

OZONUCLEOLYSIS: A SAFE AND LEAST INVASIVE PROCEDURE FOR THE TREATMENT OF SCIATICA

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Abstract : Ozonucleolysis is amongst the latest innovations as a least invasive, interventional option for discogenic radiculopathy when sciatica or brachialgia from a prolapsed disc does not respond to conservative treatment. Treatment employs the injection of a measured amount of ozone-oxygen mixture inside and around the prolapsed disc. Mechanism of action is the relief of symptoms from disc prolapse by decompression of the nerve root by a physical shrinkage of the prolapse by ozone. This is in neutralizing the algogenic (pain producing) events that occur with disc herniation; the case of a 70 years old, who underwent such treatment is described.

INTRODUCTION

Back pain is highly prevalent in the adult population, with estimates up to 80% of adults having at least one episode in their lives. While spinal surgery is widely performed for the treatment of herniated discs, a minimally-invasive procedure that is gradually gaining worldwide acceptance is the injection of oxygen-ozone gas or ozonucleolysis¹⁻³.

Since the discovery of ozone by the German physicist Christian Friedrich Schonbein in 1840, it has taken a long time for scientists to understand its usefulness in clinical medicine. Ozone was used as an agent to purify water in 1901 and found its clinical application as an antimicrobial during the First World War for treatment of infected wounds and burns. Italians and Germans were on forefront of research on the application of ozone. Velio Bocci has done pivotal work on this molecule and written two landmark monographs in English on the physiology and the clinical applications of ozone on a myriad of clinical disorders⁴.

The proposal by Verga in 1988 that ozone can be used for disc prolapse was refined by Muto ten years later to pave the way for an exponential increase in the application of this molecule for disc prolapse²⁴. In this era of surgical minimalism, nearly 150,000 spinal interventional procedures are performed annually (nearly a third of all spinal surgical procedures for degenerated disc), many of which comprise of ozone injection therapy for disc prolapse. An unparalleled record of safety, cost effectively and relative technical simplicity is a reason for enormous growth of the technology.

The need for alternatives to invasive disc surgery is clear from studies from groups such as Weber's that have shown that surgery does not lead to lasting improvements in pain when examined at four and ten years out⁶ and a failure rates as high as 30%^{7,8}. Other authors have reported a success rate between 49 and 90% and re-operation rate after lumbar discectomy ranging from 4% to 15%⁹⁻¹⁴.

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PATHOPHYSIOLOGY OF PAIN IN DISCOGENIC DISORDERS

The common treatment for severe sciatica has been the removal of material from a herniated disc. The basis for this procedure dates back to 1934 when Mixter and Barr showed that a herniated disc was associated with sciatica. Removing the compressive force on a nerve root by the disc material made intuitive sense and showed results. Then studies to recreate the pain showed that an increased compressive force on normal nerve roots did not evoke pain¹⁵. Nerves that were swollen or inflamed when compressed did cause pain. This gave some of the early evidence that sciatica has an important inflammatory component.

Subsequent research showed that the intervertebral disc had immune properties and was not a simple, inert collagenous material^{16,17}. Important cytokines including TNF-alpha, prostaglandin E2, phospholipase A2, IL-1, and IL-6 have been shown to increase around a herniated disc by Saal et al. and others^{18,19}. The nucleus pulposus that escapes from the capsule during a disc herniation has been shown to express TNF-alpha²⁰. A theory that makes sense now is that trauma may expose a nerve root to the nucleus pulposus that sets up an inflammatory process. Further irritation of the inflamed nerve by compression leads to the classic symptoms of sciatica.

The Role of Ozone in Sciatica: The escape of the nucleus pulposus outside of the surrounding annulus fibrosus that occurs on disc herniation leads to an algogenic inflammatory reaction associated with elevated levels of PGE2 and PLA2⁷. It is believed that ozone may relieve pain through its effect of altering related cytokine levels⁷. Its equivalent effectiveness to epidural steroid injections²² supports the theory that it may work through a similar anti-inflammatory effect.

Observations at our centre²³ and others have seen radiological evidence of shrinking of the disc after an intradiscal ozonucleolysis procedure²¹. Water comprises up to 80% of the weight of an intervertebral disc in young adults. Andreula¹ proposed that ozone desiccates the disc and thereby causes it to shrink, reducing compressive forces that a prolapsed disc could cause.