Intradiscal Thermal Therapy for Discogenic Low Back Pain

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Introduction

One of the most popular new spine treatments for chronic low back pain in the United States has taken medical communities by storm, in part due to pent up demand from patients suffering from chronic low back pain who have not responded to traditional treatment, and from pain management physicians who have seen the bad results of spine fusion as the accepted treatment for discogenic low back pain.

Literature Review

As of July 2000, only one published study on the treatment of back pain using electrothermal therapy (IDET) has made the literature. In the published study, Joel S. Saal, M.D. and Jeffrey A. Saal, M.D. performed IDET on 25 patients with chronic discogenic pain, unresponsive to conservative treatment and who rejected fusion as a possible surgical option. The patients were treated with a thermal catheter manufactured by Oratec Interventions of Menlo Park, California. Of the 25 patients, 20 (80%) reported a reduction of their back pain of at least two points on a 10 point analog scale, improvement in their sitting tolerance, and reduction in their medication intake. A SF-36 questionnaire on all twenty five patients produced a positive change of at least seven points.

This finding was not surprising to the senior author, as he has reported at the NASS meeting in NewYork 1997, that in a study of 100 consecutive patients undergoing KTP laser assisted arthroscopic microdisectomy, 80% had relief of their back pain as well as their leg pain following arthroscopic microdiscectomy. This study was blinded and independently reviewed by F.A. Al-Hamdan, M.D.and A Hadjipavlou, M.D., of UTMB Galveston.

Evolution of Thermal therapy for Discogenic Pain

As a result of that study, the author began prospectively studying other types of thermal treatment as an adjunct to endoscopic discectomy for herniated discs. The technique soon evolved to incorporate endoscopic treatment of discogenic back pain as a primary rather than a secondary adjunctive treatment option.

The KTP laser was abandoned in favor of a unipolar radiofrequency non-steerable probe by Ellman International because of cost considerations and a seeming backlash against laser by program committees of National meetings. Good laser papers that were favorable to laser could not get into major spine meetings. The unipolar probe was therefore utilized only to control bleeding. The flexible probe was satisfactory for cauterizing small bleeders on the annulus and epidural fat, but the electrode was limited by its inability to be used as a flexible probe.

There were no adverse effects noted as the thermal effect was limited to the annulus in the path of the cannula or inside the disc. Although there were no complications using this high frequency unipolar electrode, there was also no dramatic decrease in back pain either. When a flexible and steerable temperature controlled probe became available, a prospective, IRB approved study was initiated. However, before the project was completed, Yeung noted complications of dysesthesia using the temperature modulated probe and speculated that device was not able to consistently

control the temperature in a cold saline irrigated environment.

The Bipolar Solution
Ellman International, in response to the need for a safer and more effective flexible spine probe, developed a bipolar 4.0MHz High-Radiofrequency probe specifically for endoscopic use through the Yeung working channel endoscope. The design was specifically tailored to be used with the multi-channel, flow integrated spine scope (YESS System) designed by Yeung and developed by Wolf GmBh. Without changing surgical technique, the rate of post operative dysesthesia decreased from 20% to less than 5%. Further modifications of the technique has served to virtually eliminate dysesthesia as a complication.

In a recent prospective study of the 4.0 MHz High-Radiofrequency bipolar probe by Ellman used in a series of patients operated on by the senior author, research fellow Walter Bini, M.D., queried 40 patients with three or more levels of discogenic back pain who were determined to be inappropriate for multi-level fusion elected to undergo percutaneous Selective Endoscopic Discectomy and Thermal Annuloplasty for their chronic back pain unresponsive to conservative treatment. The patients all had provocative discography by the senior surgeon before receiving this minimally invasive surgical procedure. No effort was made to exclude patients with medication dependency problems, workman's comp, or litigation. The patients all had Percutaneous Selective Endoscopic Discectomy utilizing a specialized operating spine scope with multi-channel irrigation ports.

Selective discectomy was made possible by incorporating a vital dye to stain degenerative disc tissue for targeted extraction, followed by thermal annuloplasty using the Ellman flexible probe. Because many patients had markedly narrowed disc spaces and foraminal stenosis, a Trimedyne side-firing laser developed specifically for the YESS scope was also utilized for tissue and bone ablation. Many patients with discogenic back pain also had calcified discs and foraminal stenosis. The holmium laser was useful for bone ablation and tissue ablation that interfered with visualization. At the time of surgery, a repeat intra-operative discogram using Indigocarmine, a vital dye mixed 1-9 with isovue M-200, reconfirmed the painful level and labeled the disc for extraction. Patients were assessed with an Oswestry questionnaire and selected questions from a modified SF-36 questionnaire.

Results
32/40 (80%)patients responded favorably in the Oswestry questionnaire, indicating significant improvement of their back pain greater than 50% on a visual analog scale. All would do it again. There were no complications and no patient was worse.

Discussion
Treatment for non-radicular back pain is currently limited to fusion techniques that, due to its morbidity, is reserved only for carefully selected patients with severe, incapacitating pain. While fusion is a accepted option, there is currently no solution for multi level discogenic pain or pain in non-contiguous segments.

It is clear from the author's experience with intradiscal thermal therapy that its efficacy is better than conservative treatment. Factors such as physician enthusiasm, and perhaps the placebo effect of a new and sophisticated treatment may need to be considered. However, this new technique deserves further study by clinicians who employ the technique cautiously and responsibly. It also

deserves the support of organized medicine, especially since the technique is relatively safe and potentially beneficial for patients who are not being helped by ineffective conventional treatment.

The author's choice of a visualized technique over the blind technique of a thermal resistive catheter is supported by his success in converting failed IDET procedures to successful ones using his selective discectomy and visualized thermal annuloplasty. The most common finding with failed IDET is the presence of a herniated disc fragment or inter-positional disc tissue preventing the shrinkage of the annular tear. The author has, on rare occasions seen necrotic disc tissue confirmed by microscopic slides in patients who have undergone IDET treatment. A visualized technique overcomes both conditions when visual control of tissue reaction to thermal treatment allows the surgeon to avoid carbonization of tissue and target the annular tear more directly.

Conclusion

Thermal Modulation for discogenic pain works well in selective patients. It offers back pain relief to those with no other options with very little downside risk. The causes of discogenic pain is multi-factorial and all causes must be considered for an effective treatment regime. to withstand the test of time. Endoscopic visualized techniques that incorporate all available adjunctive therapy will allow gradual evolution of treatment modalities and enhance the development of the field of minimally invasive spine.

Like any new procedure, there will be sharp criticism from skeptics whose sole purpose is to try to discredit a procedure that they have not tried. It would be more fair if we limit the debate to those who have learned this new technique and tried it for their patients. With electrothermal treatment, we must keep in mind that this treatment modality will continue to evolve, and the ultimate goal is to restore the function of the disc. To this end, the future will incorporate the concept annular reinforcement and nucleus replacement.

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