



Article

DIAGNOSIS AND SUBSEQUENT TREATMENT WITH OXYGEN-OZONE THERAPY OF BAASTRUP'S DISEASE

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ABSTRACT

In recent years, several studies have demonstrated the utility of oxygen-ozone in reducing the size of herniated discs, proving the validity of this treatment on back pain due to hernias (1-19). In this study, the authors evaluate the therapeutic results obtained in the treatment of 56 patients suffering from non-discogenic low back pain caused by Baastrup's syndrome after radiological diagnostic confirmation by magnetic resonance imaging (MRI) completed with Fat / Sat sequences before and after administration of paramagnetic contrast (20-22).

KEYWORDS: *oxygenKE , ozone, ozone therapy, Baastrup's syndrome, Baastrup's disease, kissing spine syndrome*

INTRODUCTION

The Baastrup's Syndrome described for the first time by Danish radiologist Christian Baastrup in 1933 - also known by the Anglo-Saxon term "kissing spines" - is characterized by the presence of arthrosis between the spinous processes of the vertebral column, which leads to the formation of real "neo-joints" (23-29). It is also often the cause of low back pain refractory to common treatments with anti-inflammatory and anti-pain drugs. It mainly affects women - with an F: M = 4: 1 ratio - and is usually diagnosed towards the third decade of age. The diagnosis is radiological: the standard X-ray shows an extreme hyperlordosis of the lumbar tract up to the mutual contact of the spinous processes and degeneration of the same (23-27) (Fig. 1).

The course of the disease is progressive, and in case of accentuation of the lumbago, it is indicated to complete the investigations with an MRI with Fat / Sat sequences and possible administration of gadolinium in order to highlight any inflammatory focal points in the acute phase (20-22) (Fig. 2 a, b).

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A precise diagnosis conducted after careful, objective examination and supported by a precise evaluation using Nuclear Magnetic Resonance (MRI) is essential to establish the best possible therapy based on the severity and stage of progression of the disease.

Treatment for this disease usually involves two-stage therapy. The first stage consists of physiotherapy manipulation, which, with movements and massages, restores lordosis and stretches the degraded muscles. Physiotherapy is necessary to strengthen and stretch the muscles through decontracting massages, thermotherapy and targeted exercises. In this phase, painkillers, anti-inflammatories, and muscle relaxants could be administered to improve the effect of physiotherapy therapy. If all these treatments do not have an effect, it is necessary to proceed with classic surgery or through Interspinous Process Distraction (26).

Oxygen-ozone therapy was introduced in 1985 and has been widely proven as a valid method for the treatment of herniated discs (1-19). Over the years, numerous series have reported positive results ranging from 75% up to almost 90% in treating low back pain complicated or not by disc-radicular impingement sciatica due to disc herniation (1-19).

In this note, we report the results of the selected treatment of patients with low back pain not due to hernias and/or disc protrusions. We focused our attention on the pathology of the posterior compartment, which may be responsible for this symptomatology in Baastrup's Syndrome, pictures after diagnostic confirmation with lumbosacral MRI completed with Fat / Sat sequences before and after administration of paramagnetic contrast medium.

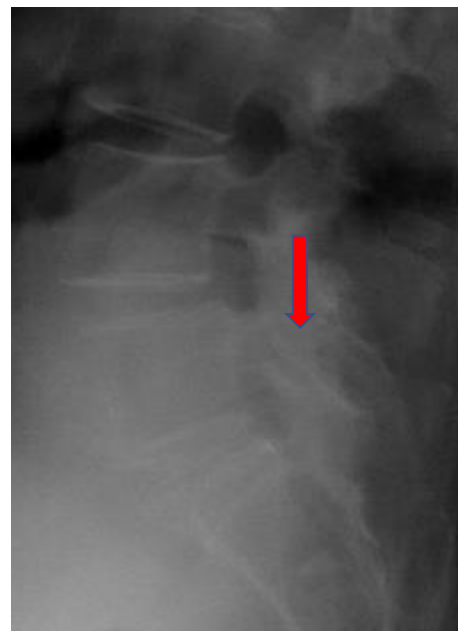


Fig 1. Standard X-Ray (LL view): Baastrup's Syndrome (arrow).



Fig 2. a, b) MRI sag. and ax. with Fat / Sat sequences after administration of paramagnetic contrast agent: inflammation of the interspinous ligament **a)**: arrow; **b)**: arrowhead.

MATERIALS AND METHODS

In this study, we present the treatment with injections of a gaseous mixture of oxygen-ozone from January 2017 to February 2020 in 56 patients (38 F-18M, age 51/79 years). Targeted infiltrations were carried out with this therapy in patients suffering from Baastrup's Syndrome in the acute phase, subject to diagnostic confirmation by Magnetic Resonance (MRI) of the acute stage of the disease with evidence of pathological impregnation of contrast medium at the point of inflammation.

In all 56 patients, the diagnosis of Baastrup's Syndrome to be treated was confirmed by magnetic resonance imaging (MRI). The MRI investigations were carried out with Siemens Magnetom AERA 1.5 T software SYNGO MR D13 at the Clinical Institute of the City of Brescia and the neuroradiology service of the Careggi Hospital in Florence. At the same time, a GE Healthcare Signa Voyager 1.5 T equipment was used in the neuroradiology department of the Cardarelli in Naples; all investigations were performed with standard sequences and then completed the examination with the use of Fat/Sat sequences without and with the administration of contrast medium (Fig. 3 a, b).

Infiltration technique

All treatments were performed under CT guidance. After being informed about the procedure and possible complications, the patient signs the informed consent. Preliminary CT scans are performed with the patient prone to confirm the pathology and the level to be treated. At this point, the skin is disinfected using special preparations for general skin antisepsis (Citro jod 100 registration No. 1805 of the Ministry of Health based on iodine polyvinylpyrrolidone).

A preliminary CT scan is performed to identify the skin approach point. Local anaesthesia is performed with ethyl chloride spray, and then, again using the CT guide, a spinal needle is placed, typically using needles of varying calibre between 22 and 25 G. The perfect positioning of the needle in the interspinous space in the case of Baastrup's Syndrome is checked with a CT scan. A 10 ml syringe in polyethylene is then filled with the gaseous mixture at a 25 µg/ml concentration.

The gaseous mixture is then injected, generally injecting a variable volume from 3 ccs to 5 ccs of the O₂-O₃ gaseous

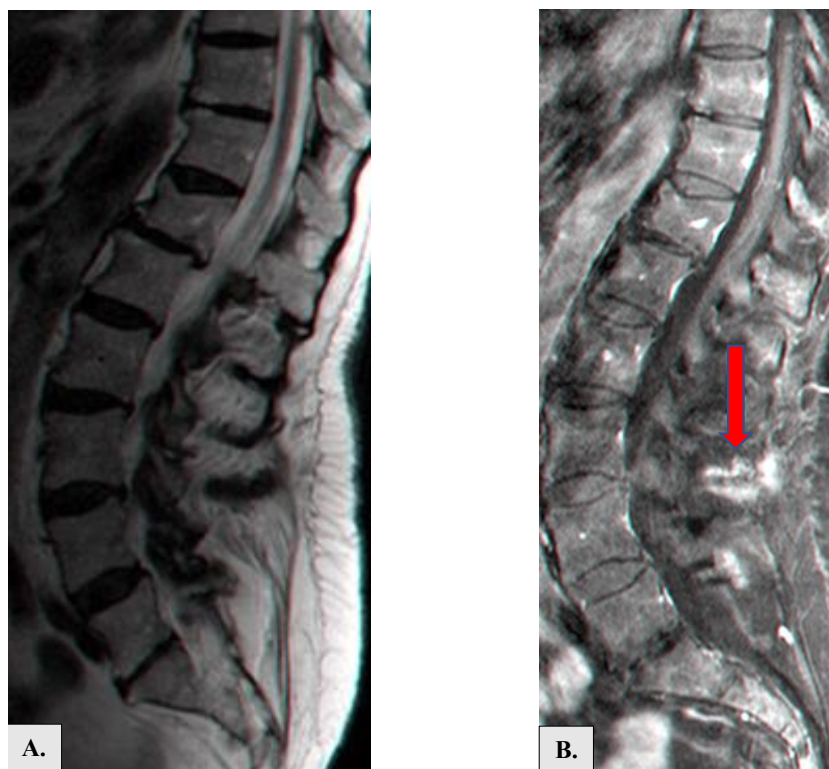


Fig. 3. *A): MRI sag. T2 and Fat / Sat after contrast medium. B): after administration of contrast medium, impregnation is evident from the local inflammatory state of the interspinous ligament L3-L 4 (arrow).*

mixture. After the infiltration, other CT scans are performed to document the correct distribution of the gaseous mixture. All material used must be sterile and single-use (2, 7).

The 56 patients we treated had initially been diagnosed with the pathology by radiographs of the spine and subsequently confirmed with MRI without and with gadolinium with Fat/Sat sequences capable of documenting the inflammatory state at the level of the interspinous ligament. All the patients suffered from pain in the lower dorsal and lumbosacral tract, in which arthritic manifestations were advanced, and all showed an associated analgesic contracture of the paravertebral musculature.

Infiltrations of 4 cc of a gaseous mixture of oxygen-ozone at a concentration of 25 μg / ml with 23 G needles were carried out in correspondence with the inflamed interspinous ligaments as documented by the MRI investigation, followed by intramuscular paravertebral infiltrations always at 25 μg / ml in the tract affected by the disease. In 22 patients enrolled in our study (39.2%), we then performed a control MRI without and with the administration of an intravenous contrast medium between 15 days and one month from therapy.

RESULTS

In all 56 cases, at the check-up carried out one week after treatment, all patients reported a clear improvement in painful symptoms, while 6 months later, all subjects showed a partial recrudescence of pain; 12 (21.4%) reported that the clinical picture had returned substantially similar to what was present at the beginning of treatment.

Of the 56 patients treated, in the 22 in which we performed the control MRI with Fat/Sat sequences before and after administration of intravenous contrast medium in 18 (81.8%), the MRI allowed documenting the complete resolution of the inflammatory state of the interspinous ligament treated (Fig. 4, 5). In 23 cases (41.07%), it was decided to carry out a second treatment which immediately led to a clear reduction in painful symptoms.

In all the patients we treated, we were advised to follow a physiotherapy protocol for preventive purposes. In 18 cases (32.1%), the physiatrist colleague advised patients to include in their therapeutic path the possibility of performing thermal treatments; in particular, he advised carrying out cycles of balneo-mud therapy (1/2 times a year) to maintain the good therapeutic result obtained.

DISCUSSION

Baastrup's syndrome (or lumbar interspinous arthrosis) consists of a degenerative process associated with the development of a pseudo-articulation between the spinous processes and the appearance of arthritic phenomena. It is defined as a particular variant of arthrosis in the axial plane.

It is a condition generated by mutual contact (of the adjacent spinous processes (hence the name of "Kissing spine syndrome")), which produces a mechanical overload and changes in the bone surfaces. It is observed more frequently



Fig 4. Baastrup's Syndrome: RM ax. Fat / sat after gadolinium before treatment. Inflammation of the interspinous ligament (arrow).

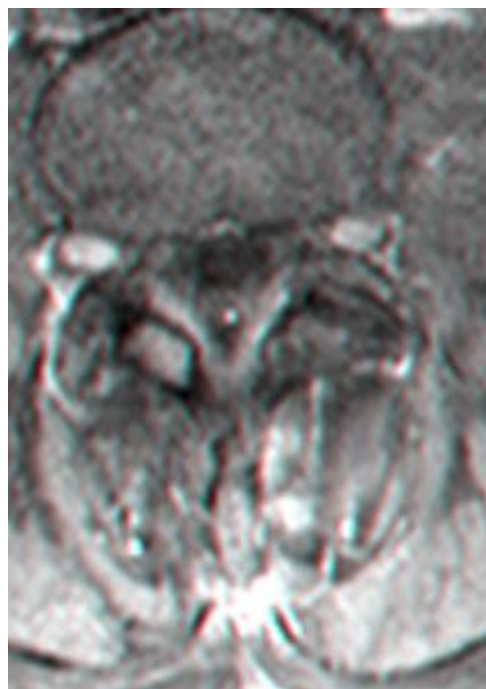


Fig 5. Baastrup's disease: RM ax. Fat / sat with gadolinium after treatment. Complete resolution of the inflammatory state of the interspinous ligament.

between the third, fourth, and fifth lumbar vertebrae (23-27). Based on our experience, the excellent therapeutic results obtained in patients suffering from Baastrup's Syndrome are undoubtedly attributable to the known mechanisms of action of the oxygen-ozone mixture at the site of the disease.

The oxygen-ozone gas mixture injected at this level exerts an important anti-inflammatory and analgesic action, also normalizing the level of cytokines and prostaglandins, increasing superoxide dismutase (SOD), minimizing reactive oxidant species (ROS), and improving local periganglionic circulation with a eutrophic effect (1-19). Oxygen-ozone therapy has, in fact, proved to be an effective therapeutic option in symptomatic treatment by acting mainly on pain but also muscle tone by reducing the analgesic contracture of the paravertebral muscles. In this group of patients, clinical benefit is obtained already with a single targeted treatment. In cases where the therapeutic result was poor or unsatisfactory, in addition to the intervention of the physiatrist colleague, a neurosurgical reassessment of the picture is also indispensable to decide whether an intervention is essential.

CONCLUSION

In recent years, mainly thanks to the introduction of MR sequences with Fat Saturation and gadolinium in patients with degenerative disease of the lumbar spine and low back pain, Diagnostic imaging has become even more helpful to the clinician in making a natural diagnosis in order to decide then the best therapeutic strategy to be adopted based on the pathology to be treated.

In particular, in patients with non-radicular low back pain, this syndrome may arise from changes in the posterior elements of the lumbar spine (the "posterior vertebral compartment").

The correct selection of the patient allows, in most cases striking clinical results; in reference to our series of patients afflicted by Baastrup's Syndrome, we found optimal therapeutic results already with a single infiltration under CT control followed by intramuscular paravertebral treatment. The rapid resolution of pain (with no complications), the ease of performing the method, and the complete control of infiltration under CT control allow proposing CT-guided oxygen-ozone therapy as a viable alternative to the various treatments currently proposed for Baastrup's Syndrome. In consideration of these factors, it is safe to assume that it can also be proposed as a method of choice between conservative therapies. It is also important to underline that this therapy does not contraindicate other infiltrative or surgical therapies.

Conflict of interest

The authors declare that they have no conflict of interest.

REFERENCES

1. Andreula CF, Simonetti L, De Santis F, Agati R, Ricci R, Leonardi M. Minimally invasive oxygen-ozone therapy for lumbar disk herniation. *AJNR American journal of neuroradiology*. 2003;24(5):996-1000. <https://pubmed.ncbi.nlm.nih.gov/12748111/>
2. Bonetti M, Fontana A, Coticelli B, Volta GD, Guindani M, Leonardi M. Intraforaminal O(2)-O(3) versus periradicular steroidal infiltrations in lower back pain: randomized controlled study. *AJNR American journal of neuroradiology*. 2005;26(5):996-1000. <https://pubmed.ncbi.nlm.nih.gov/15891150/>
3. Bonetti M, Coticelli B, Raimondi D, Valdenassi L, Richelmi P, Bertè FA. Ossigeno-ozono terapia vs infiltrazioni epidurali cortisoniche. *Rivista di Neuroradiologia*. 2000;13:203-206.
4. Gallucci M, Limbucci N, Zugaro L, et al. Sciatica: treatment with intradiscal and intraforaminal injections of steroid and oxygen-ozone versus steroid only. *Radiology*. 2007;242(3):907-913. doi:10.1148/radiol.2423051934
5. Gualandi G, Bonetti M. Ossigeno-ozonoterapia nel trattamento della patologia dolorosa del rachide lombare: esperienza preliminare. *Acta Toxic Therap*. 1996;17(2-3):261-264.
6. Iliakis E. Ozone treatment in low back pain. *Orthopaedics*. 1995;1:29-33.
7. Iliakis E, Valadakis V, Vynios DH, Tsiganos CP, Agapitos E. Rationalization of the activity of medical ozone on intervertebral disc and histological and biochemical study. *Rivista di Neuroradiologia*. 2001;14(S1):25-30.

8. Lehnert T, Naguib NNN, Wutzler S, et al. Analysis of Disk Volume before and after CT-guided Intradiscal and Perianglionic Ozone–Oxygen Injection for the Treatment of Lumbar Disk Herniation. *Journal of Vascular and Interventional Radiology*. 2012;23(11):1430-1436. doi:10.1016/j.jvir.2012.07.029
9. Leonardi M, Albini Roccioli L, Battaglia S, et al. Oxygen-ozone chemonucleolysis for herniated disc with sciatica. A comparison of treatments in patients with subacute and chronic symptoms. *Rivista Italiana di Ossigeno-Ozonoterapia*. 2006;5:33-36.
10. Leonardi M, Simonetti L, Agati R. Neuroradiology of spine degenerative diseases. *Best Practice & Research Clinical Rheumatology*. 2002;16(1):59-87. doi:10.1053/berh.2001.0207
11. Leonardi M, Simonetti L, Raffi L, Cenni P, Barbara C. Mini-Invasive Treatment of Herniated Disc by Oxygen-Ozone Injection. *Interventional Neuroradiology*. 2003;9(2_suppl):75-75. doi:10.1177/15910199030090s211
12. Magalhaes FNDO, Dotta L, Sasse A, Teixeira MJ, Fonoff ET. Ozone therapy as a treatment for low back pain secondary to herniated disc: a systematic review and meta-analysis of randomized controlled trials. *Pain Physician*. 2012;15(2):E115-129. <https://pubmed.ncbi.nlm.nih.gov/22430658/>
13. Muto M, Andreula C, Leonardi M. Treatment of herniated lumbar disc by intradiscal and intraforaminal oxygen-ozone (O2-O3) injection. *Journal of Neuroradiology*. 2004;31(3):183-189. doi:10.1016/s0150-9861(04)96989-1
14. Pellicanò F, Martinelli F, Tavanti V, et al. The Italian Oxygen-Ozone Therapy Federation (FIO) study on oxygen-ozone treatment of herniated disc. *International Journal of Ozone Therapy*. 2007;6:7-15.
15. Perri M, Grattacaso G, Di Tunno V, et al. MRI DWI/ADC signal predicts shrinkage of lumbar disc herniation after O2–O3 discolysis. *The Neuroradiology Journal*. 2015;28(2):198-204. doi:10.1177/1971400915576658
16. Rahimi-Movaghar V, Eslami V. The major efficient mechanisms of ozone therapy are obtained in intradiscal procedures. *Pain Physician*. 2012;15(6):E1007-1008.
17. Splendiani A, Perri M, Conchiglia A, et al. MR Assessment of Lumbar Disk Herniation Treated with Oxygen-Ozone Diskolysis: The Role of DWI and Related ADC versus Intervertebral Disk Volumetric Analysis for Detecting Treatment Response. *The Neuroradiology Journal*. 2013;26(3):347-356. doi:10.1177/197140091302600316
18. Steppan J, Meaders T, Muto M, Murphy KJ. A metaanalysis of the effectiveness and safety of ozone treatments for herniated lumbar discs. *Journal of vascular and interventional radiology: JVIR*. 2010;21(4):534-548. doi:10.1016/j.jvir.2009.12.393
19. Zhang Y, Ma Y, Jiang J, Ding T, Wang J. Treatment of the lumbar disc herniation with intradiscal and intraforaminal injection of oxygen-ozone. *Journal of Back and Musculoskeletal Rehabilitation*. 2013;26(3):317-322. doi:10.3233/bmr-130386
20. Czervionke LF, Fenton DS. Fat-Saturated MR Imaging in the Detection of Inflammatory Facet Arthropathy (Facet Synovitis) in the Lumbar Spine. *Pain Medicine*. 2008;9(4):400-406. doi:10.1111/j.1526-4637.2007.00313.x
21. D'Aprile P, Tarantino A, Lorusso V, Brindicci D. Fat Saturation Technique and Gadolinium in MRI of Lumbar Spinal Degenerative Disease. *The Neuroradiology Journal*. 2006;19(5):654-671. doi:10.1177/197140090601900518
22. D'Aprile P, Tarantino A, Jinkins JR, Brindicci D. The value of fat saturation sequences and contrast medium administration in MRI of degenerative disease of the posterior/perispinal elements of the lumbosacral spine. *European Radiology*. 2007;17(2):523-531. doi:10.1007/s00330-006-0324-0
23. Alonso F, Bryant E, Iwanaga J, Chapman JR, Oskouian RJ, Tubbs RS. Bastrup's Disease: A Comprehensive Review of the Extant Literature. *World Neurosurgery*. 2017;101:331-334. doi:10.1016/j.wneu.2017.02.004
24. Filippiadis DK, Mazioti A, Argentos S, et al. Bastrup's disease (kissing spines syndrome): a pictorial review. *Insights into Imaging*. 2015;6(1):123-128. doi:10.1007/s13244-014-0376-7
25. Kerroum A, Laudato PA, Suter MR. The steps until surgery in the management of Bastrup's Disease (kissing spine syndrome). *Journal of Surgical Case Reports*. 2019;2019(6). doi:10.1093/jscr/rjz194
26. Singla A. Bastrup's disease: The kissing spine. *World Journal of Clinical Cases*. 2014;2(2):45. doi:10.12998/wjcc.v2.i2.45
27. Philipp LR, Baum GR, Grossberg JA, Ahmad FU. Bastrup's Disease: An Often Missed Etiology for Back Pain. *Cureus*. 2016;8(1). doi:10.7759/cureus.465