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Percutaneous Laser Diode Disc Decompression (PL3D™)

EPIDEMIOLOGY

Almost 80% of adult population has experienced once in their lives lumbago, with or without radicular involvement and herniated polposus (HNP), diagnosed in more than 60% of the cases. Over the years the treatment of herniated disc disease (HDD) has developed and involved different mini-invasive surgical options.

The Percutaneous Laser Diode Disc Decompression (PL3D™) is a new minimally invasive technique, which has been proven to be safe, time-effective and can be performed in a total out-patient setting.

MULTIDIODE PL3D™ by INTERmedic is the first Laser system exclusively designed for this application.

LASER DECOMPRESSION HISTORY

Between 1984 and 1989 a series of experimental studies were performed, which were based on the principle that a small reduction of volume in closed hydraulic space, such as an intact disc, results in a considerable fall of intradiscal pressure. In the late 80's the first percutaneous applications with the use of different types of lasers (CO₂, KTP, Ho:YAG, Nd:YAG) were conducted. A 1.000 Nd:YAG laser application to nucleus polposus in human lumbar discs reduced the intradiscal pressure at an average of 55.6% (Altman et al. – J. Clin. Med. Surg. 1985; Spine 1993).

980 nm OPTIMAL WAVELENGTH FOR LASER DISK DECOMPRESSION

980nm is 5 times more absorbent in water than 810nm

980nm is 2 times more absorbent in water than 1.064nm

This greater specificity requires less laser energy, which implies less heat diffusion in surrounding tissue and no undesirable side effects.

INDICATIONS

Contained disc herniations (protrusion, subannular extrusion) and non-contained (transannular extrusion), but contiguous with the parent disc are indicated to be treated. Only free disc fragment (sequestration) is an absolute contraindication.

Previous surgery or spinal stenosis, partially caused by disc herniation, do not contraindicate the procedure.

SURGICAL TECHNIQUE

The PL3D is a procedure in which herniated intervertebral discs are treated by reduction of intradiscal pressure through laser energy. A fibre optic is introduced through a 22 gauge needle inserted into the nucleus polposus under local anesthesia and fluoroscopic monitoring. A small amount of vaporized nucleus results in a sharp fall of intradiscal pressure, with consequent migration of the herniation away from the nerve root. The gas formed, due to the mass of nucleus vaporized by the laser, is removed by a specific handpiece that incorporates a smoke evacuation system, so as to minimize the postop muscle spasms.

Energy levels, exposure time and pulses are decided by the operator, depending on the pathology to be treated (protrusion or extruded disc).

RESULTS

In the last ten years, the percutaneous laser decompression and nucleoplasty have been performed in more than 40,000 cases of HNP worldwide (Europe, USA, Japan). Several publications validated the technique and the overall success rate ranged from 80% to 89%, with a complication rate of less than 1%. Most patients reported no post-operative pain and went back to work in 5 to 7 days. The lasers used over the years were HO:YAG 2.100nm; Er:YAG 2.940nm; Nd:YAG 1.064nm; CO2 10.600nm; Diode 810 nm, 940nm and 980nm.

OUR EXPERIENCE

In the last 18 months, more than 400 cases have been performed with the Diode 980 nm. The first series results published by Menchetti et al. - *Lasers Med. Sci.* (2003) confirm the previous findings.

Several retrospective, prospective and experimental studies (Hellinger et al. – 1998; Nakai et al – 2003) show the advantages using the Diode versus other lasers, not only in terms of clinical results, but also in terms of reducing the postoperative complications (no histological damage has been detected on adjacent vertebral body and cartilage end plate after Diode irradiation).

REASONS TO APPLY THE PL3D™

Regarding microsurgery, the percutaneous use of laser does not damage neither the vertebral body by removal of the intervertebral lamina, nor the vertebral facet joints or the ligament flavum.

For these reasons the technique is:

- Minimally invasive
- Performed in outpatient environment
- Requires no general anesthesia
- Results in no periradicular scarring or spinal instability
- Reduces rehabilitation time
- Does not preclude open surgery if needed
- Costs reducing

Patients with high surgical risks due to cardiopulmonary decompensation, renal, hepatic, or major organ failure can be safely treated with the technique as only a local anesthesia is used.

WHY USE MULTIDIODE PL3D™?

- A laser system designed and optimised for the Discectomy treatment
- Ergonomic handpiece, with a fibre blockage mechanism and a built-in smoke evacuation, which eliminates intradiscal pressure produced by disc vaporization (worldwide patented)
- External power meter to verify the true fibre output just before introducing the fibre into the needle
- Exclusive system to maintain fibre sterile during power test
- Friendly-user software
- Statistical control: number of pulses, total applied energy and emission time.

