Percutaneous lumbar disc ozone nucleolysis

By

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Introduction

Lumbar disc herniation is one of the most common causes of low back pain and/ or sciatica. Pathogenesis of radicular pain is multifactorial and is likely due to mechanical and/or inflammatory factors, and even the neural inflammation plays a major role in the origin of radicular pain and make the nerve roots even sensitive to minimal pressure (Simonetti L et al.,2001; Yang H et al.,2015).

The natural history of symptomatic disc herniation is favorable, and the conservative treatment is essential during this period. The majority [60-80%] of patients showing improvement within 6-12 weeks. In case of failure of conservative treatment, many minimally invasive techniques have been used as alternatives to surgical options, to avoid their potential complications. (Rhee JM et al., 2006; Buy X, Gangi A.,2010)

Now; surgery is confined for treatment of patients with a progressive or major neurological deficit, or cauda equina syndrome. (Awad JN et al.,2006).

- Minimally invasive techniques include mechanical (Nucleotome or Dekompressor devices), thermal (laser or radiofrequency coblation), and chemical decompression (chemonucleolysis) using gelified ethanol alcohol "Discogel®" or oxygen-ozone mixture (Buy X, Gangi A., (2010); Filippiadis DK, Kelekis A., 2015).

Ozone nucleolysis

Ozone nucleolysis is one of the promising minimally invasive techniques that had been investigated for treatment of disc herniation.

It has the following mechanisms of actions:

1. Ozone has a strong oxidizing effect on the proteoglycans of the nucleus pulposus with resultant matrix dehydration, and hence, reduction of the intradiscal pressure, disc volume, and the nerve root compression.

2. It also has anti-inflammatory effects as it inhibits the release of prostaglandins and bradykinins, and promotes the release of anti-inflammatory cytokines.

3. Moreover, it increases tissue oxygenation, thereby, improving tissue hypoxia, venous stasis, and the local microcirculation (Andreula CF et al.,2003; Guarnieri G et al.,2009; Magalhaes FN et al.,2012; Muto M et al.,2016; Murphy K et al.,2016).

Pre-operative clinical evaluation:

- To confirm the diagnosis of disc herniation as a cause of patient symptoms, a good history taking and neurological examination to confirm nerve roots or thecal compression is required, with adequate reviewing of the radiological imaging; including (CT and/or MRI).

- In some situations; NCS & EMG are needed to determine the involved nerves.

Inclusion criteria for ozone therapy include:

- Patients with a history of low back pain and/or radiculopathy, resistant to conservative treatments of at least one months' duration, and the symptoms correlating with the radiological findings.

- Patients with radiological evidence of protruded and extruded disc herniations with no evidence of large migrated or sequestrated hernial fragments.

Exclusion criteria include:

- Presence of significant canal stenosis, or spondylolithesis - more than grade I.

- Severe disc collapse; more than 2/3 height disc reduction -

- Presence of major neurological deficit or cauda equine - syndrome.

-History of failed back surgery; Active infections, Hemorrhagic diathesis, or Pregnant patients at the time of the procedure.

Procedure of ozone discolysis:

1-Patient preparation:

- Pro-operative investigations including : CBC, coagulation profile & blood sugar.

•Informed consent.

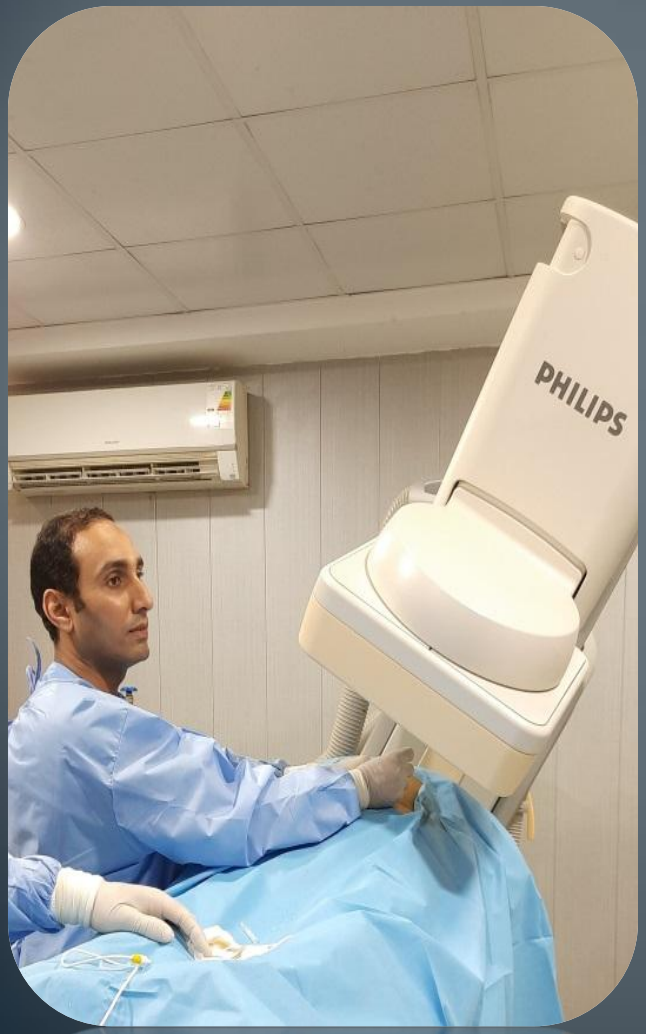
• Placement of peripheral venous line.

•Disinfection of the lumbar region and sterile drapes should be applied.

2-Equipments &materials

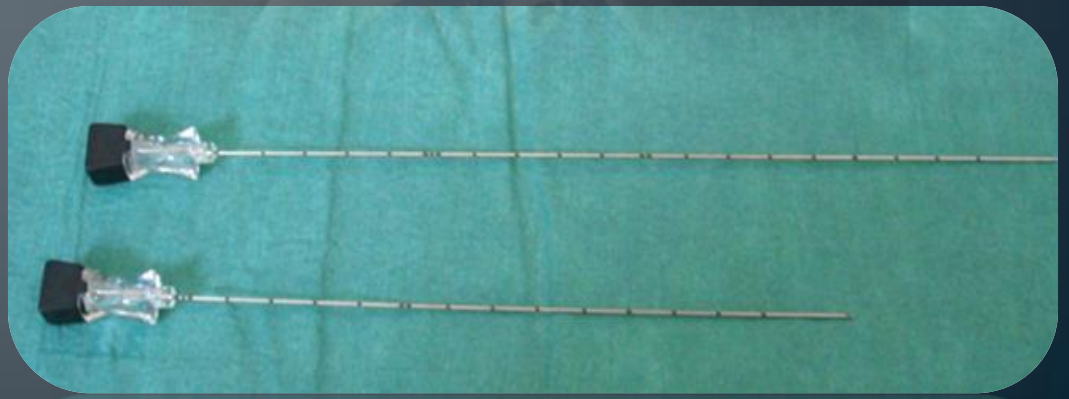
-Angio- cath lab

-or C-arm machine



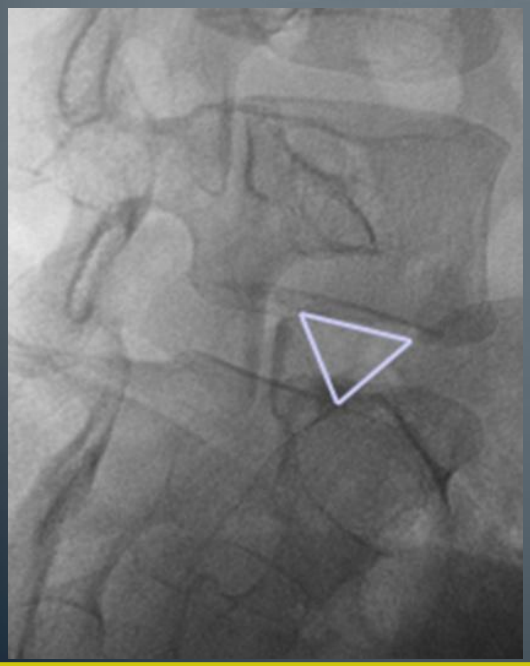
Ozone generator

Chiba needles: (22G- & 15-20cm length)



3- Disc injection

L5-S1



3-Disc puncture under fluoroscopic guidance:

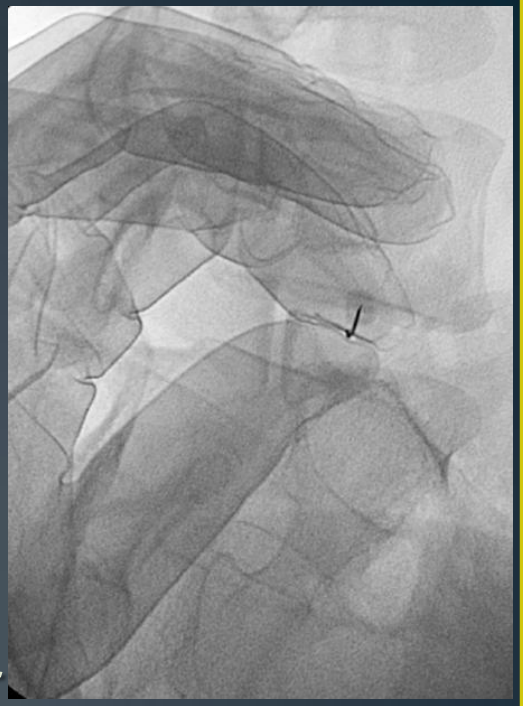
•The treatment is a minimally invasive technique that can be applied without the use of general or local anesthetics.

•The patient lies in the lateral or prone position & alignment of the vertebral end plates is obtained.

•Oblique projection of the C arm: 40°- 45°, to obtain the so-called "Scotty dog" appearance.

- Needle puncture through the paravertebral oblique approach using a 22-G Chiba needle; inserted just anterior to the Scotty dog" ear at the direction of the x-ray beam (tunnel view).

- The lateral position is then obtained, and needle advancement continues until reaching the disc center , followed by a confirmatory A-P view. Then; injection of the disc material using 5-10ml of 30ug/ml ozone plus intra-foraminal injection of [10ml] ozone, [40mg] long-acting steroid and local anesthetic



Real time intra-discal ozone injection

4. Post-procedure care:

- It is one -day treatment with a short post procedure care, hospitalization, and home rest.
- After the procedure; the patients lie in in supine decubitus for at least 2- hours; then discharged .
- The patients are advised for relative bed rest for the first day and home rest for at least one week.
- Limitation of physical work, lifting, prolonged seating, spinal bending or twisting during the next few weeks.

Outcome assessment

Clinical evaluation:

- at 2 weeks & 2-months after treatment for assessment of the clinical efficacy in term of reduction of pain and its disability.

- If improvement is more than 70-80%; no further intervention is needed.

- If response is less than 70% and more than 30%; so another injection is recommended to gain a full response.

Outcome assessment

- **Imaging;** A request of follow up imaging is usually not obtained and only requested during the follow up period, in patients with worsening or changing symptoms to rule out the possibility of a critical complication such as a septic discitis or new development of recent discal lesions at different other levels.

Success rate: Ozone chemonucleolysis is not less effective than other percutaneous disc decompression techniques, which has a high therapeutic success rate (70-80%) with the lowest cost and complications; less than (<0.1%).

The failure in previous studies was usually related to the presence of calcified herniated discs, spinal canal stenosis or failed back syndrome (Steppan J et al.,2010; Magalhaes FN et al.,2012; Muto M et al.,2016).

Combined therapy is more effective than a single treatment:

- Combined intra-discal ozone and intra-foraminal injection of medical ozone and steroid has a cumulative effect that enhances the overall outcome (Andreula CF et al.,2003)

Combined therapy is more effective than a single treatment:

A further addition of another treatment such as pulsed radiofrequency on the affected nerve roots; it will increase the effectiveness of the intra-discal zone, with early onset of pain reduction and higher success rate reaching about 90%. (Canovas L et al.,2009).

Radiofrequency machine & Ozone generator

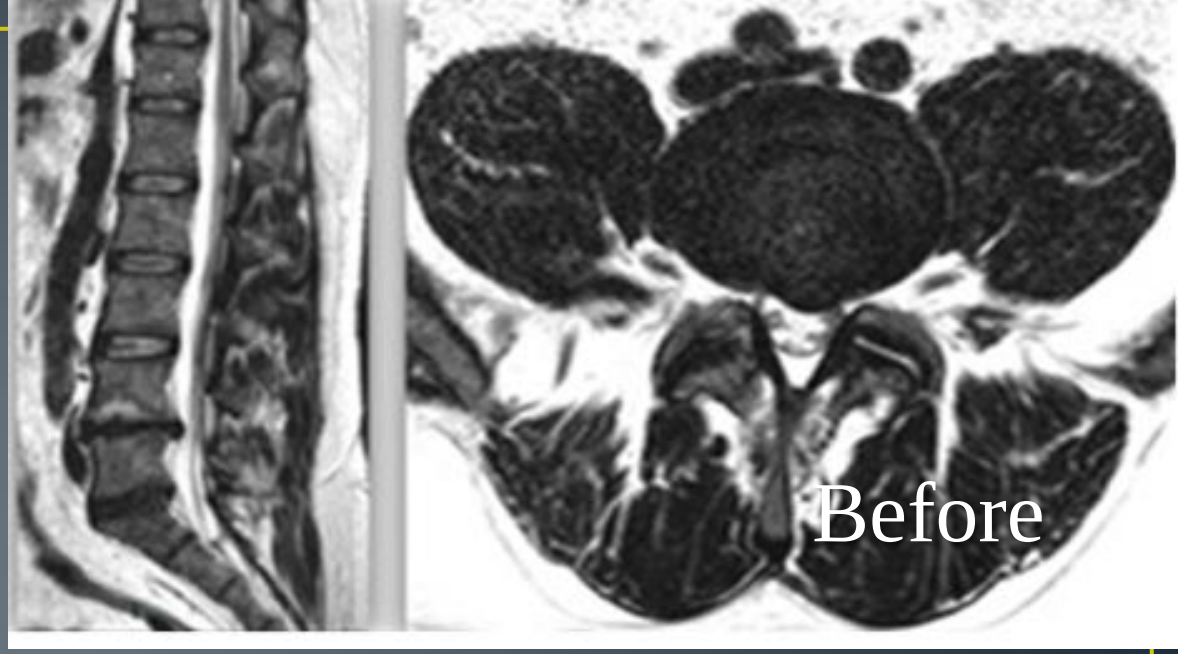
Real time intrradiscal zone injection plus PRF on the affected nerve roots

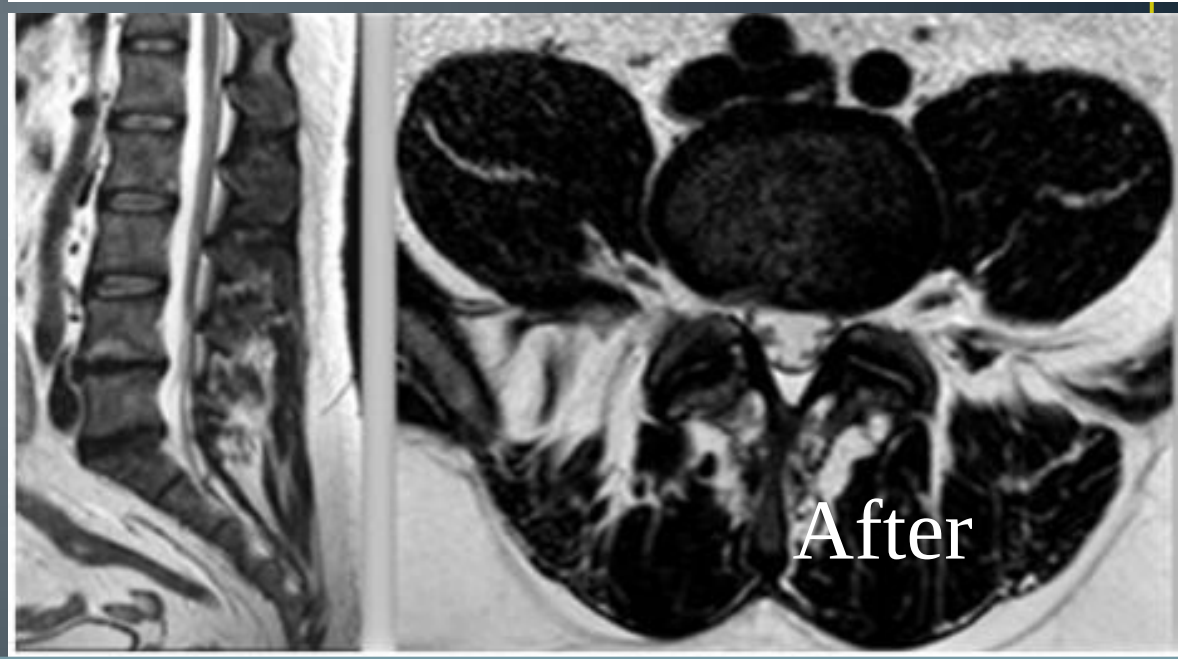
Case presentation

Case (1)

A 68- year- old man with left lumbosciatica of 2-years duration.

L4-5 left paracenteral disc herniation





The patient showed significant clinical and radiological outcome

Case (2)

A 58- year- old man complaining of right lumbosciatica of 8-months duration.

L4-5 right para-centeral disc herniation

The patient showed significant clinical and radiological outcome

Conclusion

- Ozone disc nucleolysis is a simple, cost-effective, and safe minimally invasive treatment for patients have failed to respond to conservative treatment with a rapid and short recovery period, which can reduce the need for surgery or applied when surgery is not possible .

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