



Endoscopic Spine Surgery: Current State of Art and the Future Perspective

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Introduction

Endoscopic spine surgery promises to be the next paradigm shift in the field of minimally invasive spine surgery (MISS). The use of endoscopy in spine surgery is not a novel concept; Forst and Hausmann [1] described the use of an arthroscope to visualize the contents of the intervertebral disc in 1983, and the first description of an endoscopic discectomy by Kambin et al. [2] followed soon after in 1988. However, the use of endoscopy has been slow to develop, partly due to un-familiarity with the technique and clinical benefits. Studies of its safety and efficacy are beginning to surface [3-5], and full endoscopic spine procedures are now being performed in spine centers around the world.

Current Indications

Endoscopic techniques originated in the lumbar spine, and have now expanded to include the cervical [6], thoracic [7,8], and thoracolumbar junction regions [9,10]. Popular approaches include the transforaminal and interlaminar approach in the lumbar spine, and anterior and posterior approach in the cervical region [11]. Published experiences in endoscopic spinal surgery include treat-

ment of primary and recurrent disc disease, failed back surgery syndrome, spinal stenosis, spondylolisthesis, synovial cysts, radiculopathy, infectious processes, discogenic back pain, spinal tumors, dural tears, and tethered cord syndrome. Surgical options and indications will likely continue to expand as technique papers and case reports are published in the literature.

Proposed Benefits

Endoscopic surgery encompasses the benefits of 'traditional' minimally invasive surgery. Most of these surgeries can be performed under local anesthesia with sedation in an outpatient setting, with some studies reporting improved quality of life [3,5,6] and potential for reduced costs [7]. However, more literature is needed to further investigate these potential benefits over traditional open procedures.

Limitations & Learning Curve

Similar to MISS in general, endoscopic surgery has a steep learning curve, and requires additional training, careful patient selection, and thorough understanding of the anatomy [8-10]. Additionally, endoscopic spine

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surgery is contraindicated in cases of cauda equina syndrome, clinically relevant instabilities and deformities, and some cases of large disc herniations. There is also concern of radiation exposure to the patient and surgeon, particularly during a surgeon's early experience in minimally invasive endoscopic spine surgery [11]. Similarly, there may be a higher rate of complications during these early experiences, which include dural tears, dysesthesia, nerve or vessel injury, hematoma, infection, and potentially higher recurrence rates [12]. Some solutions to these concerns include conferences and workshops, didactic lectures, virtual reality learning, hands-on cadaveric training, and surgical observation.

Future Perspective

With advancement in implant and instrument technology and incorporation of robotic technology there may be expansion of surgical indications into motion preserving scoliosis surgeries, tumor resections and more complex surgical procedures. As we move towards a patient-centered and cost-effective model of healthcare, we may see endoscopic spine surgery become increasingly relevant to the future of spine surgical practice with improved patient outcomes and decreased medical costs. The future of endoscopic spine surgery remains to be seen, but early results are promising.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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