

PELVIC NEUROSONOGRAPHY: A NEW TOOL IN THE DIAGNOSIS AND CONTROL OF ENDOMETRIOSIS OF THE LUMBOSACRAL PLEXUS AND SCIATIC NERVE, A CURRENT VIEW

JOSÉ AS DE ARRUDA CAMARA, ADILSON C FERREIRA, LARA OLIVEIRA DUTRA

ABSTRACT

INTRODUCTION: Chronic pelvic pain has among several causes endometriosis and among the types, deep infiltrative pain is the one that is most related to severe and disabling symptoms, sometimes taking years to be diagnosed, which has become a serious health problem throughout the world, among the various types, neural involvement is the one that is least diagnosed by ultrasound.

OBJECTIVE: To review, identify, compare the ultrasound findings between a patient with neural endometriosis and a healthy patient, as well as describe, what we believe to be, the first ultrasound technique for this evaluation.

MATERIAL AND METHODS: This is a literature review and comparative evaluation between a patient with neurotrophic endometriosis and a patient without endometriosis, with a description of an ultrasound technique for this purpose, our research is due to the feasibility of the ultrasound diagnosis of neurotropic endometriosis, that is, the one that causes injury to pelvic nerves such as sacral nerve branches, lumbosacral trunk and sciatic nerve.

RESULTS AND DISCUSSION: In this evaluation, we examined two patients, one of whom had a diagnosis of neurotropic endometriosis in the lumbosacral trunk and sciatic nerve and the other without clinical symptoms to compare the ultrasound findings; In the affected patient, our evaluation technique was performed and it was possible to diagnose the nerve alteration, which had also been confirmed by magnetic resonance imaging, and it was also possible to visualize the nerve roots of the patient without endometriosis.

CONCLUSION: In view of our still incipient examination technique, which requires further studies to establish itself as a reproducible technique, it was possible to visualize the neural alteration of the affected patient and compare it with the unaffected patient. To our surprise little literature on the subject was found.

KEYWORDS: ENDOMETRIOSIS, NEURO ENDOMETRIOSIS, PELVIC NERVES, SCIATIC NERVE, SACRAL PLEXUS, LUMBOSACRAL PLEXUS, CATAMENIAL PAIN, CYCLIC PAIN, CHRONIC PELVIC PAIN AND ULTRASOUND

INTRODUCTION

Endometriosis is a condition defined by the presence of endometrial tissue outside the uterus (gland and stroma) ¹. It affects women of reproductive age around 2-10%, and in women where pelvic pain is present or infertility the incidence can be between 35-50% ^{2,3}. Chronic pelvic pain in women is defined as persistent and non-cyclical pain perceived in structures related to the pelvis and lasting more than six months and affects one in six adult women ⁴, it is one of the most common clinical manifestations of endometriosis, where 71 to 87% of women who manifest it have laparoscopic evidence of endometriosis lesions ⁵. Neural involvement is rare and its prevalence is limited to case reports ⁶. Despite its rarity, it has significant clinical relevance due to the potential of

sensory and motor symptoms to cause impairment in quality of life and treatment difficulties, neural endometriosis can be diagnosed based on imaging findings, but it can often be overlooked or underdiagnosed ⁷. Peripheral neuropathies continue to be one of the most common reasons for the general population to seek neurological care ⁸.

After a search in the most recent literature, the last seven years, we will try to show where the evaluation of the sacral plexus and sciatic nerves affected by endometriosis is now, by ultrasound and what we are performing in our service.

MATERIALS AND METHODS

We searched the literature using Pubmed and Google Scholar for the following keywords: endometriosis, neuro en-

1. Instituto Arruda Camara



MAILING ADDRESS:

INSTITUTO ARRUDA CAMARA

Av. Luiz Carlos Prestes 410, sala 211, Barra da Tijuca RJ,

Rio de Janeiro. CEP – 22631-390

Email – drjosearruda7@gmail.com

ometriosis, pelvic nerves, sciatic nerve, sacral plexus, lumbosacral plexus, catamenial pain, cyclic pain, chronic pelvic pain and ultrasound.

RESULTS

Using the technique of abdominal ultrasound approach with a low frequency convex probe in two different equipment WS80 elite Samsung and Voluson E10 BT 18 GE, adjusted for the study of the pelvis, we examined two patients, one of whom was known to be affected by endometriosis of the lumbosacral trunk and sciatic nerve and another without clinical complaints. Below we demonstrate the technique used to evaluate the lumbar roots and lumbosacral trunk (figures 1-7).



Figure 1 – Sagittal section in the infra-umbilical region to demonstrate the L3, L4 and L5 vertebrae and sacrum (S1) and their respective intervertebral spaces (arrows).



Figure 2 – Para-sagittal section of the lumbar spine to identify the transverse apophysis of the vertebrae and their relationship with the psoas muscle



Figure 3 – Para-sagittal section with medial inclination between 15 and 30° to visualize the emergence of the lumbar roots of L4 and L5 and their union in the formation of the lumbosacral trunk.

Using these cuts, we were able to demonstrate both the nerve roots and their respective union in the formation of

the lumbosacral trunk, but when we identified the vertebrae and their respective spaces in a sagittal section in the infra-umbilical region, we rotated the transducer 90° for direct visualization of the vertebrae nerve fibers within the medullary canal in order to characterize them in order to show their echographic characteristics¹⁰ in the extra medullary canal topography, as seen below.

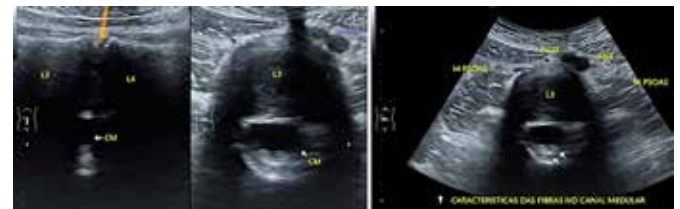


Figure 4 – Echographic characteristics of the nerve fibers within the spinal canal (white arrows) and the intervertebral space (yellow arrow) in sagittal and axial sections at the level of the bifurcation of the aorta into the iliac arteries.

Below we use the color Doppler technique to identify the great vessels of the pelvis (arteries and veins) and their correlations with the lumbosacral trunk posterior to the psoas muscle.

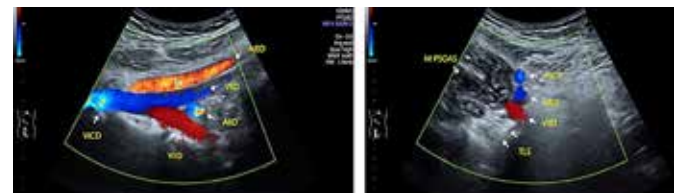


Figure 5 – Identification in para-sagittal external oblique section in the pelvis at the level of the bifurcation of the great vessels, demonstrating right external iliac artery (AIED) (red color), right external iliac vein (VIED) (blue color), right internal iliac artery (AIID) (blue color), right internal iliac vein (VIID) (red color) and right common iliac vein (VICD) (blue color), and in the axial section we demonstrate the lumbosacral trunk (TLS) just below the confluence of the internal and external iliac veins and posteromedial to the psoas muscle.

In a para-sagittal oblique axial section, we demonstrate the relationship between the nerve root, transverse process of L5 and psoas muscle.



Figure 6 – Demonstration of the lumbosacral trunk in the cross section above the transverse process and posteromedial to the psoas muscle (white arrow).

Finally, the demonstration of two different cases where the first image represents a union of the root of L4 and L5 in the formation of a lumbosacral trunk of normal aspect, hyperechoic with a maintained fibrillar pattern and without thickening and in the second image the visualization of a heterogeneous thickened lumbosacral trunk, with loss of the fibrillar pattern, demonstrating a clear involvement of an infiltrative pattern in it and, just below, the confirmation of the involvement of the endometriotic lesion by magnetic resonance.

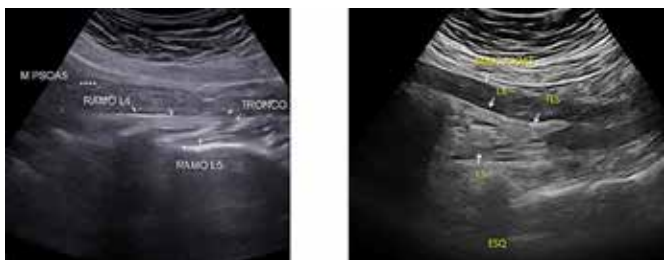


Figure 6 – First image of the union of the L4 and L5 roots in the formation of a normal lumbosacral trunk in a para-sagittal view with medial inclination in the pelvis; and second image the formation of a lumbosacral trunk affected by infiltration by endometriosis.



Figure 7 – Confirmation of the involvement of the sciatic nerve formation region on magnetic resonance imaging (yellow arrows).

Our study was performed with the patient in bowel preparation after using the following day: 2.5mg two (02) gelatinous pearls of Sodium picosulfate orally; high absorption diet and intake of at least two liters of water and fleet enema one hour before the exam. The evaluation was only carried out by the abdominal route with a convex probe.

In the line of ultrasound evaluation of nerves, we are advancing in the face of new technologies where even “share wave” elastography is being used for neural evaluation and mapping¹¹⁻¹².

DISCUSSION

In our research, we first tried to show the anatomical identification of the pelvic nerves and their relationship with bone, muscular and vascular structures. Possover in 2004 identified the pelvic nerves with electrical stimulation in order to reduce the atrogenesis of the bladder and rectum after pelvic surgery⁹, the American Society of Neuroimaging in 2015 shows that the nerve can be effectively evaluated in its cross section in certain places of interest clinical condition, its variability along its path, echogenicity, vascularization and mobility¹⁰. Using the five parameters in 2016, ultrasonography was described in the diagno-

sis of extrapelvic sciatic nerve endometriosis by the Hungarian group with confirmation of the lesion by magnetic resonance and it was possible to demonstrate the clinical improvement by ultrasound after treatment¹¹. Therefore, we know that it is possible to identify the anatomical nerves and their visualization through ultrasound, with these data our study is based on the identification of the lumbosacral trunk (union of the L4 and L5 nerve roots) and the characterization of the normal ultrasound structure as well as the visualization also the extrapelvic sciatic nerve as well as the work of the Hungarian group¹¹.

CONCLUSION

As seen in Figures 1-6, we demonstrate that it has become possible to visualize the lumbar nerve roots and the formation of the lumbosacral trunk following anatomical references with rules and ultrasound techniques already well established both in B-mode and in Doppler.

Previous knowledge of the echotexture and ultrasound characteristics of nerve fibers and adjacent structures, such as blood vessels and their correlations, has allowed us to visualize them; as neural endometriosis is still a rare object of study and summarized in a few case reports.

We believe that due to its clinical and social importance, it is still a very new and emerging area, requiring more studies and publications, which will help us to have better results in the diagnosis and control of the pathology in the future.

REFERENCES

- Olive DL, Schwartz LB. Endometriosis. *N Engl J Med.* 1993; 328(24): 1759-1769.
- Giudice LC, Kao LC. Endometriosis. *Lancet* 2004; 364(9447): 1789-1799.
- Morasutto C, Monasta L, Ricci G, Barbone F, Ronfani L. Incidence and estimated prevalence of endometriosis and adenomyosis in Northeast Italy: a data linkage study. *PLoS ONE* 2016; 11(4): e0154227.
- Zondervan KT, Yudkin PL, Vessey MP. The community prevalence of chronic pelvic pain in women and associated illness behaviour. *Br J Gen Pract.* 2001; 51: 541-547.
- Latremoliere A, Woolf CJ. Central sensitization: a generator of pain hypersensitivity by central neural plasticity. *J Pain* 2009; 10(9): 895-926.
- Ceccaroni M, Clarizia R, Roviglione G, Bruni F, Ruffo G, Petersl, et al. Deep rectal and parametrial infiltrating endometriosis with monolateral pudendal nerve involvement: case report and laparoscopic nerve-sparing approach. *Eur J Obstet Gynecol Reprod Biol.* 2010; 153(2): 227-229.
- Moura Filho, J.P., Leão, R.V., Horvat, N. et al. What abdominal radiologists should know about extragenital endometriosis-associated neuropathy. *Abdom Radiol* 2020; 45, 1818-1828.
- Martyn CN, Hughes RA. Epidemiology of peripheral neuropathy. *J Neurol Neurosurg Psychiatry* 1997; 62(4): 310-318.
- Possover M, Rhiem K, Chiantera V. The "Laparoscopic Neuro-Navigation" – LANN: from a functional cartography of the pelvic autonomous neurosystem to a new field of laparoscopic surgery. *Minim Invasive Ther Allied Technol.* 2004; 13(5): 362-367.
- Kerasnoudis A, Tsigvoulis G. Nerve ultrasound in peripheral neuropathies: a review. *J. Neuroimaging* 2015; 25: 528-538.
- Arányi Z, Polyák I, Tóth N, Verme G, Göcsei Z. Ultrasonography of sciatica nerve endometriosis. *Muscle Nerve.* 2016 ;54(3): 500-505.
- Bedewi MA, Elsifey AA, Alfaifi T, Kotb MA, Abdelgawad MS, Bediwy AM, Swify SM, Awad EM. Shear wave elastography of the tibial nerve in healthy subjects. *Medicine (Baltimore).* 2021; 22 100(3): e2