Original Research Article

Indian Journal of Anesthesia and Analgesia
2019;6(4) (Part - II): 1383-1386
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.6419.46

Intraarticular Ozone Therapy for Knee Osteoarthritis: A Single Centre Experience

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Abstract

Introduction: Osteoarthritis of the knee joint is a widely prevalent problem and leads to decrease in physical function through pain and reduced range of motion. Since there is no cure for the disease, the main aim of treatment if to reduce pain and preserve function. While early osteoarthritis is treated with exercise and lifestyle modifications only, measures like intra-articular ozone administration and platelet rich plasma therapy reduce pain, restore function and enable patients to exercise more effectively. We studied the effectiveness of ozone administration in patients with knee osteoarthritis. *Materials and Methods:* Thirty patients with Kellgren-Lawrence grade 2-3 osteoarthritis of both knees were recruited and administered intra-articular ozone. Pain and patient global assessment scores were recorded on the visual analogue scale at baseline and at 6 months. *Results:* All patients experienced improvement with an improvement of mean pain VAS from 6.9 at baseline to 2.9 at 6 months. Patient global assessment also improved from 5.1 to 1.3. *Conclusion:* Intra-articular ozone administration is effective in reducing pain in patients with osteoarthritis of the knees.

Keywords: Knee; Osteoarthritis; Ozone; Pain.

How to cite this article:

Neha Goyal. Intraarticular Ozone Therapy for Knee Osteoarthritis: A Single Centre Experience. Indian J Anesth Analg. 2019;6(4):1383-1386.

Introduction

Osteoarthritis (OA) of the knee is a commonly prevalent condition that causes both pain and functional limitation. Long known to be caused by mechanical stress only, chemical factors like oxidative stress have come to be recognised as contributing factors in the causation of OA. Female gender, advancing age and obesity are the frequently encountered associates of OA of knees.[1] The diagnosis of OA remains largely clinical.[2,3] The common complaints by the patients are pain, stiffness, swelling and difficulty in using stairs and getting up from sitting position. Tenderness and joint crepitus may be appreciated on clinical examination. Significant swelling may be seen in wet OA where there is effusion of the joint and limb deformity may be seen in advanced cases. A thorough history and clinical examination are usually sufficient to ascertain the diagnosis. A further roentgenogram helps to stage the OA of

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Received on 06.05.2019, **Accepted on** 22.05.2019

knees and help decide the further course of action. In absence of a cure, the main aim of management of the condition is to alleviate pain and restore function. While exercise and lifestyle modification remain the mainstay, other modalities like pain relieving medications, interventional procedures like ozone administration, platelet rich plasma therapy, radiofrequency ablation and surgeries like proximal fibular osteotomy and total knee replacement have been used.[4,5]

Ozone has for long been used in dentistry and cosmetology because of its anti-inflammatory and anti-oxidant properties. US-FDA approved the use of intra-articular ozone therapy (a mixture of oxygen and ozone) for the treatment of knee osteoarthritis in 1997.[6] Besides, ozone discectomy has been used for herniated discs and ozone has also been used in tears of the meniscus and inflammation of the plantar fascia.

The exact mechanism of the anti-inflammatory properties of ozone has not been elucidated but it has been observed that ozone administration results in reduced tumour necrosis factor (TNF) concentrations.[4,5,7] The safety profile of ozone has been a major reason of its popularity.[4,8]

Here we study the effect of administration of intra-genicular ozone in 30 patients with osteoarthritis of the knee.

Materials and Methods

OA of knees was staged by Kellgren-Lawrence radiologic scoring (KLS) (score from grade 0 to 4).[9] Thirty consecutive patients having bilateral knee OA grade 2-3 and who underwent intra-articular ozone administration in both knees were included in the study. Patients above the age of 70 years and those with other physical comorbidities which could interfere with assessment of function (e.g. hip OA, inflammatory polyarthritis, spondyloarthritis, paraplegia/paresis etc.) were excluded. Patients with history of trauma, surgery, lower limb deformities, and abnormal haematologic and coagulation parameters were also excluded.

Using medical grade ozone generator machine, 20 cc of 30 mcg/mL ozone-oxygen mixture was injected in both the knee joints. Administration of this mixture was preceded by injection of 2 mL of 2% lignocaine solution. Taking all sterile precautions, patient was made to lie in supine position and knee was flexed to 90 degrees. A 22-gauge needle was inserted through the antero-medial approach and lignocaine was injected. The needle was secured by a stop cock in the meantime. 10 ml of 30 mcg/mL ozone was then inserted after removing the stop cock. The procedure was performed by a qualified anaesthesiologist wit special training in pain medicine. Patient was advised relative rest for 72 hours after ozone administration. All the patients were taught and advised to undertake regular home based quadriceps strengthening exercise after 72 hours of ozone administration.

Patients were evaluated at baseline and after 6 months of the procedure. Pain was assessed on a visual analogue scale (VAS) (scored from 0 to 10, with 0 being no pain and 10 being the worst pain ever).[10] Patient's global assessment was also recorded from 0 to 10 on the visual analogue scale. The data was put through student t test.

Results

Thirty patients with mean age 64.3 ± 3.4 (age range 58 to 69) years, KLS grade 2-3 osteoarthritis of the knee on the roentgenograms were included in the study. None of patients has any serious intra-procedure or post-procedure adverse events. Three patients had stiffness in the joint on the morning after the procedure which lasted 12-36 hours.

The mean pain VAS score at baseline was 6.9 ± 1.13 (range 5 to 9) and the mean patient global assessment on VAS was 5.1 ± 1.92 (range 2 to 8).

The mean pain score reduced from 6.9 at baseline to 2.9 at 6 months after the procedure. All the 30 patients had a minimum of 3-point improvement in pain on the VAS. The mean patient global assessment score improved from 5.1 at baseline to 1.3 at 6 months after administration of ozone. All the 30 patients had a minimum of 4-point improvement on the VAS.

The comparison of pain and global assessment scores at baseline and at 6 months is given in table 1.

Table 1: Comparison of VAS scores at baseline and at 6 months

	VAS score at baseline	VAS score at 6 months	
Pain	6.9 ± 1.13	2.9 ± 1.64	p<0.01
Patient Global Assessment	5.1 ± 1.92	1.3 ± 1.27	p<0.01

Discussion

Osteoarthritis of the knee can be a crippling disease. In absence of a cure for the disease, the main aim of treatment is to reduce pain and preserve joint

function. Ozone injection into the joint has been used for the treatment of knee OA. Ozone leads to production of reactive oxygen species and lipid oxidation products.[8,11] It thus reduces inflammation and improves function through repair and vascularization. There is downregulation of proteolytic enzymes and proinflammatory. Articular cartilage and matrix may be formed through secondary proliferation of fibroblasts and chondrocytes.[4]

The primary objective of this study was to assess the efficacy of intra-articular ozone administration in alleviating pain in patients with osteoarthritis of the knee. Multiple studies have documented the beneficial effects of intra-articular ozone administration in patients with osteoarthritis of the knees over a short term.[12] This study assesses the effect of this procedure on knee pain over an intermediate period. While most of the studies included administration of ozone unilaterally, we have included patients who underwent bilateral intra-articular ozone administration.

The intermediate to longer term benefits of ozone administration may be derived from post ozone administration downregulation of cytokines which are responsible for sustained inflammation and progression of structural damage as noted in certain studies.[4]

One study demonstrated intra-articular ozone to be significantly superior to intra-articular methylprednisolone in patients with knee OA.[11] Jesus *et al.* and Hashemi *et al.* compared intra-articular ozone with sterile air and found ozone to be effective at 4 months.[13,14] Ozone was also found to be effective in post-arthroscopic surgery patients of knee OA.[15]

In our study, patients had significant improvement at 6 months after intra-articular ozone administration. Regular quadriceps strengthening exercise is a contributory factor for maintaining function and is likely to have accounted for better patient global assessment scores at 6 months.

Conclusion

Intra-articular ozone administration is an effective tool for reducing pain and improving function in patients with knee osteoarthritis. Regular quadriceps strengthening exercise after the procedure can prolong the effect of ozone.

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