



# Endoscopic spine surgery in Republic of Korea

Hyeun-Sung Kim, Harshavardhan Dilip Raorane, Dong Hwa Heo, Yeon Jin Yi, Il-Tae Jang

Department of Neurosurgery, Nanoori Hospital Gangnam, Seoul, Republic of Korea

Correspondence to: Prof. Hyeun-Sung Kim, MD, PhD. Department of Neurosurgery, Nanoori Hospital Gangnam, Seoul, 731, Eonju-ro, Gangnam-gu, Seoul, Republic of Korea. Email: neurospinekim@gmail.com.

Submitted Aug 23, 2019. Accepted for publication Sep 26, 2019.

doi: 10.21037/jss.2019.09.30

View this article at: <http://dx.doi.org/10.21037/jss.2019.09.30>

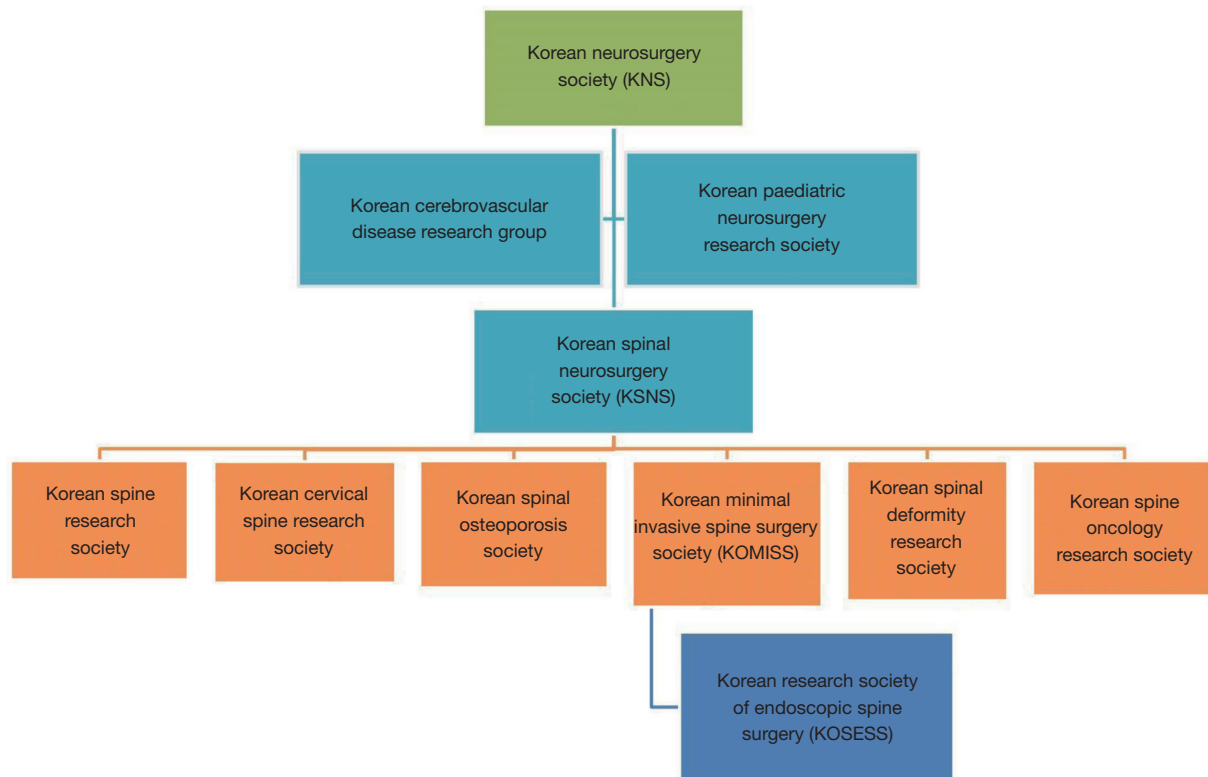
## Introduction

Spinal surgery may profoundly improve the quality of life in patients suffering from degenerative conditions of the spine. Minimally invasive spinal surgery (MISS) and endoscopic spine surgery (ESS), in particular, have expanded the accepted indications for spine surgery in the growing elderly population mostly affected by the age-related disease (1,2). However, ESS is considered by most to be challenging to learn and costly to implement. In this editorial, the authors—two fellowship-trained and ESS enthusiasts each with more than 10 years of clinical experience—are attempting to illustrate why and how the implementation of such a groundbreaking technology has occurred at a faster pace in Republic of Korea than in other countries with a highly-developed health care system.

## Historical review

Neurosurgery was not a recognized surgical specialty in the Republic of Korea until 1950. It was the period of the Korean War, which changed the future of the neurosurgical specialty. During the war, the United States (US) soldiers stationed in Korea and set up army and field hospitals. This provided an opportunity for Korean military surgeons to work alongside American surgeons. They trained and developed their surgical skills side by side. Several Korean surgeons were also allowed to travel to and work in hospitals in the US to acquire surgical knowledge and expertise. Korean neurosurgeons were at the forefront of this early learning explaining their current dominance in the specialty of spine surgery in Republic of Korea. Professor Hwan Yung Chung and Young Soo Kim founded the Korean Spinal Neurosurgeon Society (KSNS) under the roof of the Korean Neurosurgery Society (KNS) in October 1987 (3).

The last half-century has seen Korean neurosurgeons passionately making great strides in the field of spine surgery and developing dedicated subdivisions in the specialty. KSNS has expanded across six subdivisions, one of them being the Korean Minimal Invasive Spine Surgery Society (KOMISS). At its inception, ESS faced stiff resistance from within the specialty in Republic of Korea. ESS was initially considered and developed by practicing spine surgeons in private hospitals. They had trained with European (Thomas Hoogland) and US (Anthony Yeung) key opinion leaders at the time and took the technology home to implement into their private practices. The positive reception by patients was overwhelming. Initially, spine surgeons in university hospitals looked onto this development more reluctantly and adopted the technique later. In the late 1990s, spine surgeons from private hospitals with interest in MISS established a community named the “Korean Society of Minimal Invasive Spine Surgery” (KOSMISS). In turn, neurosurgeons from university hospitals established their community by the name of KOMISS in 2002 (4). These two communities came together to merge into a single organization called the KOMISS in 2016. This collaboration paved the road for the birth of the “Korean Research Society of Endoscopic Spine Surgery” (KOSESS) in 2017 (*Figure 1*). The formation of this society allowed endoscopic spine surgeons in Republic of Korea to do more focused research and develop the subspecialty further. Since 2009 KOMISS has run biannual meetings, including a spring meeting which has included an advanced course where alongside academic meetings, participants are exposed to cadaveric workshops and receive hands-on training. In 2016, KOMISS published its first official journal by the name of “Journal of Minimal Invasive Spine Surgery and Techniques” (JMISST). KOMISS successfully



**Figure 1** Various research societies under Korean Neurosurgery Society (KNS).

hosted the 5<sup>th</sup> World Congress of Minimal Invasive Spine Surgery (WCMISST) in 2016 and the 7th Asian Congress of Minimally Invasive Spine Surgery (ACMISST) in collaboration with other societies from Asian countries in 2019.

Meanwhile, another society called the Unilateral Biportal Endoscopy (UBE) society was established by spinal surgeons practicing biportal endoscopic surgery (UBE). The UBE society was officially assembled in 2017 with the first elected president of the society being Dr. Jin Hwa Eum. Outside of the societies, groups of spinal surgeons have also been working autonomously in ESS education and training at the Wooridul Hospital and the Nanoori Hospital as part of the Nanoori Vision (NAVI). Professor HS Kim is the director of the NAVI program and consists of an international visiting surgeon program and an annual symposium of endoscopic spine surgery (NASESS). This symposium incorporates academic lectures alongside a 3D model workshop with attendance from both domestic and international spine surgeons. Several other hospitals across the country have developed and are now offering fellowship programs or a visiting surgeon program to train budding

spine surgeons in ESS. Some senior Korean endoscopic spine surgeons are giving lectures internationally on how they have successfully implemented the endoscopic spinal surgery technology locally.

### International collaboration

At present, KOMISS and KOESS are in collaboration with various other minimally invasive spine surgery societies around the globe such as the North American Spine Society (NASS) from the US and other MISS societies in the world. Spine surgeons from throughout Korea are actively participating and regularly presenting their work at the annual meetings of a number of these international societies.

### Foundation and generations of ESS surgeons

Following the lead of European and US surgeons, Professor Young Soo Kim first attempted chemonucleolysis using chymopapain and published articles on the technique in 1986. Eventually, this technique fell out of favor due to

erroneous user induced hypersensitivity to chymopapain (5). In the decade 1990–2000, the use of the endoscope to visualize the herniated disc allowed for the beginning of the era of development in ESS. Republic of Korea was swift to adopt and develop ESS. In 2000, the first generation of Korean surgeons, including Gun Choi (G Choi) and Sang-Ho Lee (SH Lee) trained with Anthony Yeung of Phoenix by participating in his courses organized by the International Intradiscal Therapy Society (IITS). In the last two decades, the following two generations of Korean spine surgeons were trained in ESS building on the foundation laid by the first-generation surgeons. Amongst the pioneers in the field of ESS is SH Lee from Wooridul Hospital in Seoul and G Choi from wooridul Hospital in Pohang. Professor SH Lee was the first president and founder of KOSMISS. It is his constructive work in this field that has inspired many spine surgeons towards ESS not only in Republic of Korea but across the world. He has published more than 50 original scientific articles and made a significant contribution as co-editor to the several textbooks of ESS including “The Practice of Minimally Invasive Spinal Techniques” (2005) and “Endoscopic Spinal Surgery” (2013)—which he co-edited with the lead of this JSS special focused issue—Kai-Uwe Lewandrowski, MD. With special interests in cervical ESS, he developed the “anterior percutaneous endoscopic cervical discectomy” procedure. His work was carried forward by second-generation endoscopic spine surgeons from the same hospital, G Choi and Yong Ahn (Y Ahn). Together with Dr. SH Lee, they described a classification for migrated lumbar disc herniations and introduced the “foraminoplasty technique” for the treatment of the inferiorly migrated disc using the transforaminal approach. For L5–S1 disc herniations, Dr. G Choi described the ligamentum flavum splitting technique and popularized the trans-osseous (trans iliac) approach. he also popularized motion segment preserving techniques (transcorporeal and transpedicular) for difficult disc herniations. Dr. Y Ahn described the foraminal and far lateral decompression using endoscopy. They not only contributed academically but also helped in the development of endoscopic instruments; one of them in particular, the endoscopic drill has had a profound effect in enhancing the safety and versatility of ESS.

Among the current third generation of ESS advocates in Republic of Korea, several surgeons stand out. Jun Ho Lee, Cheol Woong Park, Chul Woo Lee, HS Kim have advanced ESS techniques by describing the endoscopic preservation of anatomical structures. This description

has been published in scientific articles and textbooks. Other contributions to the field include developing the Percutaneous Endoscopic Stenotic Lumbar Decompression (PESLD) technique in 2016, and the contralateral approach for foraminal and extraforaminal decompression in 2017. Additional modifications of the transforaminal approach, such as the mobile “outside-in technique”, the “supra pedicular approach”, and the “floating technique” were also proposed by HS Kim. Jin Sung Kim developed the endoscopy assisted oblique interbody fusion; while KT Lim described the “jumping technique” for multilevel stenosis decompression through a single incision. Presently, Korean endoscopic spine surgeons have a particular interest in the development of the endoscopic interbody fusion procedure.

While Anthony Yeung has introduced biportal transforaminal endoscopic decompression surgery in the early 2000s, JH Eum along with Young Chul Choi performed the first biportal endoscopic surgery (UBE) in Republic of Korea—a video endoscopic technique that resembles traditional MISS spinal surgery but carried out through a smaller endoscopic access portal. Indications for the use of UBE expanded from the lumbar spine to the cervical spine. Dr. Sang Kyu Son, in particular, developed the endoscopic discectomy and fusion technique in the cervical spine. Dr. DH Heo was the first to publish a scientific article describing the technique of UBE decompression for stenosis in Republic of Korea. He published a scientific article describing the utility of the UBE technique in lumbar interbody fusion following the lead by Kai-Uwe Lewandrowski who first demonstrated the feasibility of the concept of a standalone endoscopic lumbar transforaminal interbody fusion and reported successful 2-year clinical outcomes in a recent *Neurospine* journal scientific article published in March of 2019 (6). Dr. Heo also performed a trial 3D biportal ESS. Currently, more than 300 spine surgeons are practicing ESS in Republic of Korea; out of them around 100 surgeons are doing work exclusively dedicated to ESS. Although we have only been able to describe the work of a limited number of endoscopic spine surgeons in Republic of Korea, it is essential to acknowledge and recognize the significant contribution made by all surgeons towards the development of ESS in Republic of Korea.

### Ongoing debates

During the early years of ESS, the widely-used approach for lumbar disc herniation was the transforaminal approach.

Both the inside-out and the outside-in technique using the transforaminal approach were successfully adopted by the Korean surgeons with their own modifications. The introduction of the interlaminar approach by Sebastian Ruetten has expanded the indications for ESS. Additional technological advances allowing for more expansile foraminoplasty using suprapedicular and transpedicular techniques expanded the utility of the transforaminal approach for migrated disc herniations. Korean surgeons embraced the interlaminar approach to accomplish bony decompression for degenerative lumbar canal stenosis. With the help of endoscopic drills, they developed techniques for the decompression of the central canal, lateral recess, foramen, and extraforaminal regions via an ipsilateral and contralateral approach. The utility of the interlaminar approach was demonstrated by the development of safer posterior approaches for thoracic as well as cervical decompressions using the spinal endoscope. There is an ongoing debate amongst endoscopic spine surgeons between using anterior versus the posterior approach for cervical disc disease. In recent years, the paradigm of management of the lumbar degenerative disease has shifted from central canal decompression to foraminal decompression. Concerning the approach to the foramen, distinctly two groups of surgeons have evolved in Republic of Korea; One group prefer the ipsilateral approach to decompress the foramen, while another group believes in the benefits of the contralateral approach. Currently, the most significant debate taking place in Republic of Korea is between the merits of uniportal versus biportal ESS. This debate is becoming evidence-based with an increasing number of surgeons from both groups publishing their results in the literature. They have also established their respective societies (KOESS and UBE society) to support their work and share their surgical techniques.

### **Cultural and economic impact**

The average life expectancy in the Korean population has reached 80 years. With an increase in longevity, increase in the prevalence of degenerative diseases is inevitable. However, many patients from the older age group are reluctant to proceed to surgery due to fear of peri and postoperative complications and the requirement for extensive rehabilitation postoperatively (7). With these fears, such patients seek surgical treatments that

mitigate the risks mentioned above and concerns. ESS is emerging as a technique that can address these concerns, especially in this aging population and has been producing excellent results. Korean medical care is based on patient expectations; Economic stimulators are secondary. For this reason, Korean patients prefer treatment that is more developed and produces better results. The influence of the clan culture in Republic of Korea and the development of the social network via the internet has enabled treatment decisions to be more informed and has led to an increased awareness of techniques such as ESS. Inclusion of ESS into the National Health Service (NHS) and extensive patient education by spine surgeons has improved patient acceptance of ESS. The latter is equally responsible for the development of the specialty as a whole.

### **ESS training**

Numerous spine surgeons apply for MISS fellowships in Republic of Korea. This is the result of extensive teaching activities at conferences, cadaveric workshops, and training courses. At Korean universities, staff surgeons are motivated to advance their academic careers by publications and podium presentations. Korean spine societies are supportive of fellows and students to participate in the national and international symposiums and conferences actively. Many fellows, including this author, have been given numerous opportunities to partake in research work and publish in both national and international journals.

### **Conclusions**

The spine surgeons in the Republic of Korea have embraced ESS despite numerous challenges which were overcome through dedicated research, which ultimately produced generally accepted treatment guidelines and made ESS mainstream in Republic of Korea. The Korean culture and NHS have facilitated implementation, advancement, and training of ESS. ESS will likely continue with select Korean Key Opinion Leaders partaking in leadership positions.

### **Acknowledgments**

We would like to acknowledge scientific team members Ms. Jae Eun Park, Mr. Kyeong Rae Kim and Ms. So Young Lim for providing assistance in acquiring full text articles and managing digital works.

## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## References

1. Kim M, Kim HS, Oh SW, et al. Evolution of Spinal Endoscopic Surgery. *Neurospine* 2019;16:6-14.
2. Wang JC, Kim HS. Endoscopic Spinal Surgery (ESS): Prepare for a Happy 100-Year-Old! *Neurospine* 2019;16:4-5.
3. Kim DH, Lee SH, Choe WJ, et al. History of Korean Spinal Neurosurgery Society. *Neurospine* 2018;15:189-93.
4. Park CK. Minimally Invasive Spine Surgery in Korea - A Neurosurgeon's View. *J Minim Invasive Spine Surg Tech* 2016;1:3-4.
5. Park KW, Kim YS. A clinical study of chemonucleolysis for herniated lumbar discs. *J Korean Neurosur Soc* 1986;15:573-86.
6. Lewandrowski KU, Ransom NA, Ramírez León JF, et al. The Concept for A Standalone Lordotic Endoscopic Wedge Lumbar Interbody Fusion: The LEW-LIF. *Neurospine* 2019;16:82-95.
7. Kim JH, Kim HS, Kapoor A, et al. Feasibility of Full Endoscopic Spine Surgery in Patients Over the Age of 70 Years With Degenerative Lumbar Spine Disease. *Neurospine* 2018;15:131-7.

**Cite this article as:** Kim HS, Raorane HD, Heo DH, Yi YJ, Jang IT. Endoscopic spine surgery in Republic of Korea. *J Spine Surg* 2020;6(Suppl 1):S40-S44. doi: 10.21037/jss.2019.09.30