There is little evidence for waveform analysis in the form of an auditive sound adapter or by using a pressure transducer to evaluate pulsatility.[24] Probably the best way to assess correct catheter placement is the so-called 'Tsui test' or epidural electrical stimulation test.[25] Unfortunately it is not widely known or used.

Conclusion HTEA is the best and most complete regional analgesic technique at our disposal. It should be reserved for major surgery as it has drawbacks and side-effects. Nevertheless, it has a positive impact on pulmonary and functional recovery and reduces the need for opioids in a spectacular fashion. Unfortunately, it requires a lot of training to master and good follow-up with investment in an acute pain service team is essential. It should be actively promoted, trained and taught in secondary and tertiary centers with major open thoracoabdominal surgery.

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#36847 PIEB OR CONTINUOUS INFUSION FOR FASCIAL PLANE BLOCK CATHETERS

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Introduction Fascial plane blocks (FPBs) have gained significant popularity in regional anesthesia in an attempt to improve pain control and reduce opioid consumption while minimizing the risk of direct nerve damage or other neuraxial complications.[1] FPBs are performed by injecting local anesthetics (LA) into a plane between two specific fascial layers, a supposed connective tissue compartment separating different muscle groups or layers.[2] The LA is thought to diffuse within this plane to block multiple nerves traveling within or adjacent to this plane. Due to the increased distance between the place of injection and the nerves, these blocks are considered volume-dependent blocks. This contrasts the classical nerve or neuraxial blocks in which LA is injected in the vicinity of the targeted nerve(s). Nevertheless, the goal remains the same, i.e., causing a conduction block by administering LA, preventing the transmission of pain signals. Examples of FPBs include the transversus abdominis plane (TAP) block, the erector spinae plane block (ESPB), the rectus sheath block (RSB), and quadratus lumborum block (QLB), which are often used in abdominal, thoracic and breast surgeries.[1]

In an attempt to prolong the analgesic duration of an FPB, a catheter can be left behind which allows additional administration of LA. Two common techniques used for administering LA through catheters rely on either a programmed intermittent bolus (PIB) or a continuous infusion (CI). Some advocate PIB over CI to increase the extent of FPBs[3], however, evidence is still limited. We will review the current literature on this topic and provide clinicians with tools to improve decision-making in prolonging the effects of FPB catheters.

Discussion

Programmed Intermittent Bolus

PIB is defined as the intermittent administration of a certain volume of LA at specific and programmed time intervals. This requires additional resources, including automated delivery system pumps. The PIB technique was primarily described in the field of labor analgesia in which programmed intermittent epidural bolus administration, compared to other techniques, was found to be associated with improved quality of analgesia, reduced breakthrough pain, and ultimately increased patient's overall perioperative experience.[4,5] However, multiple recent studies have shown limited differences between dosing regimens.[6] For paravertebral catheters in thoracic surgery, PIB improved postoperative analgesia and quality of recovery compared to CI.[7,8] This is also supported by a cadaver study showing increased spread of dye following PIB through a TAP block catheter compared to CI.[3] Limitations include the specialized delivery systems that are required, extensive dense block following a bolus, and or missed boluses in case of malfunction. Obviously, results from epidural or paravertebral PIB are not necessarily transferable to FPBs considering the differences in anatomical target, LA used, pump settings and spread of LA.

Continuous Infusion

CI provides a constant infusion of LA at a fixed dose throughout the infusion. This can be delivered with any type of syringe pump and thus rarely requires additional resources. It is considered a simple and straightforward method of infusion allowing continuous drug delivery. As such it can easily prolong postoperative analgesia. Consequently, extensive research into this technique has been performed, showing the safety and efficacy following multiple surgical procedures. The limitation of CI includes the time until reaching a therapeutic drug concentration. Moreover, especially following prolonged infusions, the risk of LA accumulation increases in susceptible patients and can result in systemic toxicity.

Comparative research

A recent review by Jagannathan et al.[9] comparing intermittent bolus to CI in truncal and peripheral blocks identified only 13 studies but failed to show the superiority of any particular delivery regimen.[9] They, however, included only 3 studies investigating FPB which showed limited to no differences between PIB and CI for TAP blocks. Recently, other trials have been published comparing PIB to CI for several of these newly described FPBs.

Aoyama et al.[10] compared the effects of QLB with PIB (n=21) to CI (n=20) for postoperative analgesia followingla-paroscopic colorectal surgery. Both groups received an equivalent amount of LA (i.e., levobupivacaine 0.15% at 12ml every 4h compared to 3 ml/h, respectively). These authors identified no differences in any of the assessed outcomes.[10]

Following midline laparotomy, the RSB has been demonstrated to be an appropriate analgesic technique. Purdy et al.[11] performed a trial comparing different delivery regimens of LA following midline laparotomy through bilateral RSB catheters. Levobupivacaine 0.125% 10 ml every 4 hours in the PIB-group (n=12) was compared to 5 ml/h in the CI-group (n=17) and continued up to 48h after surgery.[11] No difference was detected in their primary outcome being oxycodone consumption.[11] Nevertheless, compared to the CI-group, patients in the PIB-group reported lower pain scores and higher satisfaction scores.

For thoracic surgery, the ESPB has been postulated to provide postoperative analgesia. Taketa et al.[12] compared the effect of ESPB using PIB (n=25) to CI (n=24) on desensitized dermatomes following thoracoscopic surgery.[12]Ropivacaine 0.2% 8ml every 2h in the PIB-group was compared to 8ml/h in the CI-group. They identified a wider anesthetized area with lower consumption of LA when using a PIB method compared to CI.[12] However, this did not result in any relevant difference in opioid consumption, pain scores, or other measured outcomes.[12]

Conclusion Currently, PIB has been investigated for epidural, paravertebral, and peripheral nerve catheters, where it has been shown to be safe. However, reviews have highlighted multiple limitations which include among others the differences in LA used, dosing regimens, dosing intervals, or inequivalent LA dosage. In addition, these studies rarely report on any relevant patient-centered or patient-reported outcomes. Furthermore, comparative research into these different delivery methods for FPBs is even more limited.

Based on the limited and small trials comparing PIB to CI for FPBs, we can hardly conclude that PIB delivery methods are safe. However, the potential reduction in the cumulative dose of LA seems to be beneficial. However, this technique requires additional resources (i.e., advanced pump devices) which likely increase healthcare costs. Therefore, the decision should be weighed on patient characteristics and resource availability of the center.

#36915 D37 – THE GREEN FOOTPRINT OF REGIONAL ANESTHESIA

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Today, humanity is experiencing unprecedented rapid global warming thrusting us in the midst of our most profound existential crisis. Indeed, climate change is a process due to human activity's – primarily burning fossil fuels and generation of greenhouse gases (GHGs). Human activities are warming up the atmosphere, hydrosphere, and lithosphere, producing widespread and rapid changes across the entire planet, which is the result of Earth's delicate energy balance being skewed by the excessive production of GHGs. Some of Earth's outgoing thermal radiation is normally absorbed by GHGs in the troposphere and subsequently reflected to Earth; however due to anthropogenic GHGs, this absorption and reflection of thermal radiation has increased, now amounting for 342 Wm^{-2} of incoming thermal radiation and placing the Earth in a net positive energy state.[1] This has profound impacts on the necessary conditions for life. GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases including hydroxyfluorocarbon, perfluorocarbon, sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3);[2] fluorinated gases also include anesthetic gases such as inhalational anesthetics desflurane, isoflurane, sevoflurane, and halothane. Owing to their chlorine and bromine groups, isoflurane and halothane have the potential to deplete the important stratospheric ozone layer – a layer which absorbs incoming ultraviolet (UV) radiation limiting the earthward transmission of harmful UV-B-radiation.[3,4]

Production of electricity (38%), the transport sector (22%), and the pharmaceutical and chemical industry (10%) have the greatest impact on GHGs production. However, the healthcare sector also poses significant burdens on global carbon emissions, being responsible for an estimated 4.4-4.6% of all global carbon dioxide-equivalent (CO_2e) emissions in 2019.[5,6] Six countries have calculated their national health system's carbon footprints: USA (8%), Australia (7%), NHS (6.1%), Canada (4.6%), Japan (4.6%), and China (2.7%). The NHS provides a deeper analysis, with the supply chain representing the largest proportion of emissions in 2022 (62%); other