



The motivators to endoscopic spine surgery implementation in Latin America

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The beginnings

Latin-America as a region is more than a geographic concept. The 20 countries that constitute Latin America are intermingled by history, similar language, religion, customs, and traditions as well as aspects of a collective cultural heritage. This common thread also reaches into the medical field with a strong influence of our northern neighbor—the United States. The Latin-American continent is the region between Mexico to Argentina including Brazil, Colombia, Chile, and all the Caribbean Sea Islands. For the majority of nations, the official language is Spanish. Only in Brazil—the largest and most populated country—Portuguese is the spoken language of the land. However, communication barriers are typically low due to the similarities with Spanish (1). These are the main reasons why Latin-Americans and the peoples the world over consider all the countries of Central and South America has a single region. Many consider it as an actual continent. The beginning of the endoscopic spine surgery (ESS) in Latin America took place within this cultural, economic context of healthcare delivery in its respective countries.

In 1995, I was the director of the Spine Center of the Reina Sofia Clinic in Bogotá, Colombia, and became mostly unsatisfied with the outcomes of patients treated the conventional open spine procedures. The search for less impactful and more effective treatments prompted me to travel abroad. I visited with two key opinion leaders (KOLs) in the United States. In 1993, Parviz Kambin in Philadelphia, Pennsylvania reported on his clinical series of transforaminal procedures using the safe zone formed by the triangle between the exiting and traversing nerve root

and the inferior pedicle as a percutaneous access corridor to the intervertebral disc (2). Soon after that, Tony Yeung, whom I visited in Phoenix, Arizona in 1993, popularized his YESS™ technique (3). Additional traveling fellowships with Werner Siebert, whom I visited in Kassel, Germany in 1995 provided additional insights in contemporary treatments for common degenerative conditions affecting the spine (4). It quickly became apparent that viable alternatives to open and other forms of minimally invasive (MIS) translaminar surgery existed and that it needed to be implemented on our home turf. That same year and together with Dr. Rugeles and our team in Bogotá, we started the first ESS program in Latin America. In those days, we used a basic and disposable spinal endoscope which suffered from poor image quality and low visibility. These technological problems were eventually overcome when Richard Wolf (Hamburg, Germany) started marketing higher-end endoscopes. The first high-quality multiuse spinal endoscopes—the Knight (KESS™) and Yeung (YESS™) endoscopic spinal systems—reached the Colombian market in the early 2000s. Along with this technology came a vast array of endoscopic instruments that allowed us to tackle more diverse and complex clinical indications aside from lumbar herniated disc. Moreover, clinical outcomes became more consistent and improved, in the long run, holding our endoscopic spinal surgery program to the highest clinical standards in advanced spine care practiced the world over and by honing in our skills to achieve high patient satisfaction by responding to their needs and the needs of their families. Within several years from the commencement of our ESS program in Bogotá, international recognition and validation

within Latin America led to significant traction locally. The foundation for implementing ESS as an accepted mainstream spinal surgery in Latin America was laid.

The slow-down

Although the need for implementation of ESS in Latin America seemed evident to us, convincing traditionally trained spine surgeons and the stakeholders in the establishment healthcare systems proved more difficult than expected and was slow for the most part over the next two decades. While gradual acceptance was not unique to us, it created the need for surgeon training, and clinical outcome studies to develop scientific evidence on the bases of regional patient outcome analyses. The lack of high-grade clinical evidence published in regional and local medical journals coupled with the high cost of endoscopic equipment not only created the misperception that ESS is not a viable alternative to traditional open spine surgery but was also mostly unaffordable. As a result, very few specialists initially invested their time into learning the endoscopic trade. Additional hurdles existed because of the lack of formalized training programs. Peer pressure and limited access to endoscopic equipment added other barriers. In short, it was an uphill battle in those days.

There were just a few of us. Namely, Dr. Ramiro Ramirez, who trained with us in Bogotá and with Dr. Tatai in Sevilla, Spain and Dr. Roberto Cantú, who was Yeung's fellow, were the main KOLs that followed our lead. Then, Dr. Álvaro Dowling, who initially trained with us in Bogotá, started to implement the endoscopic techniques in Santiago de Chile. In 1996, Dr. Daniel de Anthony, an Argentinean arthroscopic surgeon, begun to perform interlaminar bi-portal endoscopic lumbar procedures. In spite of him receiving recognition for his successful clinical outcomes, ESS did not gain a lot of traction in Argentina and was never implemented at another clinical center. Likely, the reasons are multifold and had at least in part to do with the tumultuous political and tenuous economic situation in Argentina at the time which was not conducive to implementing a brand-new technology in an otherwise sluggish healthcare environment. Last but not least, a Brazilian surgeon—Dr. Francisco Azuaga who also trained with us—deserves mentioning. For reasons not known to me, Dr. Azuaga briefly performed a few spinal endoscopies after he established an ESS program with my help at his hospital but later stopped, which led to the demise of the program.

The sporadic evolution of ESS in Latin America

continued for the next decade or so. Implementation hurdles really did not differ much from what surgeons in other countries faced: a steep learning curve compared with traditional open or different types of MIS translaminar surgeries, high acquisition cost for infrastructure and capital equipment, higher ongoing operational cost for un-reimbursable disposables, the lack of suitable training centers, and the lack for formalized postgraduate academic training programs. The latter also played out in failing endorsement by national and international spine organizations, whose treatment guidelines are centered around image-based surgical planning employing lumbar lordosis and sagittal balance correction concepts. Consequently, health insurance companies wrote coverage guidelines which deemed ESS experimental or outside of the established standard of care. Non-payment for ESS procedures limited access to this innovative technology significantly and slowed down its implementation in Latin America in a significant way.

Training is the key

Training is one of the most critical challenges to the implementation of brand-new surgical techniques. Before the creation and formalization of wide-spread ESS training programs stands the acceptance of the endoscopic approach to managing painful degenerative spine conditions. It implies the acceptance of other hitherto unknown pain generators that can now be directly visualized, validated, and correlated to the patient's painful and severe disability. Training of endoscopic spine surgeons goes beyond the teaching of minimal percutaneous access, and the skillful use of endoscopic instruments through a small working channel of the same endoscope used for illumination and irrigation. Trying to reduce ESS to established biomechanical concepts including deformity, instability, and encroachment of neural elements due to spinal stenosis as the only major accepted pain generators affecting patients' day-to-day function may put the aspiring endoscopic surgeon on a collision course locally in his community with the establishment surgeons in most Latin American countries. Recognizing the plethora of pain generators within a spinal motion segment by direct visualization with the endoscope is an eye-opening experience for most. Seeing and managing conditions hitherto unknown to the novice endoscopic surgeons—examples include: (I) inflamed disc, (II) inflamed nerve, (III) hypervascular scar, (IV) hypertrophied superior articular process (SAP) and ligamentum flavum, (V)

tender capsule, (VI) impacting facet margin, (VII) superior foraminal facet osteophyte, (VIII) superior foraminal ligament impingement, and (IX) hidden shoulder osteophyte—opens the door to staged management of painful degenerative spine conditions—the subject of this *JSS* special focused issue (5).

Managing the most relevant main pain generator responsible for the patient's symptoms in the clinical context at the time when the spine care is delivered detracts from traditional biomechanical spine surgery concepts of correcting the deformity, improve sagittal and coronal alignment, and treating instability with more aggressive reconstructive fusion procedures. Overcoming these obstacles and to deviate from traditional spine surgical training is often an insurmountable task in many surgeons' local clinical setting. Therefore, we built a training center in Bogotá where likeminded surgeons could come together, exchanges ideas, and train jointly side-by-side with expert and master surgeons from Colombian and the world over. In fact, Dr. Kai-Uwe Lewandrowski—the Guest Editor of this *JSS* special focus issue—came to Bogotá on several occasion to participate in surgeon training. One of the most important impulses for this was the founding of the Centro Latinoamericano de Investigación y Entrenamiento en Cirugía de Mínima Invasión CLEMI (Latin-American Center for Research and Training in Minimally Invasive Surgery) in Bogotá. This educational center was founded in 2006 in response to the universal demand for a formalized training center dedicated not only to Spine but also other clinical subspecialties interested in advancing minimally invasive surgery. To the date, CLEMI has hosted more than 100 hands ESS workshops, training close to 1,200 specialist among neurosurgeons and orthopedists from all over Latin-American. The impact of CLEMI in Latin America was immense as measured by the high number of participants from Brazil, México, and Colombia, who went on to implement their ESS programs in their respective countries.

The Latin-American boom

ESS gained significant traction in Latin America within the last ten years. Today, several clinical groups routinely perform endoscopic spine procedure all over the continent. Many of them were founded by former CLEMI fellows who have trained at our workshops. Others were mentored by pioneers such as Drs. Anthony Yeung (USA), Martin Knight (UK), Sebastian Ruetten (Germany) and Sang-Ho Lee (South Korea). As a result, second generation surgeons

emerged as active, well-trained expert surgeons. Among the most well recognized are José Gabriel Rugeles “Pepe,” my daughter Carolina Ramírez and Nicolás Prada, who also trained with us as well as with Korean KOLs including Sang-Ho Lee at Wooridul Hospital in Seoul, and Gun Choi at the Gun-Hospital in Pohang, Korea. Nicolás developed a thriving endoscopic spine practice in Bucaramanga Colombia in part because of his recognition for his mentorship program in other Latin American countries with his mentorship program including Argentina, Chile, Perú, Ecuador, Panamá, El Salvador, Costa Rica, and Honduras.

In Brazil, Roth Vargas at the Hospital Centro Médico Campinas Sao Paulo Brazil has been one of the leading KOLs for the last 20 years. He built a highly sophisticated and successful ESS program treating degenerative cervical, thoracic, and lumbar spine. He has mentored many surgeons nationally and internationally under the RIWOSPINE alliance program. In Sao Paulo, Dr. João Paulo Bergamaschi, the groups of Drs. David del Curto, Marco Vinicius Serra have busy ESS practices. In Rio de Janeiro, Drs. Marcos Tadeu, Fabricio Guedes Machado, Paulo de Carvalho, André Calderon, and Marcelo Brito have created ESS reference centers. Drs. Alvaro Dowling and Helton Delfino organized the “Modern Technical Course and Advances in Spine Surgery”, Ribeirão Preto, Brazil with the support of the Department of Biomechanics, Medicine and Rehabilitation do Aparelho Locomotor da FMRP-USP, Serviços da Coluna Vertebral da Unicamp e da Unifesp e, Faculdade de Medicina de Botucatu. The one-year training program has trained nearly 400 course participants over the last four years.

In Mexico, we must highlight the groups of Drs. Ramiro Ramírez, Roberto Cantú, David Benavides, Óscar Rojas, Javier Quillo and Víctor Miramontes. Both Dr. Ramirez and Cantú have busy ESS practices in Monterrey, Nuevo Leon, Mexico. Dr. Cantú is also the co-founder of the Mexican Society of Endoscopic Spine Surgery—SOMEEC (Sociedad Mexicana de Endoscopia de Columna). In Argentina, Dr. Guillermo Fruscella, a close collaborator with our group, has established an ESS program at the Provincial Hospital of Rosario. Finally, Dr. Andres Báez of Panama is another prominent figure in Latin America of the endoscopic technique. In spite of these Latin American KOLs having been recognized in their respective countries and the region over, the number of spinal procedures performed with endoscopic techniques is still very low compared to traditional open techniques. Surgeons from Brazil, Mexico,

Colombia, Chile, Panama and Ecuador are taking the lead.

The challenges

Undoubtedly, the first challenge facing surgeon specialists in spinal endoscopy, not only in Latin America but around the world, is to publish high-grade scientific evidence (6). Specifically, in Latin America, we must improve efforts to publish at a high level in national and internal peer-reviewed journals of high impact factor. Currently, the journal *Coluna/Columna*, is the official journal publication for several Latin American spine societies, including the Latin American Society of Spine Surgeons (SILACO). However, there are fewer than nineteen articles related to spinal endoscopy (7), published in *Columna*. Therefore, the postgraduate training of new physicians should also include modern minimally invasive and endoscopic surgical techniques. In my opinion, this is best accomplished by either involving universities or scientific societies. There are two powerful societies in Latin America, such as the SILACO and the SICCFMI (Inter-American Society of Minimally Invasive Column Surgeons). These societies have served as a conduit to funnel industry support provided mostly by Elliquence, Richard Wolf, Max More into formal training and scientific programs. However, recruiting industry support can be tricky since ESS directly competes with traditional open translaminar decompression fusion surgeries employing pedicle screws and interbody fusion cages. Likewise, convincing surgeons with busy fusion practices to retool their practices to endoscopic pain management surgeries without implants may lead to significant disruption of revenue cycles. The combination of these dynamics may dominate the scientific discussion of ESS benefiting patient care for as long as when the motivators in physician reimbursements are changed to reward them for implementing more simplified and less costly ESS programs. In time, these dynamics will likely change as more clinical evidence in support of ESS is presented at congresses, courses, workshops, textbooks, and peer-reviewed journal articles becomes available and as industry is identifying new business opportunities within that new framework of delivering high-quality advanced spine

care to patients with less trauma and less collateral damage.

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Footnote

Conflicts of Interest: JF Ramírez León is shareholder & President of Board of Directors Ortomac, Colombia, consultant Elliquence, USA.

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