-pharmacological approaches have the benefits of being more 'natural' and risk-free, which may make them more appealing to some patients. Most of them can also be used in combination with other methods.

New developments in regional anaesthetic techniques with plane blocks are in their infancy. They may begin to be used more widely. Their efficacy for post-operative analgesia in Caesarean Sections has growing evidence; however their use in labour still requires further investigation. They are techniques that not all anaesthetists feel confident in performing at present, unlike epidurals, which remain a staple of training. Epidurals are a proven, effective method of labour analgesia, and will remain the first line option for most mothers.

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6

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7

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8