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Intradiscal Therapy and Nucleus Augmentation as a Surgical Technique for the Treatment of Common and Chronic Low Back Pain

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Introduction

The patho-genesis of common persistent and chronic low back pain is a difficult condition to treat, because its pathogenesis is multifactorial and may be only partially understood. Non-operative therapeutic methods are the first treatment of choice, with multiple stakeholders offering a myriad of non-surgical treatment options. It includes the use of prescription and nonprescription pain medication, physical therapy, pain management, or multiple nonsurgical methods to treat pain, such as acupuncture or natural pathic methods. These options provided by non-surgeons usually offer ony temporary benefits. For the patients who benefit, and continue to utilize these treatments regularly, they also adopt better life styles, such as weight loss, healthier eating and exercise, which help, but many continue to seek additional treatment options after a reasonable period when symptoms persist or their activities of daily living becomes significantly restricted. Most appropriately reserve surgical options as the last option. A novel minimally invasive surgical option is considered here.

Methods

There are now transforaminal endoscopic minimally invasive surgical pain management techniques that bridge a big gap between nonsurgical modalities and traditional spine surgery. Such techniques involve transforaminal endoscopic decompression, ablation, and irrigation, coined "selective endoscopic decompression" (SED) that fills the Gap between non-surgical and traditional open surgical treatment. Following successful intermediate term relief with this transforaminal endoscopic surgical technique for intradiscal therapy, augmenting the pain generator, the intervertebral disc, is an attractive additional option.

A 1997 IRB approved study by Yeung at St Luke's Medical Center on endoscopic spine surgery for painful degenerative conditions of the lumbar spine determined that the pain originates from the disc. Aided by laser or radiofrequency for annular thermal modulation, this treatment combination has demonstrated efficacy in providing back pain relief emanating from the lumbar disc.

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Many techniques have come and gone in the treatment of discogenic lumbar pain. Chymopapain, the first and only Level I validated technique with two large double blinded randomized studies and 38 cohort studies in the literature, is no longer available due to abandonment by the pharmaceutical industry, due to profitability versus risk. Other techniques, such as laser decompression, percutaneous mechanical decompression, and intradiscal therapy utilizing coblation, biacuplasty, and Ozone are still being practiced, but acceptance has a been sparse.

Morganstern, Barcelona Spain, studied 11 patients with discogenic pain who failed nonsurgical treatment. 10/11 patients demonstrated improvements in VAS Back (ave 6.5-5), VAS leg (ave 4.5-4) and ODI (ave 75-60) at one year follow-up. One patient with degenerative spondylolisthesis did not improve, and brought the average improvement down. All painful degenerative discs were documented by positive evocative discography for concordant pain. There were no complications reported to the scientific advisory board of Replication Medical.

Martin Knight, of the Spinal foundation United Kingdom, studied 188 patients with three year follow-up. He Combined Gelstik implants in advanced disc degeneration with foraminal stenosis also treated with foraminoplasty. Patients without compications all obtained back pain relief along with radicular symptom relief. He concluded that the back pain relief may have been aided by added intradiscal support. 3/188 (2%) had poor results due to infection and post op disc extrusion.

Evidence levels for discogenic pain was 5, and level of evidence for the knight study is 4. Relative contraindication is discogenic pain with spondlolisthesis

Background for nucleus augmentation for discogenic pain

Nonsurgical injection pain management therapies can be temporarily effective, these pain management techniques do not effectively fill a big gap between non-surgical techniques and surgical management. Surgery, performed by surgeons is usually considered a "last resort" for most patients. Traditional surgical options, however, vary greatly, ranging from open and percutaneous disc decompression to 360° fusion. The cost of surgical fusion, along with its surgical morbidity, has caused payers to push back on indications and payment. Intradiscal therapy with nucleus augmenta [1-5].

Fernstrom introduced the term "discogenic pain" in 1960 when he produced pain by stimulating the annulus in vivo [6]. This established the association between annulus stimulation and pain. Histologically, the innervation of the disc is in the outer 1/3 of the annulus, and in the endplate attached to the annulus [7-9]. The nucleus pulposus and its metabolic by products are known irritants to nerve tissue. It is evidenced by cryosections of cadaver anatomy that demonstrate granulation tissue in the annulus from micro trauma leading to fissuring of the annulus fibrosis. These defects in the annulus and endplates bring the sinuvertebral nerves into chronic contact with the cytokines generated by the degenerating nucleus. The fissures in the annulus create an inflammatory response and ingrowth of nerves and granulation tissue [10]. With chronic exposure of the acidic irritants in the annular defects, pain is the result of this sensitization

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pathway leading to chronic lumbar discogenic pain (CLDP). When the dorsal root ganglion is involved, the pain produced becomes out of proportion to the imaging study.

Discussion

Research in Gene Therapy has generated much interest, but little progress (Figure 1). Clinical research on intradiscal therapy, focusing on the disc, has demonstrated efficacy with reasonable costs (Figure 2). Treating the pain source: the disc.

The use of intradiscal hydrogel implants to provide reduction of the PH and mechanical support of the disc has produced early favorable results when intradiscal augmentation implants of poly acrylonitrile (HPAN 90) are used (Figures 3 and 4). Introducing a Novel Intradiscal Implant for the treatment of painful discs).

Pilot studies provide high efficacy rate with very low risks of complications that are lower than traditional surgical methods. Complications are not just lower, but less surgically morbid than traditional mechanical decompression surgery. Biologics to heal, slow degeneration, or even regenerate degenerative intervertebral discs through Intradiscal therapy may also serve as a viable step toward slowing and mitigating the degenerative process (Figures 5-8).

Discectomy, supported by the SPORT Study, is a universally accepted surgical treatment procedure, especially when discogenic pain progresses to disc herniation with radiculopathy. Minimally Invasive surgical treatment options have demonstrated efficacy, notably disc decompression through mechanical decompression, whether performed transforaminally or translaminarly. Posterolateral Selective Endoscopic Discectomy (SED) and radiofrequency (RF) thermal annuloplasty, a percutaneous endoscopic technique developed by Yeung, also known as PELD, is currently the flagship of minimally invasive transforaminal decompression.

The painful discs mostly had inflammatory or granulation tissue associated with disc herniation and annular tears. The degenerative nucleus pulposus was removed mechanically with pituitary rongeurs and shavers, and the granulation and inflammatory tissue adjacent to the annular tears were thermally modulated by flexible radiofrequency electrodes or laser. The annular defects were endoscopically observed to be altered by both treatments.

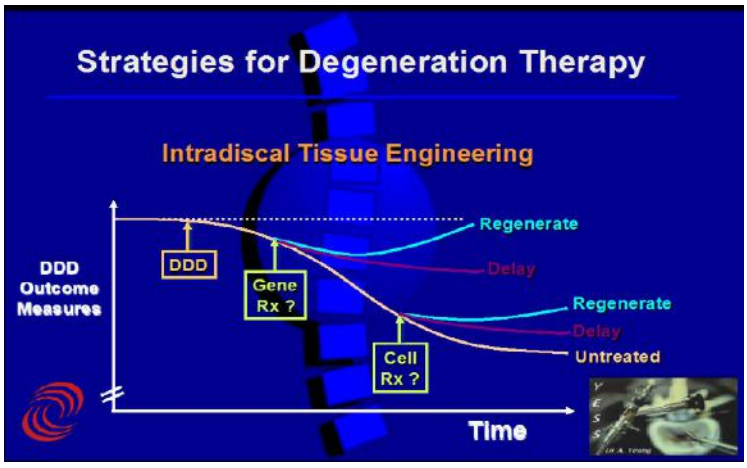


Figure 1: Nucleus Augmentation figures and legend. Research Strategies for Intradiscal tissue Engineering have focused on Gene and Cell Therapy to regenerate or delay disc degeneration. Nucleus replacement strategies have encountered various technical problems with extrusion or regulatory headwinds of biocompatibility. Nucleus augmentation, however, has obtained CE mark and getting excellent results in early pilot studies. with no issues of bio compatibility nor extrusion problems.

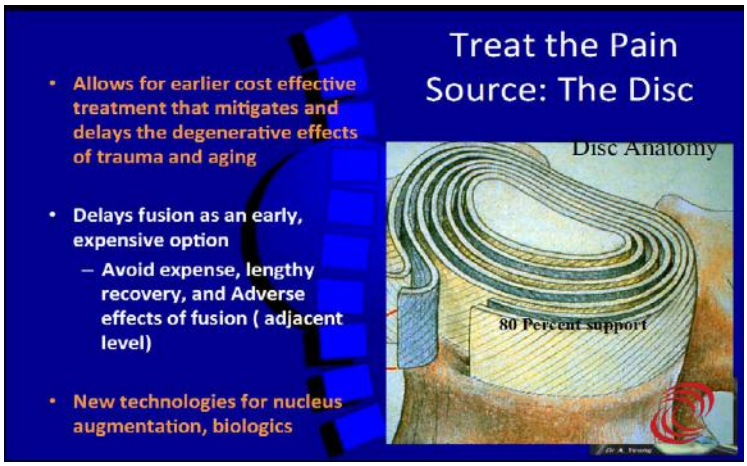


Figure 2: The Intervertebral Disc is the most common source of common back pain. The patho-anatomy of back pain from an aging spine begins in the disc. Strategies to treat this common aging condition should focus on Intradiscal Therapy culminating in Nucleus Augmentation and Biologics before fusion.

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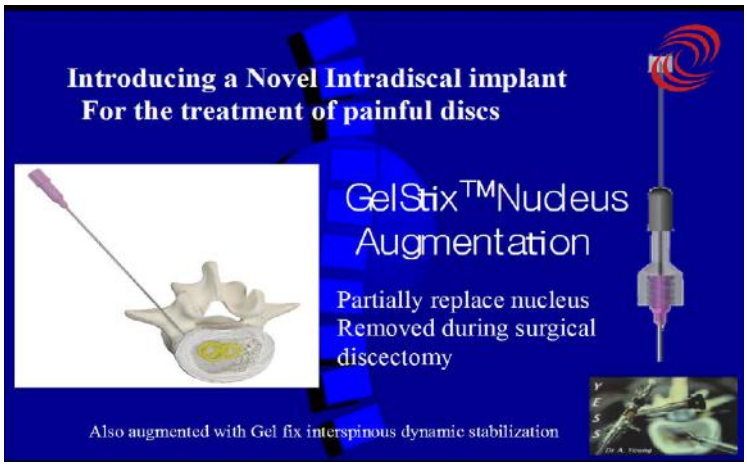


Figure 3: A hydrogel Implant of poly(acrylonitrile) is stable, biocompatible, and has biomimetic properties that makes it viable implant to help delay painful conditions from an aging spine.

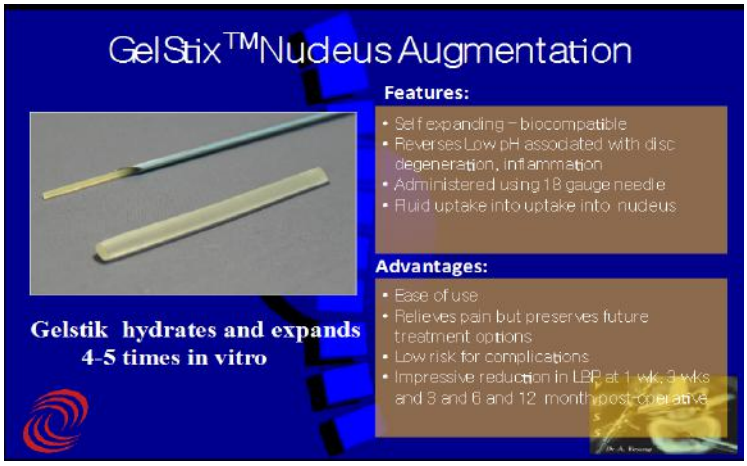


Figure 4: Hydrogel sticks with features of biocompatibility and the ability to reverse low pH from disc degeneration and the ability to restore some of the function of a degenerating disc make it an excellent implant for further study.

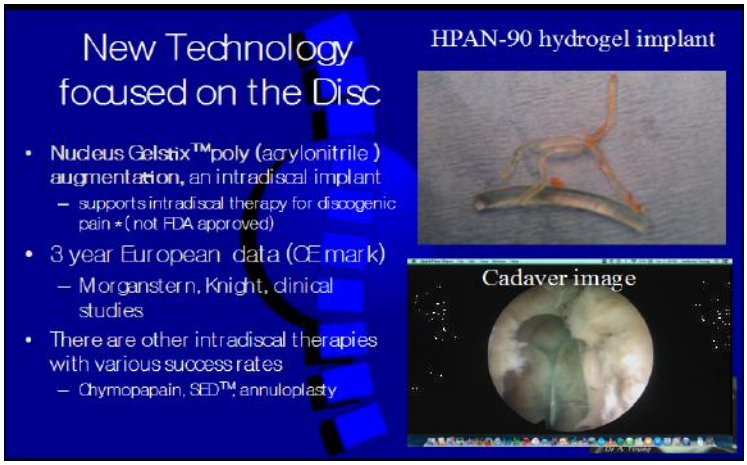


Figure 5: Cadaver Studies with Biomechanical testing to 30 million cycles of a nucleus replacement implant made of HPAN hydrogel material demonstrate excellent potential for human trials.

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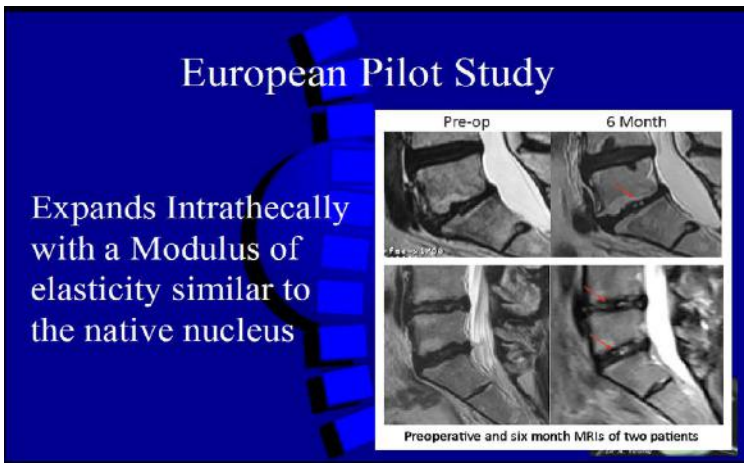


Figure 6: All implants requiring mechanical fenestration of the annulus to insert the implant raises concerns of extrusion. The use of very small implants via a thin walled needle makes extrusion very unlikely, and certainly no more than the incidence of recurrent disc herniation.

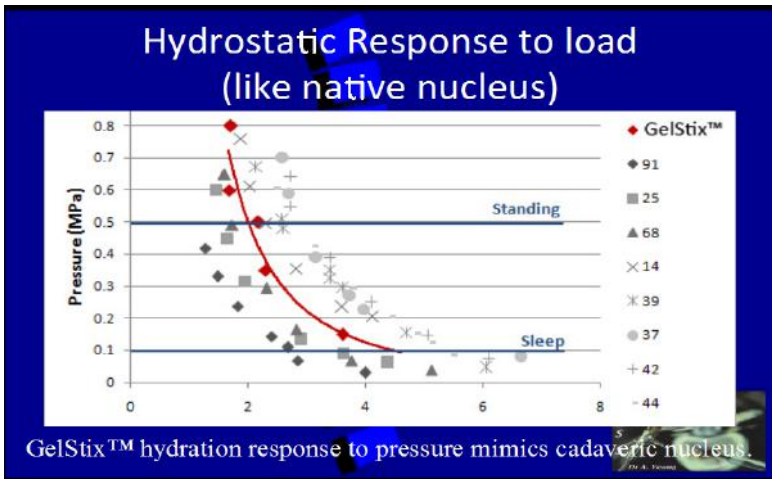


Figure 7: Hydrostatic Response to Load.

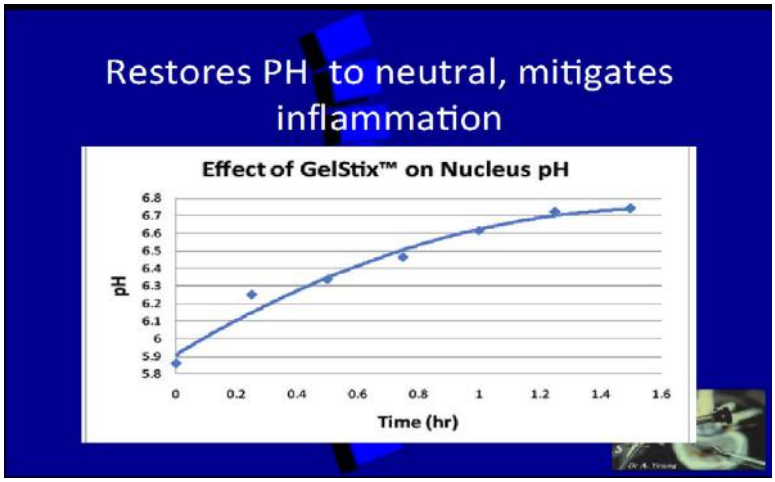


Figure 8: The effect of Polyacrylonitril implants on the PH of the disc.

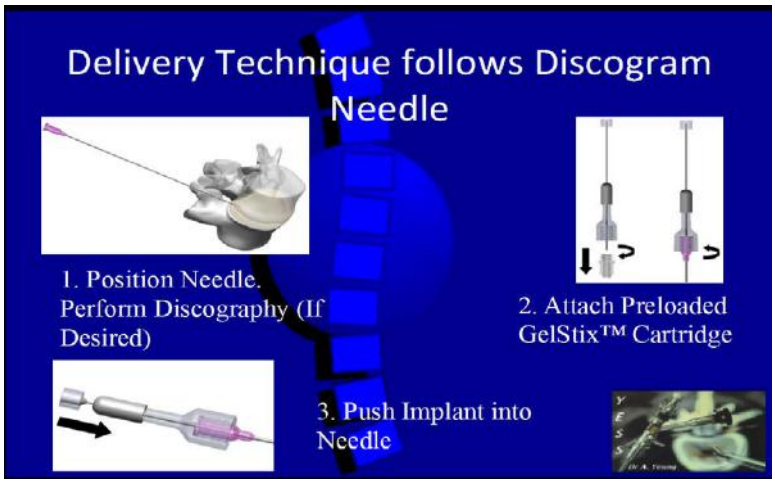


Figure 9: The delivery technique follows an evocative discography needle. If the discogram pattern is abnormal, and concordant back pain is reproduced, Gelstik implantation is considered. One implant is inserted for every cc of contrast agent injected into the disc, creating discogenic pain greater than VAS 4-6.

A wide spectrum of degenerative discs from early to late stage degenerative disc disease was successfully treated without stratification. Experience gained from this study led to an evolution and expansion of more specific patient selection criteria based on surgical experience, stratification of indications, and new endoscopes and instruments that facilitate selective mechanical decompression.

My 25 year experience in transforaminal endoscopic spine surgery came with the discovery that I had the ability to visualize and correlate the patho-physiology of pain with the patho- anatomy of the pain generator when operating on my patients under local anesthesia. The ability to communicate with my patient during surgery also helped me correlate endoscopic findings with pain generation and results of decompression, ablation, and irrigation [11-20]

The current trend in MIS endoscopic spine is surgical procedures with a focus on intradiscal therapy. This includes Pilot studies on intradiscal augmentation that are CE marked, featuring intradiscal augmentation implants with hydrogel sticks that can be inserted with a thin 18 gauge needle. Preliminary results demonstrate high efficacy rate with few surgical complications. Biologics to heal, slow degeneration, or even regenerate injured intervertebral discs is becoming a viable step towards that goal (Figure 9).

Other intradiscal therapies have emerged, but all have focused on the elimination of pain in a degenerating disc by decompression, ablation, and irrigation. The Gelstik option is the first procedure focused on nucleus augmentation rather than decompression and ablation. Favorable results in 1500 cases supported by pilot studies in Spain, England, and Germany demonstrate the efficacy and safety of nucleus augmentation.

Conclusion

Intradiscal therapy, combined with transforaminal endoscopic decompression is effective for chronic back pain and sciatica by decompressing the patho-anatomy in the disc, and in the axilla, called the "hidden zone of Mac Nab". First focus on the disc as a pain generator, but extend the technique to the foramen containing the lateral recess, subarticular recess, and entrance zone with foraminoplasty. The aging process alters spinal anatomy.

By focusing on the disc, supported by level I chymopapain studies, future considerations should include intradiscal nucleus augmentation as a means to delay the effects of the aging process. The current focus on biologics to at least delay, even if not able to reverse the effects of an aging process, bears investigation.

References

1. Yeung AT, Gore SA (2001) Evolving methodology in treating discogenic back pain by Selective Endoscopic Discectomy (SED). J Minimally Invasive Spinal Tech 1: 8-16.
2. Tsou PM, AT Yeung, Yeung CA (2004) Posterolateral Transforaminal Selective Endoscopic Discectomy and Thermal Annuloplasty for Chronic Lumbar Discogenic Pain. The Spine Journal.
3. Yeung AT (2011) The role of provocative discography in endoscopic disc surgery. The Practice of Minimally Invasive Spinal Technique.
4. Yeung AT (2000) Intradiscal thermal therapy for discogenic low back pain, in the practice of minimally invasive spinal technique.
5. Yeung AT, Yeung CA (2006) Microtherapy in low back pain. Minimally Invasive Spine Surgery (2nd edtn), Berlin Heidelberg, Germany.
6. Fernstrom, U (1960) A discographical study of ruptured lumbar intervertebral discs. Acta Chir Scand 258: 1-60.
7. Aprill CN, Diagnostic Disc Injection, in The Adult Spine: Principles and Practice, F. J.W., Editor. 1996, Lippincott-Raven Publishers: Philadelphia. p. 539-562.
8. Coppes MH (1997) Innervation of "painful" lumbar discs. Spine 22: 2342-2349.
9. Fras C (2003) Substance P-containing nerves within the human vertebral body. an immunohistochemical study of the basivertebral nerve. Spine J 3: 63-67.
10. Kauppila LI (1995) Ingrowth of blood vessels in disc degeneration. Angiographic and histological studies of cadaveric spines. J Bone Joint Surg Am 77: 26-31.
11. Gore SR, Yeung AT (2003) Identifying sources of discogenic pain. Journal of Minimally Invasive Spinal Technique 3: 21-24.
12. Yeung, AT, Tsou PM (2002) Posterolateral endoscopic excision for lumbar disc herniation: surgical technique, outcome, and complications in 307 consecutive cases Spine (Phila Pa 1976) 27: 722-731.
13. Yeung AT (2011) Gore SR *In-vivo* Endoscopic Visualization of Patho-anatomy in Symptomatic Degenerative Conditions of the Lumbar Spine II: Intradiscal, Foraminal, and Central Canal Decompression. Surg Technol Int 21: 299-319.
14. Yeung AT, Yeung CA (2006) In-vivo endoscopic visualization of patho-anatomy in painful degenerative conditions of the lumbar spine. Surg Technol Int 15: 243-256.

15. Yeung AT (2007) MD The Evolution and Advancement of Endoscopic Foraminal Surgery: One Surgeon's Experience Incorporating Adjunctive Techologies SAS Journal 1: 108-117.

16. Yeung AT (2000) Minimally invasive surgery with the Yeung endoscopic spine system (YESS). Surg Tech Int 8: 267-277.

17. Yeung AT, Yeung CA (2003) Advances in Endoscopic Disc and Spine Surgery: The Foraminal Approach. Surgical Tech Int 11: 253-261.

18. Yeung AT (2003) Percutaneous Endoscopic Discectomy: the Posterolateral Approach, (2nd edtn), Minimal Access Spine Surgery Quality Medical Publishing.

19. Kim IS (2005) Indigo Carmine for the Selective Endoscopic Intervertebral Nuclectomy J Korean Med Sci 20: 702-703.

20. Tsou PM, Yeung AT (2002) Transforaminal endoscopic decompression for radiculopathy secondary to intra-canal non-contained lumbar disc herniations: outcome and technique. Spine Journal 2: 41-48.

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