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Use still ozone from the block: management of chronic discogenic low back pain in a 16 years old child with ozone based ESP block

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Keypoints

The article aims to describe this innovative management of Chronic Discogenic Low Back Pain in a 16-years-old boy with Ozone Based ESP Block.

Abstract

Erector Spinae Plane Block (ESPB) is a fairly novel method of locoregional anesthesia, used mostly postoperatively in spine surgery. Although its mechanism of action has not been completely understood, its effectiveness has made its use increasingly frequent, even in pain therapy field. Otherwise, Ozone Therapy has long played an important role in the treatment of chronic discogenic low back pain, albeit its use in locoregional procedures is still little explored. In this case report we describe a young patient with a chronic discogenic low back pain who underwent Ozone based ESP block.

Keywords

Erector Spinae Plane Block; Ozone; Ultrasound-guided; Chronic Low Back Pain.

Introduction

Erector Spinae Plane Block is an ultrasound-guided interfascial nerve block technique in which a local anesthetic is injected into the space between the erector spinae muscle and the transverse process of the vertebrae. It was first described in 2016 by Forero as a treatment for thoracic neuropathic pain, and since then its use has become widespread in perioperative anesthesia and analgesia (Fig 1).

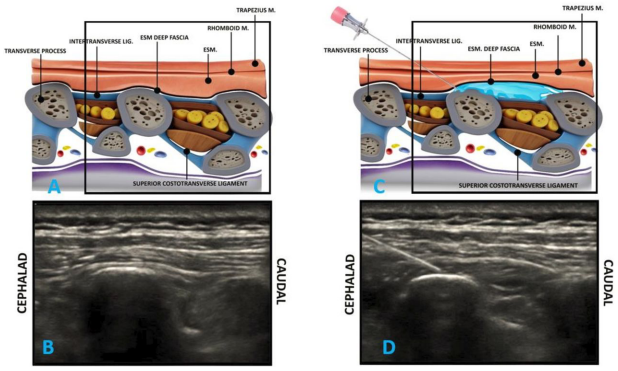

Fig 1. Anatomical and Ultrasound Reconstruction of ESPB

From an anatomical point of view, it requires the identification of vertebral transverse process as main landmark. The target muscle is, as mentioned above, erector spinae, composed of the iliocostalis, longissimus and spinalis. The space between the muscle and the transverse process allows for craniocaudal and sometimes anterolateral diffusion of the anesthetic (Fig. 1). Possible involvement of the dorsal and ventral branches of the spinal nerves,

paravertebral sympathetic plexus and nerve roots may explain its effectiveness.

Technically, it is preferred ultrasound-guided approach in the sitting, lateral, or prone position with a linear or convex probe, depending on the level. After the identification of the transverse processes and the muscle plane, needle is advanced in-plane until contact with the transverse process and local anesthetic is applied in the deep space of the erector spinae typically with a volume of 20–30 ml in adults and 15-20 ml in pediatric patients, variable depending on the level and indication.

The range of use is extremely wide, going from perioperative analgesia (thoracic surgery, upper addominal surgery, spine and orthopedic surgery), by way of acute pain management (thoracic trauma, rib fractures, postoperative pain), until getting to chronic pain management (thoracic neuropathies, persistent pain syndromes, chronic discogenic low back pain). This block has gained importance due to his advantages:

-relatively simple and safe technique;

-ultrasound guided approach that allows a greater precision;

-lower risks compared to neuroaxial blocks (e.g epidural, paravertebral block);

-effective multimodal analgesia, that allows reduced opioid comsumption, also in the context of opioid free or opioid sparing strategy as indicated by ERAS protocols.

However, this technique is not free from risks and possible complications are rarely pneumothorax, vascular puncture, infection, local anesthetic toxicity. More frequently it is possible technical failure or insufficient analgesia because of inadequate diffusion.

Having said that, we try to combine the benefits of ESPB with ozone therapy. There is now a lot of evidence on Ozone therapy for back pain, and although the methodological quality of certain studies has been questioned in some cases or the samples examined were small, positive data emerge on the use of this method. Ozone (O_3), mixed with oxygen (O_2), could be administered intradiscally, paravertebrally, epidurally, or intramuscularly. The main mechanisms are:

1. Mechanical Action on the Intervertebral Disc:

Ozone oxidizes the glycosaminoglycans of the nucleus pulposus. This reduces the disc ability to retain water, leading to dehydration of the protruded disc and reduction of intradiscal pressure. The result is reduction of radicular compression and therefore radicular pain.

2. Anti-inflammatory Action

Ozone modulates the activity of inflammatory mediators (↓ TNF-α, IL-1β, IL-6; ↑ IL-10). It inhibits the production of PGE2 and substance P, key mediators of nociceptive sensitization with the effect of reduction of radicular edema and periradicular inflammation.

3. Controlled oxidative effect ("oxidative eustress")

Ozone in small doses induces mild oxidative stress that stimulates endogenous antioxidant systems (e.g., ↑ SOD, catalase, glutathione peroxidase). This leads to a redox balance that reduces chronic oxidative damage present in inflamed tissues.

4. Neuromodulatory Effects

Ozone affects peripheral nerve conduction → reduction of nociceptive transmission. Possible direct analgesic effect on the compressed nerve due to improved biochemical microenvironment. Some studies have described a reduction in central sensitization secondary to peripheral improvement.

5. Improved Microcirculation

Ozone induces an increased erythrocyte deformability and O_2 release to tissues (shift in the Hb dissociation curve) and vasodilation mediated by Nitric Oxide and prostacyclins. The result is improved oxygenation and tissue trophism with reduction of local ischemia, responsible of less pain.

6. Effects on Degenerative Tissues

Ozone stimulates fibroblast repair and extracellular matrix turnover improving disc elasticity and stability in the subacute phase. In experimental studies potential slowing of disc degeneration was observed.

Chronic low back pain is defined as pain localized in the lumbar region (between the lower costal margin and the lower gluteal folds, with or without radiation to the lower limbs) lasting ≥ 12 weeks. It is important to note that duration refers to persistence of pain for at least 12 weeks (3 months), regardless of wheter it is continuous or recurrent. About the nature, it may be mechanical, degenerative, inflammatory, neuropathic or non-specific in origin (in most cases, without a single identifiable cause).

In this regard about 30-40% of children and adolescent experience low back pain; in one third to half of cases, the pain persists for more than 3 months or affect daily life. In most cases (95-98%) pediatric low back pain is non-specific. In younger children (under 10 years, especially < 4 years), back pain may be a red flag for serious conditions such as infections, tumors, fractures or neurological disorders. Warning signs include fever, night pain, morning stiffness, neurological deficits, bowel or bladder dysfunction. Initial evalution should include detailed history and physical examination. Imaging is not routinely indicated, unrell red flags are present.

Regarding the treatment, the World Health Organization (WHO) published specific guidelines in 2021 for chronic pain in children aged 0-19, focusing on three categories of intervention:

-physical (physical therapy/physiotherapy);

-phychological (including cognitive-behavioral therapy):

-pharmacological, with restricted use: for example, morphine is recommended only in palliative care or in conditions with severe quality-of-life limitations.

The model of care is multidisciplinary with a biopsychosocial approach, child and family centered. Going more specifically on unspecific back pain in young people, according to evidence-based expert consensus physical therapy, especially exercise and phychotherapy are recommended, whereas medications are not recommended.

Case report

Patient initially presented symptoms compatible with acute left lumbosciatica in L5-S1 area (NRS 8-9). MRI revealed a median-paramedian L4-L5 hernia and an extruded L5-S1 hernia in the left preforaminal area with a tendency to caudal migration (Fig. 2).

Fig. 2. MRI images of patient (consent obtained for the diffusion of images)

Initially, given her young age, physiotherapy and oral paracetamol (as needed) were recommended. However, since no improvement was noted after 12 weeks, an initial attempt was made to reduce the pain with short-term steroid therapy (oral Methylprednisolone), which only gradually improved. Following yet another flare-up, steroid was replaced with slow-release Diclofenac with excellent response (NRS 0). Upon suspension, pain returns (NRS 4-5) with sciatica-like features, from the left glutes to the foot, exacerbated by movement and passive leg raise at maximal degrees (positive Lasegue Sign).

Since patient and his parents refused epidural injections and could not continue chronic treatment with NSAIDs, we decided to perform an Ozone based ESP block, thus exploiting both the anesthetic efficacy of the block and the anti-inflammatory, antioxidant, anti-edema and ultimately painkiller properties of Ozone.

After obtaining consent from parents and from patient, an ultrasound-guided left L4-L5 ESP block was therefore performed using a convex probe and a 50 mm needle by injecting 20 ml of Ozone at 40 mcg. During the procedure, the patient reported feeling mild tenderness at the

puncture site when the ozone was injected. After the procedure, in the following 2 days pain initially decreased (NRS 2-3), then slowly increased (NRS 4-5) and then reduced further 2 week later (NRS 2-3).

ESP block was repeated 1 month after the first procedure and pain resolved completely (NRS 0).

Discussion

Although ESPB has been a known anesthesia technique since 2016, its mechanisms of action are still not fully understood, but several anatomical and clinical studies have highlighted some key points.

These are some of the probable mechanisms implicated:

1. Cranio-caudal interfascial spread

The injection occurs between the erector spinae muscle and the transverse process. The interfascial plane allows for extensive diffusion of the anesthetic volume along multiple metamers (even up to 3–5 levels above and below the injection site).

2. Dorsal branch block of the spinal nerves

The anesthetic reaches the dorsal branches (which innervate paraspinal muscles and posterior skin of the chest and back). This explains its effectiveness on posterior wall and musculoskeletal pain.

3. Possible anterior spread into the paravertebral space

In some dissection and MRI studies, the drug reaches the ventral branches and intercostal nerves in the paravertebral space. This also provides anterolateral thoracic and abdominal analgesia, similar to a paravertebral block but with fewer risks.

4. Sympathetic Chain Involvement

When the anesthetic extends medially to the paravertebral space, it can reach the thoracic sympathetic trunk. This contributes to a visceral effect (useful for chest and abdominal pain).

5. Systemic Absorption

As with other interfascial blocks, part of the analgesic effect may also result from systemic concentrations of local anesthetic, although this is not the primary mechanism.

Therefore, it is clear how the benefits of ESP add to those of Ozone Therapy, which we have discussed extensively above and whose mechanisms of action we have described. Furthermore, the use of this innovative method has allowed us to escalate the use of NSAIDs, to the point of discontinuing them, and to avoid the use of steroids, except for a very short period, and the use of opioids (which, as mentioned above, should not be used in pediatric patients). From a multimodal approach, locoregional methods, especially when combined with ozone therapy, could represent a new frontier in the management of chronic discogenic low back pain in pediatric patients.

Conclusion

Ultrasound guided ESP Block is a relatively new procedure and its use with Ozone in DLBP management had been recently described in literature.

It already appears clear, however, that combining an effective and versatile block such as ESP with Ozone therapy, a practice already in use for years and which also boasts a fair amount of literature, can be a winning choice in the management of chronic discogenic low back pain in pediatric patients.

References

1. Inklebarger J et al, Ultrasound Guided Erector Spinae Plane Block with Ozone and Corticosteroid for the Management of Discogenic Back Pain: A Case Report, International Journal of Medical Science and Clinical Invention, Vol 9 No 10 (2022), 6286-6295.
2. Sachdev D et al, Narrative Review: erector spinae block in spine surgery, J Spine Surg 2023.
3. Costa T et al, Ozone therapy for low back pain. A systematic review, Acta Reumatol Port 2018.
4. Ribeiro de Andrade R et al, Effectiveness of ozone therapy to other therapies for low back pain: a systematic review with meta-analysis of randomized clinical trials, Braz J Anesthesiol 2019 Sep-Oct; 69(5):493-501.

5. Sconza C et al, Oxygen-ozone therapy for the treatment of low back pain: a systematic review of randomized controlled trials, Eur Rev Med Pharmacol Sci 2021 Oct; 25(19):6034-6046.
6. Chemeisani A et al, The benefit of epidural transforaminal injection of ozone in comparison with transforaminal steroids injection in the management of chronic low back pain in Lebanese population: one-year retrospective study, Cureus 2023 Jan 23;15(1):e34106.
7. Jeyaraman M et al, Ozone therapy in musculoskeletal medicine: a comprehensive review, European Journal of Medical Research 29, Article number 398 (2024).