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SP39 WHAT FASCIAL PLAIN BLOCKS CAN AND CANNOT DO

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Background The first brachial plexus block is often attributed to Halsted who during skin infiltration anesthesia with

cocaine, dissected the brachial plexus and placed cocaine directly on to the nerve structures.[1] This was of cause associated with excellent precision but represented a quite awkward technique to produce a peripheral nerve block. Development of better syringes and needles produced a change of practice, instead using landmarks and fascial pops and clicks as well as searching for paresthesia to determine where to inject the local anesthetic. However, this reduced the precision and the success rate to an extent that did not impress many surgical colleagues and was often associated with prolonged paresthesia-induced nerve injury-like sequalae. Nerve stimulator guidance provided a real improvement that increased success rate and reduced the risk for nerve injury. Further, the report by Kapral in 1994 of ultrasound guided regional anesthesia represented a seminal breakthrough that allowed, not only orientation of the needle tip immediately close to the target nerve structures, but also visualization of the local spread of the injected local anesthetic.[2] If not optimal, then the needle tip can be re-localized and the injection repeated until a satisfactory spread is achieved. In a way this represents going full circle from Halstead, thus, allowing perfect visualization of both nerve structures and the spread of local anesthetic. In a sense peripheral regional anesthesia was perfected by ultrasound guidance, especially if occasionally used as a combined technique with nerve stimulation then visualization with ultrasound is difficult (e.g. deep blocks or obese patients).

However, as peripheral regional anesthesia became 'perfected', a new concept was launched simultaneously in Ireland and Australia in 2007- the landmark-based fascial plane block called the TAP (Transverse Abdominis Plane) block.[3,4] This new concept hinges on the idea of injecting a large volume of local anesthetics in an anatomical fascial plane that contain the nerves of interest. After introducing ultrasound guidance to perform this block, the TAP and many other fascial plane blocks were invented by the dozen and has spread like wildfire. One can wonder where this popularity really come from, since replacing the high-precision techniques of ultrasound guided proper peripheral nerve blocks, with injecting a large volume of local anesthetics in a fascial plane, not seeing the actual nerve structures or adequate spread of the local anesthetic, defy logic. One cannot help wondering if this is merely because many fascial plane blocks do not require much skill or knowledge, especially regarding ultrasound visualization.[5] In summary, when performing the different fascial plane blocks, you will inject your LA in a defined fascial plane but not close to all the nerve structures that you would like to block and, thus, you will rely on a random but favorable spread of the LA to get a reasonable block.

Are all fascial plane blocks basically the same?

The answer to this is obviously no. Some fascial plane blocks have a quite clear mode of action and does anesthetize well defined nerve structures. Examples of such blocks are the rectus sheath and PECS II blocks where the injection is made close to target nerves that are well known to innervate the area of surgery. Thus, these blocks are in a sense close to the situation of the ilio-inguinal, ilio-hypogastric nerve block, where the injection is done very close to the nerves even if you cannot fully visualize both nerves (e.g. in the obese patient). The Trans-muscular Quadratus Lumborum Block (TQLB) also represents a technique where the injection is made very close to relevant nerve structures and where relatively consistent spread is also seen to the caudal parts of the thoracic paravertebral space (thereby creating a lower Thoracic ParaVetebral Block; TPVB), which partly explain its effect.[6]

Other fascial plane blocks rely on being lucky, getting a favorable spread involving all relevant nerve structures, e.g. the TAP, QL I and II blocks. Other fascial plane block, especially the Erector Spinae Plane block (ESPB), or its close relative retrolaminar nerve block, have no defined mode of action, at least regarding how they supposedly produce any analgesic effect in front of the mid-axillary line.

Furthermore, since you do not inject close to the nerve structure/structures at hand, it is not surprising that the quality of the nerve block achieved is not as dense as compared to what you achieve with an ultrasound guided proper peripheral nerve block with the injection being performed immediately close to the nerve structures.

What fascial plane blocks can do:

1. Meta-analyses show that fascial plane blocks add moderately improved analgesia as compared to placebo or established clinical routine analgesic regimens.[7,8]

2. Provide equipotent analgesia when compared to proper regional anesthetic blocks for surgery associated with limited tissue trauma but not for more major open surgery (e.g. laparoscopic vs. open cholecystectomy).[9,10]

3. Produce rapid and high plasma levels, as well as prolonged elimination half-life, of local anesthetics when compared to intravenous administration.[11] This is caused by very rapid uptake of the local anesthetic from the site of injection by the lymphatic system.[12]

4. Produce local anesthetic systemic toxicity (LAST) both in adults and children.[13–16]

5. Provide equipotent postoperative analgesia as compared to intravenous lidocaine in renal transplant patients.[17]

6. Provide worse postoperative analgesia, with a higher failure rate, when compared to proper peripheral nerve blocking techniques in association with breast surgery.[18,19]

What fascial plane blocks cannot do:

1. Provide successful surgical anesthesia on its own, as proper regional anesthesia nerve blocking techniques can (e.g. spinal, epidural, brachial plexus, ankle blocks etc). Thus, they are best employed as part of multimodal analgesia with other systemic analgesics, rather than as sole anesthetic techniques.[20]

2. Spread through substantial anatomical barriers, e.g. ligament structures, in a sufficient and reliable way.[12,21,22]

3. Provide reliable anesthesia of the anterior part of the thorax.[23,24]

Of cause, the above is not a fully comprehensive review of the vast literature but do provide a relevant summary of the current situation in the opinion of the author. For more in-depth critical reading, two previous communications by the author are recommended.[25,26] Even proponents of fascial plane blocks, in this case the ESPB, suggest that a large part of its overall moderate effect may just be due to the systemic analgesic effects of the absorbed local anesthetic (11) and this interpretation is repeated by Bryne et al.[24]

In summary, the situation may possibly be best illustrated by a quote from a previous Editorial on fascial plane blocks: '…, just because fascial planes exist in most parts of the body, it does not mean that injecting local anesthetics into these fascial planes always produces relevant blockade of local nerve structures to the degree that it will produce clinically relevant intra- and postoperative analgesia.'.[25]

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SP40 CHALLENGING THE DOGMA: IS A SHORT-DURATION PNB BETTER THAN A LONG-LASTING ONE?

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The duration of a nerve block depends mainly on the type of local anesthetics used and the amount (volume and concentration, actually total 'mass' of local anesthetic) injected around the target nerve. Block duration can be prolonged with the use of a vasoconstrictor such as epinephrine, which decreases the diffusion of the anesthetic away from the nerve or the use of other adjuvants, each with a different mechanism of action and final effect (dexamethasone, clonidine, dexmedetomidine, magnesium).

When deciding, which local anesthetic to use, what concentration, which adjuvant and whether we should place a catheter for continuous infusion, there is no actual dogma to challenge. We just need to know what is our aim. When the aim is to provide a long lasting analgesic effect, long lasting local anesthetics may be used and/or adjuvants may be added and/or a perineural catheter may be placed. Drawbacks of this decision are: the delayed ambulation and risk of falls in case lower limb blocks are performed, the delayed neurological and motor examination, the requirement for specialized equipment and additional skills when catheters are used and the need for prolonged patient monitoring and management from dedicated acute pain teams. In case short lasting effects are required, so that motor and sensory function return as quickly as possible, to achieve early ambulation and neurological examination, short acting local anesthetics may be used and the known drawbacks are: the risk of rebound pain upon resolution of nerve blockade, the need for higher opioid doses, delayed rehabilitation due to opioid side effects and the pain itself and prolonged hospital stay. Additionally, if eventually acute pain is not managed adequately, the risk of patient dissatisfaction and the incidence of cardiovascular and pulmonary complications and persistent postsurgical (chronic) pain are increased.

So, the solution is to balance the risks and benefits of each technique, choose the proper one for each individual and of course not to rely just to the peripheral nerve blockade for postoperative pain management but on to a multimodal regimen including a block but also other agents administered from different routes. In this case drawbacks of short acting blocks will be successfully managed. In case long lasting blocks are used, proper multi-intervention fall-prevention strategies may be applied, so that patients are safely mobilized early and dose adjustments both in continuous and single shot techniques or proper adjuvants (that tend to prolong analgesia more than they prolong motor block, according to studies can counteract the relevant drawbacks effectively.

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