Evaluation Study

TREATMENT OF RHIZARTHROSIS WITH OXYGEN-OZONE THERAPY: OUR EXPERIENCE

M. Bonetti[1], G. Bragaglio[2], G. Guarino[2], I. Marchina[2], G.M. Ottaviani[3], M. Moretti[2] and G. Tabaracci[4]

[1] Department of Neuroradiology, Istituto Clinico Città di Brescia, Brescia, Italy;
[2]Oberdan Specialistic Clinic, Brescia, Italy;
[3]Emergency and Urgency Department, Spedali Civili di Brescia, Brescia, Italy;
[4] San Rocco Specialistic Clinic, Montichiari, Brescia, Italy

**Correspondence to*:
Matteo Bonetti, MD
Department of Neuroradiology,
Istituto Clinico Città di Brescia,
Via Gualla, 15,
25128 Brescia, Italy
e-mail: dottorbonetti@gmail.com

ABSTRACT

In recent years, the number of reports on the use of oxygen-ozone therapy for treating acute and chronic inflammatory joint disease has been constantly increasing. In this study, we report our experience in the treatment of rhizarthrosis. From March 2018 to February 2019, 27 patients (21 females and 6 males aged 58 to 79 years, mean age 67.8 years) were enrolled. They were affected by rhizarthrosis. The diagnosis was confirmed by clinical examination and radiographic findings from standard metacarpal trapezius joint radiograms. Of the 27 treated patients, the clinical result was excellent in 16 (59%), in 5 it was satisfactory (19%), while in the remaining 6 no clinical benefit was obtained (22%). Although our series is currently limited to only 27 patients, we believe oxygen-ozone therapy in the treatment of metacarpal trapezius rhizarthrosis represents a valid therapeutic option instead of the use of drugs such as NSAIDs and/or steroids, especially in the first phase of the disease.

KEYWORDS: *rhizarthrosis, thumb, osteoarthritis, trapeziometacarpal, joint*

INTRODUCTION

Rhizarthrosis is a degenerative-arthritic process that affects the joint of the base of the thumb (1, 2). The endurance of pain and the significant deficit of strength between thumb and forefinger can interfere with daily tasks such as – for example – turning a key, opening a car door, picking up a book, threading a thread through the loop of a needle; objects may fall from the grip of hands and night resting may be prevented. All these factors can cause a lack of autonomy, decreasing the overall quality of life (3, 4). Rhizarthrosis most frequently affects one side, and women over 40 are more likely to be affected by this pathology (1-4).

Conservative treatment involves administering anti-inflammatory drugs and braces that temporarily immobilize the joint or intra-articular infiltrations with cortisone. From a therapeutic point of view, using a specific handheld device may be useful to keep the joint locked, at least during the night. Simple analgesics such as paracetamol and, in the most painful phases, non-steroidal anti-inflammatory drugs can also be useful (5-17).

Received: 29 March 2023
Accepted: 02 May 2023

There are also some reports on the effectiveness of local infiltrative therapy with hyaluronic acid (18-20). In case of failure, surgery is performed. The surgery that currently provides the most significant therapeutic success is the so-called biological arthroplasty (21, 22).

In light of the recent results reported in the literature on the use of oxygen-ozone therapy to treat acute and chronic inflammatory pathology of small and large joints (23-32), we treated 27 patients suffering from arthrosis (Fig. 1).

Fig. 1. *(**A**-**B**): radiographic diagnosis of rhizarthrosis (arrows). **A**): oblique projection and **B**): Kapandji projection for the evaluation of the joints of base of the thumb.*

MATERIALS AND METHODS

From March 2018 to February 2019, 27 patients with a diagnosis of rhizarthrosis confirmed both by clinical examination and by radiographic findings with standard radiograms of the hand (Fig. 1) were enrolled. Specifically, 21 females and 6 males aged between 58 and 79 (mean age 67.8 years). All treatments were carried out using needles 25 G 5/8 Terumo orange colour code (Fig. 2).

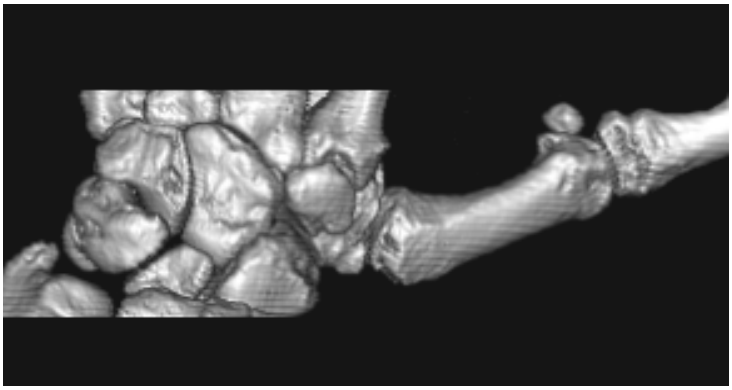

Fig. 2. *3D CT reconstruction of the metacarpal trapezius joint: rhizarthrosis.*

After signing an informed consent, all patients underwent a local infiltration with oxygen-ozone at a concentration of 20 micrograms/ml. The first treatment was delivered using the CT guide to allow perfect access to the joint. Local anaesthesia was performed with ethyl chloride spray, and then, again using the CT guide, the needle of 25 G was inserted in the joint (Fig. 3).

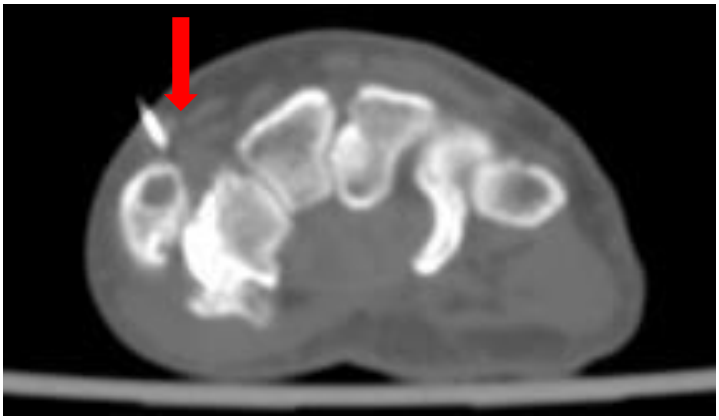

Fig. 3. *Preliminary CT scan: checking the positioning of the 25G needle (arrow).*

Once the entry point had been correctly identified, it was marked with a demographic pencil and kept constant for subsequent treatments. A 5 ml syringe in polyethylene was then filled with the gaseous mixture at a 20 µg/ml concentration. The gaseous mixture was then injected, generally using a variable volume from 3 cc to 5 cc of the O_2-O_3 gaseous mixture. All materials used must be sterile and single-use. After the infiltration, other CT scans were performed to document the correct distribution of the gaseous mixture. (Fig 4).

Fig. 4. *TC control of the distribution of the gaseous mixture (arrows).*

An average of 6 to 10 infiltrations of the metacarpal trapezius joint every two weeks were performed depending on the severity of the case treated. In particular, in 6 patients, we performed six injections, in 12 eight infiltrations, and in the remaining 9 ten applications. Having to treat an extremely sensitive region, local anaesthesia with ethyl chloride spray was always performed. Infiltration was always well tolerated by patients.

RESULTS

All patients included in the study were clinically evaluated one month after the end of the therapy. During the treatment period, any anti-inflammatory therapy was stopped. Instead, patients continued to use the brace. Therefore, only 8 out of 27 patients continued to take advantage of the brace.

Among 27 treated patients, there were excellent, satisfactory and poor results in 16 (59%), 5 (19%) and 6 (22%) subjects, respectively. Clinical results were evaluated one month after the end of treatment. Excellent results were those with almost complete disappearance of painful symptoms; satisfactory results were those where patients reported only a partial remission of painful symptoms; poor results were those with no clinical benefit. These last were referred to orthopaedics for a further therapeutic decision**.**

DISCUSSION

In rhizarthrosis, the arthrosis process causes the cartilage that lines the two bones in contact (trapezius and first metacarpal bone) to become thinner; this process causes further friction, wear and pain. It is challenging to translate the intensity of pain reported by the patient in an objective evaluation of the joint condition. In fact, significantly compromised clinical pictures at radiographic control are often associated with a very low impact on the patient's activity, while, in other cases, early stages can be extremely troublesome and cause severe functional deficits. The main symptom is pain, which appears when the patient performs simple gripping and gripping movements with the thumb (1-4).

Pain can also appear spontaneously with the change of weather, especially in the presence of humidity. Pain is also awakened by direct pressure on the joint at the base of the thumb or by grabbing the thumb and pushing it towards the wrist. Over time, the reduction of the force expressed during gripping becomes more and more marked, and pain appears while carrying out light manual activities more and more.

The characteristic of rhizarthrosis is also the appearance in the initial stages of swelling at the base of the thumb, followed by progressive displacement of the base outwards. no consensus has emerged in the literature regarding a single effective protocol for conservative treatment, and in the literature, there are few works compared to what is proposed for the surgical techniques (1-23).

The therapy involves keeping the joint at rest through braces and treatment with non-steroidal anti-inflammatory drugs (NSAIDs), generally at full dosage for an adequate period. Intra-articular infiltrative therapy with corticosteroids is also possible. Sometimes, physical therapy is associated (ultrasound, iontophoresis, etc.). Rarely is there an indication of surgical treatment utilizing arthroplasty (4-23).

In light of our experience in oxygen-ozone therapy treatments in various musculoskeletal districts, we used this type of treatment for analgesic purposes also in rhizarthrosis. The mechanisms of action of the oxygen-ozone gas mixture are well-known and widely documented in the literature (23-32). The rationale for intra-articular oxygen-ozone infiltration is based on relieving inflammation with subsequent analgesic action. The oxygen-ozone gas mixture injected normalizes the level of cytokines and prostaglandins, increases superoxide dismutase, minimizes reactive oxidant species and improves local circulation with a eutrophic effect.

CONCLUSIONS

Although the reported case series is based on evaluating only 27 patients, we believe oxygen-ozone therapy in treating metacarpal trapezius rizarthrosis is a valid therapeutic option, especially in the first phase of the disease. It can be used instead of other drugs, such as NSAIDs and/or steroids. The good results obtained in our series are related to some of the main activities of oxygen-ozone therapy: the intra and trans-tissue oxygenation with consequent improvement of both hypoxia and ozone's anti-inflammatory, analgesic and eutrophicating activities.

In conclusion, oxygen-ozone therapy can be considered an excellent therapeutic approach for patients afflicted with rizarthrosis.

REFERENCES

1. Saheb RLC, Vaz BADS, Soeira TP, Shimaoka FJ, Herrero CFPDS, Mazzer N. Surgical treatment for rhizarthrosis: a systematic review of the last 10 years. *Acta Ortopédica Brasileira*. 2022;30(1). doi:https://doi.org/10.1590/1413-785220223001e246704
2. Chevalier X, Maheu E. [Rhizarthrosis]. *La Revue Du Praticien*. 2012;62(5):639.
3. Verrijdt G, De Landtsheer A, Mellen A, Godderis L. Rhizarthrosis in banknote processing workers: a retrospective cohort study. *Occupational Medicine*. 2017;67(8):615-620. doi:https://doi.org/10.1093/occmed/kqx144
4. Aita MA, Alves RS, Longuino LF, Ferreira CHV, Ikeuti DH, Rodrigues LMR. Measurement of quality of life among patient undergoing arthroplasty of the thumb to treat CMC arthritis. *Revista Brasileira de Ortopedia (English Edition)*. 2016;51(4):431-436. doi:https://doi.org/10.1016/j.rboe.2016.06.003
5. Roux CH, Euller-Ziegler L. Injections for treatment of carpometacarpal osteoarthritis (rhizarthrosis): What is the evidence? *Joint Bone Spine*. 2016;83(2):125-126. doi:https://doi.org/10.1016/j.jbspin.2015.04.012
6. Szalay G, Scheufens T, Alt V, Boecker W, Schnettler R. Die operative Versorgung der therapierefraktären Rhizarthrose mittels Trapezektomie und Suspension des ersten Strahls mittels Mini TightRope®. *Handchirurgie Mikrochirurgie Plastische Chirurgie*. 2014;46(03):179-185. doi:https://doi.org/10.1055/s-0034-1368715
7. Dreiser RL, Gersberg M, Thomas F, Courcier S. [Ibuprofen 800 mg in the treatment of arthrosis of the fingers or rhizarthrosis]. *Revue Du Rhumatisme (Ed Francaise: 1993)*. 1993;60(11):836-841.

8. .J Jurča, M Němejc, Havlas. Surgical Treatment for Advanced Rhizarthrosis. Comparison of Results of the Burton-Pellegrini Technique and Trapeziometacarpal Joint Arthroplasty. *Acta Chirurgiae Orthopaedicae Et Traumatologiae Cechoslovaca*. 2016;83(1):27-31. doi:https://doi.org/10.55095/achot2016/004
9. Russo S, Bernasconi A, Busco G, Sadile F. Treatment of the trapeziometacarpal osteoarthritis by arthroplasty with a pyrocarbon implant. *International Orthopaedics*. 2015;40(7):1465-1471. doi:https://doi.org/10.1007/s00264-015-3016-z
10. Fuchs S, Mönikes R, Wohlmeiner A, Heyse T. Intra-articular hyaluronic acid compared with corticoid injections for the treatment of rhizarthrosis. *Osteoarthritis and Cartilage*. 2006;14(1):82-88. doi:https://doi.org/10.1016/j.joca.2005.07.016
11. Bohr S, Rennekampff HO, Pallua N. Cell-Enriched Lipoaspirate Arthroplasty: A Novel Approach to First Carpometacarpal Joint Arthritis. *Hand Surgery*. 2015;20(03):479-481. doi:https://doi.org/10.1142/s0218810415720259
12. Ingegnoli F, Soldi A, Meroni P. Power Doppler Sonography and Clinical Monitoring for Hyaluronic Acid Treatment of Rhizarthrosis: A Pilot Study. *Journal of Hand and Microsurgery*. 2016;03(02):51-54. doi:https://doi.org/10.1007/s12593-011-0037-8
13. Jaminet P, Kraus A, Manoli T, Werdin F, Schaller HE, Nektarios Sinis. Accidental median nerve injury during trapezium resection and ligament reconstruction for primary rhizarthrosis. *Microsurgery*. 2010;30(6):502-504. doi:https://doi.org/10.1002/micr.20768
14. Gwendoline De Fleurian. Étude d'un cas de rhizarthrose parmi les pêcheurs de poulpes en Méditerranée. *La Presse Médicale*. 2010;39(3):398-402. doi:https://doi.org/10.1016/j.lpm.2009.11.009
15. Karalezli N, Ogun TC, Kartal S, Saracgil SN, Yel M, Tuncay I. The pain associated with intraarticular hyaluronic acid injections for trapeziometacarpal osteoarthritis. *Clinical Rheumatology*. 2006;26(4):569-571. doi:https://doi.org/10.1007/s10067-006-0354-7
16. Valentino M, Rapisarda V. [Rhizarthrosis of the thumb in ironing workers]. *La Medicina Del Lavoro*. 2002;93(2):80-86.
17. Arnaud Dupeyron, Ehrler S, Marie-Eve Isner-Horobeti. Rhizarthrose et orthèse.Revue de la littérature. *Ann Readapt Med Phys*. 2001;44(3):123-131. doi:https://doi.org/10.1016/s0168-6054(01)00074-5
18. Monfort J, Rotés-Sala D, Segalés N, et al. Comparative efficacy of intra-articular hyaluronic acid and corticoid injections in osteoarthritis of the first carpometacarpal joint: Results of a 6-month single-masked randomized study. *Joint Bone Spine*. 2015;82(2):116-121. doi:https://doi.org/10.1016/j.jbspin.2014.08.008
19. Cormier G, Le Goff B, Denis A, et al. Corticosteroids injections versus corticosteroids with hyaluronic acid injections in rhizarthrosis: the randomised multicentre RHIZ'ART trial study protocol. *BMJ Open*. 2019;9(1):e022553. doi:https://doi.org/10.1136/bmjopen-2018-022553
20. Fuchs S, Erbe T, Fischer HL, Tibesku CO. Intraarticular Hyaluronic Acid versus Glucocorticoid Injections for Nonradicular Pain in the Lumbar Spine. *Journal of Vascular and Interventional Radiology*. 2005;16(11):1493-1498. doi:https://doi.org/10.1097/01.rvi.0000175334.60638.3f
21. Martínez-Martínez F, García-Hortelano S, García-Paños JP, Moreno-Fernández JM, Martín-Ferrero MÁ. Estudio clínico comparativo de 2 técnicas quirúrgicas de rizartrosis del pulgar. *Revista Española de Cirugía Ortopédica y Traumatología*. 2016;60(1):59-66. doi:https://doi.org/10.1016/j.recot.2015.05.005
22. Luther C. Handchirurgie [Hand surgery. Surgery in rhizarthrosis: prospective comparison]. *Unfallchirurg*. 2013;116(10):868-869. doi:https://doi.org/10.1007/s00113-013-2510-2
23. Giombini A, Menotti F, Di Cesare A, et al. Comparison between intrarticular injection of hyaluronic acid, oxygen ozone, and the combination of both in the treatment of knee osteoarthrosis. *Journal of Biological Regulators and Homeostatic Agents*. 2016;30(2):621-625.
24. Muto M, Giurazza F, Silva RP, Guarnieri G. Rational approach, technique and selection criteria treating lumbar disk herniations by oxygen–ozone therapy. *Interventional Neuroradiology*. 2016;22(6):736-740. doi:https://doi.org/10.1177/1591019916659266
25. Murphy KJ, Elias GJB, Steppan J, et al. Percutaneous Treatment of Herniated Lumbar Discs with Ozone: Investigation of the Mechanisms of Action. *Journal of Vascular and Interventional Radiology*. 2016;27(8):1242-1250.e3. doi:https://doi.org/10.1016/j.jvir.2016.04.012
26. Bonetti M, Zambello A, Leonardi M, Princiotta C. Herniated disks unchanged over time: Size reduced after oxygen–ozone therapy. *Interventional Neuroradiology*. 2016;22(4):466-472. doi:https://doi.org/10.1177/1591019916637356
27. Chen H, Yu B, Lu C, Lin Q. The effect of intra-articular injection of different concentrations of ozone on the level of TNF-α, TNF-R1, and TNF-R2 in rats with rheumatoid arthritis. *Rheumatology International*. 2012;33(5):1223-1227. doi:https://doi.org/10.1007/s00296-012-2529-7
28. Yu B, Chen H, Lu C, Lin Q, Wang B, Qin C. [Effect of intra-articular ozone injection on serum and synovial TNF-α, TNFR I, and TNFR II contents in rats with rheumatoid arthritis]. *Nan Fang Yi Ke Da Xue Xue Bao*. 2011;31(6):1055-1058.
29. Bonetti M, Fontana A, Martinelli F, C.F. Andreula. Oxygen–Ozone Therapy for Degenerative Spine Disease in the Elderly: A Prospective Study. *Acta neurochirurgica*. 2010;108:137-142. doi:https://doi.org/10.1007/978-3-211-99370-5_21
30. Bonetti M, Fontana A, Cotticelli 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.
31. Bonetti M, Fontana A, Albertini F. CT-guided oxygen-ozone treatment for first degree spondylolisthesis and spondylolysis. *Springer eBooks*. 2005;92:87-92. doi:https://doi.org/10.1007/3-211-27458-8_19

32. 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:https://doi.org/10.1177/1971400915576658