



Essay



Development of Neurospine Surgery in North Korea: The Contribution of Korean American Neurosurgeons

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Received: June 17, 2018

Revised: June 19, 2018

Accepted: June 19, 2018

THE FIRST MEETING

His name was Pak. He was a counselor at the Permanent Mission of the Democratic People's Republic of Korea (DPRK, North Korea) to the United Nations in New York City. As George W. Bush's second term drew to an end, the United States (US)-DPRK relationship was beginning to thaw. The World Vision DPRK desk had arranged a meeting for Pak with Dr. Kee Park, a Korean American neurosurgeon. Pak had a gentle smile and spoke English with ease. Over lunch, Dr. Park conveyed interest in working with counterparts in North Korea. Pak called a couple of weeks later and asked if Dr. Park would like to visit Pyongyang. It was that simple.

THE FIRST VISIT TO PYONGYANG

As Dr. Park pulled up in front of the Pyongyang Medical College (PMC) with his guides, he was greeted by the vice-director of the hospital, chairman of the neurosurgery department, several senior surgeons, and staff from the international affairs department for the school (Fig. 1). Across a large table, they discussed the possibility of Korean American neurosurgeons working with North Korean colleagues. The PMC staff sat at their side of the table wearing stern facial expressions that seemed to say, "Many have promised but only a few have delivered. Which will you be?" They waved courteously as the car carrying Dr. Park pulled away; he was determined to return.

NORTH KOREAN NEUROSURGEONS VISIT UNITED STATES

In April of 2008, three North Koreans—two of them neurosurgeons—visited the US to attend the Annual Meeting of the American Association of Neurological Surgeons in Chicago (Fig. 2). After being welcomed at a private reception, the North Korean delegation met with many Korean American neurosurgeons and collected textbooks to take back to the DPRK. Despite repeated attempts, no other North Korean neurosurgeons have been



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Fig. 1. In front of the Pyongyang Medical College Hospital, September 2007.



Fig. 3. Dr. Kee B. Park performing laminectomy at the Pyongyang Medical College Hospital, April 2008.

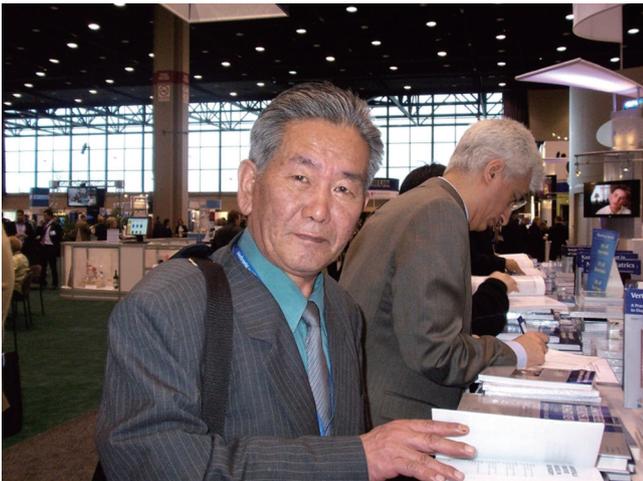


Fig. 2. North Korean neurosurgeon at the Annual Meeting of the American Association of Neurological Surgeons, April 2008.

able to visit the US since 2008.

FIRST JOINT OPERATION

Dr. Park returned to the DPRK later that month with Dr. Byong Uk Chung, another Korean American neurosurgeon. Having recently hosted the North Korean surgeons in US appeared to have a huge impact in building trust and advancing the relationship. This time, the Korean American neurosurgeons were invited to participate in surgeries (Fig. 3). Their first operation with the North Koreans was a laminectomy for lumbar stenosis. The patient was laid out on a heavily used Wilson frame. There was no Bovie. Instead, the surgeons used straight bipolar

forceps that was too short for spine surgery, with a loose connection requiring the assistant to hold the cable in just the right angle for it to work. The only retractor option was a large angled Weitlaner. The rongeurs were all dull and had angles that the US surgeons were not used to. Most of the instruments were made in Russia at least 30 years ago. The microscope came from former East Germany in the 1970's. It had a misaligned surgeon's eyepiece – adapting involved closing one eye at a time to avoid diplopia. The situation was made worse by the improvised, underpowered light source. The scrub nurse multitasked – tending to the surgery while hand-threading the eye of the dull suture needles with silk, cutting cotton patties and painstakingly attaching strings to each piece. The North Korean surgeons chuckled as the American surgeons struggled to adjust their techniques. In any case, the surgery went smoothly.

DEVELOPMENT OF NEUROSPINE SURGERY

With each biannual surgical trip, the Korean American neurosurgeons identified neurosurgical needs and together with their North Korean colleagues, created a list of priorities. New spine instruments and a microscope were sent through the equipment program of the Foundation of the World Federation of Neurosurgical Societies (WFNS). Microsurgical techniques were refined using the new Zeiss Pico microscope and spine instruments (Fig. 4). Subsequently, a new bipolar set (with long-tipped bayonet forceps!) facilitated dissection and hemostasis for microsurgical procedures such as tumor resection. New, specialized instruments allowed for anterior cervical spine surgery



Fig. 4. Delivery of the World Federation of Neurosurgical Societies Zeiss Pico Microscope. June, 2010.



Fig. 6. Operating room nurses and anesthesia team. May 2012.



Fig. 5. C-arm. May 2011.



Fig. 7. Delivering spine textbooks from South Korea. September 2012.

and unilateral approaches. Prescott's Surgical Microscopes donated a camera for the Zeiss microscope which was critical for teaching the residents and the nurses. A high-speed drill from Aesculap, delivered in 2012, simplified foraminotomies, corpectomies, and disc space and bone graft site preparation. Unfortunately, the drill broke down frequently and is currently inoperative. Figs. 5 and 6 are pictures of the PMC operating room. Despite being unable to access North Korea since 2007, South Korean neurosurgeons provided textbooks to the Korean American team for deliver to the North in 2012 (Fig. 7).

In 2010, Dr. Kevin Yoo from San Diego joined the biannual trips to Pyongyang. Dr. Michael Yoon from Philadelphia joined the team in 2014 (Fig. 8). Through the leadership of Elizabeth Park, a Boston University medical student at the time, Korean American students began engaging with the students at PMC.



Fig. 8. Left to right. Medical Student Elizabeth Park and Dr. Michael Yoon with North Korean surgeons. September 2014.

These larger delegations allowed for the expansion of teaching activities to the Red Cross Hospital. In 2015, Dr. David Hong, a pediatric neurosurgeon, joined the team and began working with the neurosurgeons at the new Okryu Children's Hospital on pediatric cases such as dorsal rhizotomies and congenital spinal conditions (Fig. 9). Dr. Namhoon Park, an anesthesiologist from Las Vegas, played a critical role in the development of neurospine services by concurrently advancing the anesthesia services (Fig. 10). These are only a few of the many other doctors who have joined the team at one time or another and con-

tributed to the overall strengthening of the clinical services.

In 2015, Dr. Park, representing the WFNS, organized the Pyongyang International Neurosurgery Symposium with the DPRK Neurosurgery Association (Fig. 11). The symposium brought together 60 North Korean neurosurgeons with 12 international neurosurgeons to discuss topics ranging from damage control spine surgery (Gene Bolles, USA) to spine surgery in low-resource settings (Kee Park, USA), multilevel cervical spine surgery (Russell Andrews, USA) to neurotrauma in Pakistan (Tariq Khan, Pakistan), and spine surgery and neurosur-



Fig. 9. Dr. David Hong at the Okryu Children's Hospital. May 2015.



Fig. 10. Dr. Namhoon Park with the Chief of Anesthesia at the Red Cross Hospital. May 2017.



Fig. 11. Pyongyang International Neurosurgery Symposium. October 2015.

gery residency in the US (Kevin Yoo, USA). This symposium was the first time the neurosurgeons outside of Pyongyang were allowed to interact and share information vis-à-vis the conditions and capacity with the visitors. The North Koreans have expressed interest in organizing a second international symposium.

CERVICAL SURGERY

Prior to 2008, the neurosurgeons at the PMC performed laminectomies for most conditions and rarely attempted anterior approaches for cervical spine. Starting with simple cervical discectomy with iliac crest grafting, more complex techniques were introduced progressively. Fixation techniques such as anterior plate fixation were introduced using donated implants from South Korea (Medyssey, GS Medical, and L&K Biomed) and Synthes. As the supply of donated implants was not predictable, an Indian manufacturer was identified as a sustainable source of low-cost implants (Uma Surgical). Dr. Kevin Yoo introduced posterior cervical fixation techniques using a donated set from Synthes (Fig. 12). Recently, the North Koreans began using domestically manufactured titanium implants.

THORACOLUMBAR SURGERY

South Korean companies also provided the initial supply of pedicle screws, which facilitated posterior spine fixation (Fig. 13). In 2009, the North Korean neurosurgeons started with a single level spondylolisthesis case (Fig. 14). Once comfortable with pedicle screw placement, they were introduced to multi-level fixation followed by correction of kyphosis from delayed

treatment of spine fractures and infections. Similar to the development of cervical plates, the North Koreans are now manufacturing pedicle screws domestically, creating a sustainable source for implants.

CURRENT CAPACITY FOR SPINE SURGERY

The North Korean surgeons are now proficient at independently performing operations necessary to treat most spine pathologies including tumors, infections, degenerative conditions, and trauma. Significantly, they are able to locally manufacture essential spinal implants such as cervical plates and pedicle screws. The DPRK Ministry of Public Health, acknowledging the importance of the new spine services, has designated the PMC as a center of excellence for spine surgery, resulting in a surge of referrals from around the country. In an effort to improve these



Fig. 13. Dr. Kee B. Park delivering a donated pedicle screw set from Medyssey, October 2009.



Fig. 12. Dr. Kevin Yoo at the Pyongyang Medical College Hospital. June 2010.



Fig. 14. First pedicle screw fixation case at Pyongyang Medical College Hospital, October 2009.

services through research initiatives, the North Korean neurosurgeons are now collecting data to analyze epidemiological patterns and surgical outcomes. Discussion on collaborative research and subsequent publications with Korean American and DPRK neurosurgeons are underway. Moving forward, North Korean surgeons in Pyongyang, with the support of the Ministry of Public Health, plan to lead the expansion of spine services at the provincial level by taking advantage of their status as the main teaching facilities for the entire country.

CONCLUSION

A small group of individuals can make a difference in the advancement of subspecialty services, such as neurosurgery, in North Korea. Strengthening health systems and increasing neurosurgical capacity is possible in North Korea's highly centralized health system by developing specialty services at the tertiary centers in Pyongyang, which act as a lever for expansion of services to provincial hospitals. Much of the credit goes to the North Korean surgeons who drove the process by quickly adopting the experiences from the joint operations and pushing for domestic implant manufacturing. Further commendation goes to the officials at the Ministry of Public Health who approved the engagement and encouraged the surgeons by awarding them center of excellence status.

International collaboration can contribute significantly to



Fig. 15. Dr. Kee B. Park and Dr. Kevin Yoo with the Pyongyang Medical College neurosurgeons. May 2018.

strengthening subspecialty services such as neurospine surgery in North Korea. However, success requires unwavering commitment despite political challenges, patience in the face of communication limitations and unfamiliar settings, open-mindedness to think out of the box, and willingness to cultivate friendships in spite of political differences. The key was finding a common cause to battle against, i.e., disease and injury, and becoming one team in alleviating the suffering (Fig. 15). The hope is that North Korean surgeons' perspective of the collaboration will be published in *Neurospine* in the near future.