Minimally invasive spine surgery: Adapting to a new technology

"There is no such thing as darkness, just the absence of light."

March 10, 1876, Graham Bell was granted patent 174,465 for "The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in the form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

His critics called it as one of the most "useless" inventions of the time. Some even going to the extent of saying "This represents the pinnacle of the idle nature of the human mind, inventing gadgets for a purpose, which may be better served by communicating to a fellow human being by walking a few steps across to his home rather than to perform the same act using cumbersome and thick wires to hear his faded voice over a jukebox, which will soon earn its place in a circus rather than being of any true utility!"

Perhaps, the field of minimally invasive surgery also met similar if not equally intensive criticisms initially.

Few fields in medicine and surgery have grown as much in the last three decades as the field of minimally invasive spine surgery. With any such growth there have also been the rapid assessment and discarding of techniques that have mired this field in some controversy. Chymopapain, automated percutaneous lumbar discectomy have shown little benefit and are abandoned. The other minimally invasive techniques to address lumbar disc disease such as laser, endoscopy and intradiscal electrothermy have also not lived up to their initial promises.

It would however be akin to wearing blinders to dismiss minimally invasive spine surgery in today's day and age. The ability to perform complex spinal procedures with smaller incisions, less tissue trauma and less patient pain is lucrative to any surgeon and is a reality today. Most spinal centers are seeing a gradual change with minimally invasive procedures on the rise and even overtaking open procedures.

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It is important to note though that most minimally invasive procedures are strictly minimally invasive in their surgical approach. The evolution of better visualization systems such as endoscopes, microscopes and even loupes has made these procedures more accessible and widespread. The newer intraoperative imaging and navigation systems have allowed for a greater number of procedures that require less direct visual control. Until now, most minimally invasive approaches have sought to achieve the same results as open surgery with less morbidity and faster recovery.

Like laparoscopic cholecystectomy, it may well be the situation in the years to come that minimally invasive spine surgery may be the standard of care of a variety of spinal disorders. With advances in instrumentation and greater access to both training and hardware, that day is not far.

The current status, in a world of evidence based medicine, of minimally invasive spine surgery is still unproven. The most extensive data exists for lumbar disc disease with regard to chemonucleolysis, percutaneous lumbar discectomy, and percutaneous laser discectomy.

For example, van Alphen *et al.*[1] randomized 151 patients with a lumbar herniated disc to either chemonucleolysis or open discectomy. 73 patients underwent the minimally invasive procedure and 16 experienced an increased radicular pain compared with none in the 78 patients in the open group. 18 patients (25%) who underwent initial chemonucleolysis eventually underwent open surgery compared with only two reoperations in the open group. Open surgery following failed chemonucleolsis was successful in only 44% of the cases. This was cause of concern.

Mayer and Brock[2] compared the results of percutaneous endoscopic discectomy in 20 patients versus open discectomy in 20 patients in a randomized, controlled trial. Of note, only contained or small uncontained herniations were included. There was no clear statistical difference in the groups.

Such techniques rely on indirect decompression of the nerve roots through reduction of intradiscal pressure. Thus, they appear to be most effective for contained herniations that do not extend far beyond the posterior annulus.

In their study Hermantin *et al.*[3] they found in a trial of 60 patients with single level disc hernations, comparable rates of a satisfactory outcome following open discectomy (93%) and endoscopic discectomy (97%). The length of time that the patients were out of work was higher in the open group (49 days) than in the endoscopic group (27 days).

The investigators, however, excluded disc herniations that exceeded one-half of the anteroposterior diameter of the spinal canal and advised that such large fragments should be approached by open methods.

Huang *et al.*[4] found that C-reactive protein and interleukin-6 levels were lower in the endoscopic group, suggesting that, with comparable clinical results, the lower systemic insult with minimally invasive surgery may justify its use.

However, a review of all randomized controlled trials has shown no added benefit of endoscopic surgery versus the current standard of open micro discectomy.[5]

There is no significant benefit with respect to the outcome in using minimally invasive techniques, but there is some improvement in postoperative quality-of-life at least in the immediate postoperative period.

Most new techniques are beneficial in a small select group of patients which are carefully selected. However in time techniques and their indications evolve to widen their scope. This has been the story of every new invention in the field of medicine and surgery. It is no different for minimally invasive spinal surgery (MISS). In the years to come, MISS with cranial endoscopic surgery and endovascular surgery will form the mainstay of neurosurgery.

Finally, we bid goodbye and thank the IJNS for having given us the opportunity to be its founding editors. We welcome Prof. A. K. Mahapatra as the chief editor, and Dr. H. S. Bhatoe as the editor from the next issue onwards.

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