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The Aging Spine: China Facing Up to the Global Challenge

JUN ZOU, MD, PhD¹ AND HUILIN YANG, MD¹

¹Orthopedic Department, The First Affiliated Hospital of Soochow University, Suzhou, China

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The world is experiencing a shift in population distribution toward older ages, known as aging. Globally, there were 703 million persons aged 65 or over in 2019.¹ This figure will be doubled, accounting for 1.5 billion of the world's population by 2050.¹ While population aging started in high-income or industrious countries, two-thirds of the world's aging population will reside in low- and middle-income countries. Moreover, 1 in 3 older persons will live in Eastern and South-Eastern Asia in 2050. As populations age, the proportion of working age (25–64 years) and more senior (65+ years) persons is expected to rise. This drastic demographic shift presents enormous challenges to health and socio-economic systems in all countries.

The rapid aging of populations worldwide has changed the spectrum of orthopedics, especially in China, where the mass population only aggravates the problem. By the end of 2021, the National Bureau of Statistics revealed that more than 200 million people were aged 65 or older, accounting for 14.2% of the population.² Since 2000, China has stepped into the “aging society”: people aged 65 and older totaled over 88 million, accounting for 7% of the population.² Consequently, the acceleration of aging has led to the emergence of elderly spine diseases, which has brought severe challenges to treating spine-related conditions. For this reason, the Chinese spine community has proposed a series of coping strategies.

MILESTONES OF SPINE INTERNAL FIXATION

In the 1960s, physicians braced for the challenge of functional spine reconstruction while experiencing the evolution of fixation techniques, including spinous process plates, Harrington rods, and Luque rods. In the mid-1980s, health workers in Suzhou, China, started to explore the “key techniques of short-segment transpedicle reconstruction and standard operation” theory.

The theory was later widely utilized in clinical practice, ushering in a new, fast-growing era of spine surgery in China. However, with the drastic change in the aging society, osteoporosis aggravates spine degeneration and deformity. To cope with this conundrum, health professionals in China accumulated ample clinical experience during practice. At the same time, the emerging surgical methods and instruments increased the accuracy and safety of diagnosis and treatment of the spine by proposing “characteristic classification and corresponding orthopedic treatment techniques.” These developments in the diagnosis and treatment of spinal fixation and the innovation of internal fixation devices have given new solutions to the challenges of an aging spine.

TREATMENT OF OSTEOPOROTIC VERTEBRAL COMPRESSION FRACTURES

With the rapid aging population, osteoporosis has become a worldwide public health problem. Osteoporotic vertebral compression fracture (OVCF) is the most serious yet commonly found complication of osteoporosis. In 2002, Chinese physicians started to carry out minimally invasive treatment of OVCF, which featured Chinese characteristics, in synchronization with the international medical environment. The primary research of bone cement and filling materials, based on biomimetic structure and mechanical properties, has been thriving. This biomimetic approach has been applied for various applications, such as restoring defects with biological materials to achieve remineralization. Currently, the Osteoporosis Special Committee of the Chinese Rehabilitation Medical Association and many other societies have proposed comprehensive treatment strategies for osteoporosis, which have significantly reduced the incidence of OVCF and the rate of refractures, lifting the burden on families and the community.

NEW CONCEPT IN MINIMALLY INVASIVE SURGERY

China's spine surgery has made great advancements in the past 20 years. Traditional open surgery has gradually become minimally invasive. The concept and method of minimally invasive surgery have been under the microscope by more spine surgeons, from early microscopy to myriads of endoscopic techniques, including the utilization of thoracoscopy, percutaneous endoscopy, laparoscopy, microscopic endoscopy, and the progress in percutaneous vertebral kyphoplasty and percutaneous internal fixation techniques. The development of advanced fusion technology has made percutaneous pedicle screw, minimally invasive surgery-transforaminal lumbar interbody fusion, and other approaches standard and can be carried out in most hospitals. In addition, 3-dimensional printing, navigation, virtual reality, and robotics technology have been gradually applied in China's minimally invasive spine surgery field.

Correspondingly, the precision and safety of surgeries have been greatly improved. In coordination with minimally invasive treatment, precise management thinking has been constantly updated in China. For example, the concept of "enhanced recovery after surgery" in spine surgery has been well organized and implemented in the orthopedics community in China, effectively enhancing the postoperative rehabilitation of elderly patients with reduced complications.

ACCELERATED REGIONAL ACADEMIC EXCHANGES AND EDUCATION OPPORTUNITIES

China has the largest population in the world, and Asia is the most populous continent. The large

population base brings more challenges to spinal diseases. The spinal field in China is open to more frequent academic exchanges, education opportunities, and rapid development by the International Society for the Advancement of Spine Surgery and other global orthopedic organizations. Many primary spine surgeons can access the latest and most cutting-edge research and treatment concepts through academic organizations. The *International Journal of Spine Surgery* is indispensable in transmitting the spine community frontier, bringing forth a more professional and advanced scholarly communication and education platform for spine surgeons in China and Asia.

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Corresponding Author: Huilin Yang, Chairman of Orthopedic Department, The First Affiliated Hospital of Soochow University, No. 899 Pinghai Rd, Suzhou 215031, China; suzhouspine@163.com

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