Paradigm Shifting of Endoscopic Spine Surgery

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Introduction

Recently, the new concept of spine surgeries has been introduced such as virtual reality, biomaterials, robotics, navigation, and endoscopic surgery. We suggest that the mainstream of minimally invasive spine surgery may be endoscopic spine surgeries.

As you all know, laparoscopic approaches of abdominal surgeries or gynecological surgeries and arthroscopic approaches of joint surgeries were common and ordinary surgical procedures. Moreover, endoscopic approaches of the brain also have been attempted for brain tumor surgeries including skull base surgery. In the present, endoscopic spine surgeries have been vigorously developed, and indications of endoscopic spine surgeries have been extended from disc herniation to stenosis and instability and from lumbosacral to cervical area [1, 2].

Generations of Endoscopic Spine Surgery

Full endoscopic transforaminal approaches were firstly tried for lumbar disc herniation without bone work [3]. This is the first generation of endoscopic spine surgery of lumbar lesion (Fig. 1, Table 1). Followed second generation of endoscopic spine surgery is the posterior interlaminar approach without bone work for the removal of rupture disc herniation of lumbosacral area. Interlaminar endoscopic lumbar approach was firstly attempted in lumbosacral disc herniation rather than transforaminal approach. After trial of posterior interlaminar approach, it was able to perform posterior endoscopic decompressive procedures including laminectomy and laminotomy. New endoscopic specialized instruments such as endoscopic drill systems, reaming systems of foraminoplasty, and endoscopic Kerrison rongeur were developed. As a result, endoscopic decompressive laminectomy, endoscopic laminotomy, lateral foraminotomy (paraspinal approach), and foraminoplasty were possible. Therefore, indications of endoscopic surgeries have been extended from disc herniation to lumbar central stenosis and foraminal stenosis (Fig. 1, Table 1) [4].

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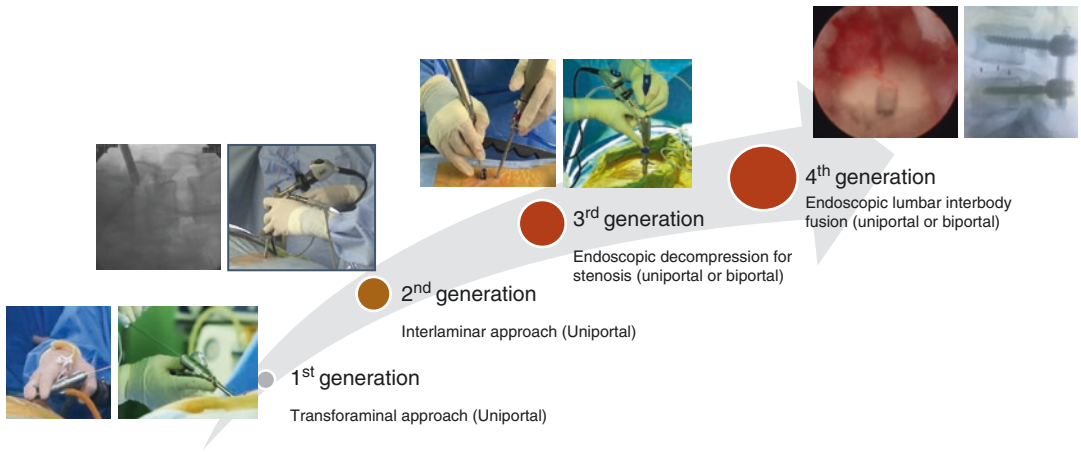

Fig. 1 Paradigm shifting of endoscopic spine surgery from first to fourth generation in lumbar area

Table 1 Generation of endoscopic spine surgery in lumbar lesion

	1st generation	2nd generation	3rd generation	4th generation
Endoscopy systems	Uniportal	Uniportal	Uniportal and biportal	Uniportal and biportal
Approach	Transforaminal approach	Interlaminar approach	Endoscopic laminectomy Endoscopic foraminotomy	Endoscopic lumbar interbody fusion
Indications	Lumbar disc herniation	Lumbar disc herniation	Central or lateral recess stenosis Foraminal stenosis	Spondylolisthesis Instability Combined lesion

Also, modified interlaminar endoscopic systems with a large working channel was developed for the treatment of lumbar stenosis. And biportal endoscopic surgeries have been re-emerged and developed in South Korea. Now, lumbar stenosis is able to be fully decompressed by large working channel interlaminar endoscopic systems or biportal endoscopic approaches [5]. The third generation of endoscopic spine surgery is endoscopic decompressive procedure for lumbar stenotic lesion by uniportal or biportal [5]. Especially, compared to uniportal endoscopic approach, biportal endoscopic surgery has different characteristics; there were two portals including endoscopic channel and working channel. Biportal endoscopic surgery was well known as abbreviation name of UBE (unilateral biportal endoscopy) in South Korea. This biportal endoscopic approach was advantage of decompressive surgical procedure [4].

Another recent issue of endoscopic spine surgery may be endoscopic lumbar interbody fusion (Fig. 1, Table 1) [2]. There were three approaches of endoscopic lumbar interbody fusion: first is the trans-Kambin triangle approach, second is the endoscopy-assisted transforaminal lumbar interbody fusion, and third is the endoscopy-assisted lateral lumbar interbody fusion [2]. Although early clinical results of endoscopic lumbar interbody fusion surgeries may be relatively favorable, we need to investigate long-term outcome and comparative study

The paradigm of endoscopic spine surgeries is still moving, and surgical techniques and instruments of endoscopic spine surgeries are still developing. Finally, the boundary and indications between conventional surgery and endoscopic surgery seem to be narrow or to disappear. We should make an effort to learn a new technique of endoscopic spine surgeries (Fig. 1).

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