ABSTRACT

Objective: To conduct cross-sectional study identifying the profile of the Brazilian spinal surgeon. Methods: Data were collected through a questionnaire with multiple alternatives during two major events for spine surgery at national level in 2011, the Congresso da Sociedade Brasileira de Coluna (Congress of the Brazilian Spine Society) and Simpósio Internacional de Coluna (International Spine Symposium, SINCOL). The data were submitted to statistical analysis comparing and stratifying the information obtained according to the profile. Results: We obtained 182 questionnaires answered by orthopedists and neurosurgeons with peculiarities and similarities on their medical management. Conclusions: The data obtained in this study may be important for the development of health policies in the spine surgery in Brazil.

Keywords: Spine; Orthopedics; Neurosurgery; Cross-sectional studies; Brazil.

INTRODUCTION

Spine surgery is a complex specialty that treats a wide variety of diseases, and which can be approached by several areas of medicine, such as orthopedics, rheumatology, and neurosurgery, among others.

Various epidemiological studies\(^1\)\(^-\)\(^3\) are continuously performed around the world to define the best therapeutic approaches and new lines of research. However, most studies are regional and relate to disease epidemiology alone without defining the geographical distribution of the surgeon and the surgical techniques performed.

After performing searches in the major scientific portals MEDLINE (via PubMed), LILACS, EMBASE (via Ovid), we encountered a national epidemiological study\(^4\) that sought to identify surgical techniques that have no longer been used in spinal surgery among Brazilian spine surgeons.

Nationally, no other study was found seeking to define the characteristics of the specialty and the spine surgeon. In Brazil there are about two thousand neurosurgeons registered in the Brazilian Society of Neurosurgery (SBN), and approximately 12,500 orthopedists in the Brazilian Society of Orthopedics and Traumatology (SBOT), divided into various sectors within their specialties. The Brazilian Spine Society (SBC) had 730 members at this time.

Due to the complexity of this specialty, there is an imminent need to collect and interpret information regarding the activity of surgeons to trace the characteristic profile of the Brazilian spine surgeon, in order to effectively plan the application of resources for the health sector, academia, and the professional sector.

METHODS

Data were collected through multiple choice questionnaires in two events relevant to spine surgery in 2011, the SBC Congress and the SINCOL.

The above events were selected in order to achieve similar representation from the number of neurosurgeons and orthopedists who work in the field of spine surgery, given that the SINCOL is organized primarily by neurosurgeons and the Brazilian Spine Congress by orthopedists.

The questionnaires were administrated individually and voluntarily among others.
answered during lectures, and collected at the end. There were 23 simple and straightforward questions based on the everyday work of the spine surgeon.

After collection, the data were statistically analyzed, and the information was compared and stratified according to the profile found.

STATISTICAL ANALYSIS

The characteristics evaluated in the spine surgeons were described using absolute and relative frequencies.

Each characteristic evaluated was described according to physician’s specialty and the existence of an association between the specialty and characteristics was determined using the chi-square test or Fisher’s exact test or the likelihood ratio test when it was not possible to apply the chi-square test.

RESULTS

One hundred eighty-two questionnaires were completed by spine surgeons during the two events and significant associations were observed in some respects. The various characteristics evaluated are shown below after the analysis and correlation of data.

Of the surgeons who answered the question about their specialty, 74.7% are orthopedists, 24.7% are neurosurgeons, and 0.5% reported no specialty.

Concerning geographical distribution, the Southeast had the highest concentration of surgeons; the state of São Paulo had the highest rate of participation, at 36.3%. (Figure 1)

The number of young spine surgeons is significantly higher among orthopedists, contrary to what was observed in the group of neurosurgeons. (Figures 2 and 3)

Surgeons have a diverse profile regarding the distribution of the workplace locations. (Figure 4) A percentage of doctors work in philanthropic associations that were classified as other workplaces.

Professionals working in polytrauma centers totaled 68.1%, 30.2% do not see such patients and 1.6% did not answer.

Surgeons were asked whether they subscribe to any scientific journal, 73.6% subscribe, 18.1% do not subscribe, and 8.2% did not answer.

Orthopedists publish most papers in the Brazilian Journal of Orthopaedics (RBO) and the Coluna/Columna Journal, while neurosurgeons publish in PUBMED and LILACS. (Figure 5)

The percentage of surgeries performed by surgeons in the Unified Health System (SUS) is 34.41%, and 26.62% are performed in the private sector, which is less than the number of procedures performed through health insurance plans, which is 38.97%. (Figure 6)

The number of surgeries performed per week, such as degenerative, minimally invasive spine surgery (MISS), tumors, deformity, trauma, and osteotomies, was similar among surgeons. Orthopedists had the highest number of surgeries performed on deformities, 87.7%, with $p < 0.001$.

The most commonly used classification of deformities was that of Lenke et al., but almost the same proportion use Moe, King and Moe, and Lenke et al., with no difference among surgeons, as shown in Figure 7.

Concerning the type of instrument used, 67.6% of surgeons use pedicle screws with the derotation technique, 1.6% use sublaminar wire loop fixation with rods, 30.8% use pedicle screws with the translation technique, 6% use a hybrid system, 1.1% use other instrumentation, and 32.1% did not answer. Percentages exceed 100% because some surgeons use more than one technique. The technique with posterior instrumental suture loop fixation was only used by orthopedists.
61.9% of orthopedists use it in idiopathic scoliosis, but only 34.3% use it for neuromuscular scoliosis. Thirty-six point one percent of neurosurgeons use it for tumors, while only 19.4% of orthopedists do, with \( p < 0.034^* \) in the chi-square test. Sixty-two point four percent of professionals do not use monitoring in surgery.

Regarding the application of magnetic resonance imaging, in adolescent idiopathic scoliosis with typical curves, orthopedists request it in 37.4% of cases while neurosurgeons do in 58.3%. (Figure 8)

Concerning the classification of cervical and thoracolumbar fractures, most surgeons use only the AO method\(^ {8-10} \), 78.6% in the cervical region and 89.1% in the thoracolumbar region. Orthopedists tend to complement with other classifications, such as Louis,\(^ {11} \) Denis,\(^ {12} \) and Harms,\(^ {13} \) SLICS (The Sub-axial Cervical Spine Injury Classification System) and TLICS (Thoracolumbar Injury Classification and Severity Score)\(^ {14} \) and especially Allen et al.\(^ {15} \) with \( p < 0.002^* \). (Figure 9)

Regarding the use of MRI in trauma without neurological deficit, 63.7% request resonance, 31.3% do not, and 4.9% did not answer.

Concerning the treatment of cervical dislocation, the anterior approach alone without the use of traction had the highest percentage of use, with 34.6%, while 12.6% use an anterior and posterior approach without traction. 15.4% use the posterior approach with traction, 9.9% use the posterior approach alone without traction, 12.6% use the anterior approach with traction, 4.9% use the anterior and posterior approach with traction, and 9.9% did not answer. Figure 10 illustrates the methods of treatment in relation to type of access and use of traction.

Figure 5. Number of publications in scientific journals.

Figure 6. Percentage of surgeries performed in the SUS, through health insurance plans, and in private institutions.

Figure 7. Classification of deformities.

Regarding the use of traction in severe scoliotic deformities, 18.7% use traction, 69.2% do not use it, and 12.1% did not answer. Concerning the approach used in severe scoliosis, 26.9% use an anterior and posterior approach in two surgical times, 36.8% use a posterior approach plus osteotomies, 8.2% use an anterior and posterior approach at the same time, 12.1% do not use an anterior approach or osteotomies and 15.9% did not answer, with \( p < 0.02^* \).

Respecting the use of intraoperative monitoring for deformities,
In regards to classifications of spinal cord metastases, 31.9% use the Enneking classification, 54.9% use the Tomita classification, 9.3% use other classifications, 18.1% do not and 5.5% did not answer, with $p < 0.001^*$ for the physicians that use Enneking classification and those that do not use spinal tumor classifications. (Figure 11)

The autologous graft is the most used in spinal arthrodesis, with 81.9% using an autograft, 11% using a BMP graft, 1.1% using a graft from bone bank, 1.1% not using grafts, 1.1% using BMP alone and 3.8% did not answer. (Figure 12)

Respecting the technique used in osteoporotic fractures, 47.8% perform vertebroplasty, 47.8% use kyphoplasty, 25.8% use arthrodesis with a posterior approach, 3.3% use the cage, and 6% did not answer. Regarding reinforcement with cement of posterior arthrodesis with pedicle screws in osteoporotic fractures, 83 (45.6%) use it, 87 (47.8%) do not, and 12 (6.6%) did not answer. (Figure 13) Navigation in spinal surgery is used by 22%, 75.3% do not use it, and 2.7% did not answer.

**DISCUSSION**

The research results should be analyzed considering the sample size and methodology. Thus we can define the profile of the professional who operates in spine surgery in Brazil.

Regarding the profile of the surgeon and their regionalization of performance, there are no differences between specialties, but we note that the largest number of surgeons operate respectively in the Southeast and South regions of Brazil, probably because they are the regions with the highest physician to inhabitant ratio.19

Concerning the age of the surgeons, the number of young spine surgeons is proportionally significantly higher among orthopedists, contrary to what is observed in the group of neurosurgeons. In addition, interest in the medical and scientific improvement is higher among younger spine surgery professionals, seeing that they subscribe to and produce more periodicals and papers.

Due to the Brazilian health policy and its recent history,20 with diminishing incentives to the public service provider and the public service sector with low wages, poor working conditions, and excessive increase in the number of health insurance plans, we note that despite spine surgeons in Brazil working in the SUS, in private clinics and through health insurance plans, the largest percentage of surgeries are performed through health insurance plans.

There are no previous data on what types of surgeries are performed by orthopedists and neurosurgeons. Due to the history of development of spinal surgery for deformities, orthopedists still perform this procedure more often than neurosurgeons, considering that the vast majority of publications on this subject are conducted by orthopedists.5-7,21-29

Several studies21,25 on the reproducibility of the Lenke and King classifications of deformities have been performed, highlighting the complexity and lack of awareness of the Lenke classification. The King classification has good reproducibility, but is limited because it only evaluates the coronal plane. In our study, the Lenke classification is more often used for deformities, almost in the same proportion of those who use the two classifications, King and Lenke, with no difference among surgeons. Moreover, although there is no consensus on the best instrumentation and correction technique,23,24 the technique with posterior instrumentation and suture loop fixation25 is used only among orthopedists, perhaps because deformities have been treated for many decades by these surgeons.

The use of traction in deformities is not routine in the surgeon’s...
daily practice, but in more severe deformities, it becomes necessary.26 Although there is no consensus in the literature regarding the best surgical approach due to the variety of deformities,27,28 most surgeons use the anterior and posterior approach in two surgical times, or the posterior approach with use of osteotomies.

Puertas et al.29 reported results that suggest that intraoperative monitoring with somatosensory evoked potential is effective in preventing neurological injury in corrective surgery for rigid curves in idiopathic scoliosis. In those times, motor potential was not used. In our study, most orthopedists use sensory and motor evoked potential for intraoperative monitoring of deformities, except in neuromuscular scoliosis.

The role of intraoperative monitoring in spinal tumors has not been well defined,30,31 but most Brazilians neurosurgeons use it in their surgeries. The routine use of monitoring is still a challenge as regards the availability and heterogeneous structure of our country. It is a resource that is not available throughout the country due to the small number of trained professionals and its high cost, and so it is not so used by a large portion of physicians.

The request for magnetic resonance imaging has not yet reached a consensus among surgeons. Unlike neurosurgeons, orthopedists tend not to request such examination for typical curves, although there is evidence of up to 10% intra-channel changes in idiopathic scoliosis with typical curves.32 Freitas et al.33 published a study showing the presence of 14.5% of syringomyelia on MRI in patients with scoliosis that was considered to be idiopathic.

Several studies34-36 were conducted to define the reproducibility of cervical and thoracolumbar fracture classifications. Most neurosurgeons use only the AO method, while orthopedists tend to complement it with other classifications such as the Denis, Harms, SLICS, TLICS, and especially Allen-Ferguson.

Some authors38 have suggested that with the exception of patients with a neurologic deficit, MRI is not useful for finding unstable injuries in the spines of patients that are conscious or already have a normal tomography. However, there are data in the literature reporting additional injuries that radiographs and CT scans are not able to demonstrate, so most surgeons choose to request MRI in the presence of a cervical dislocation without neurosurgical deficit.

There is a wide variety of opinions regarding the approach and use of traction for the treatment of cervical trauma,39 but surgeons prefer management with the use of the anterior approach alone without traction, probably because it is the simplest approach. A trend towards the use of the Tomita and Enneking classifications for vertebral tumors by orthopedists and only the Tomita classification by neurosurgeons was observed. Though there is not much evidence40 for comparing the reproducibility of spinal tumor classifications, perhaps it will be possible to obtain a more reliable and reproducible classification with more comparative studies.

One of the goals of the spine surgeon is to be able to perform good spinal fusion. There are several studies41,42 comparing the efficacy of grafts, but because of their osteogenic, osteoinductive, and osteoconductive properties, the graft is still the best option and the preferred choice of the Brazilian surgeon.

Vertebral and kyphoplasty are safe43 techniques that are widely used by national surgeons in osteoporotic fractures. Our study showed that the use of cementation in the posterior approach as reinforcement for instrumentation44 is still not preferred by spine surgeons, but may be an option for avoiding an anterior approach. Neuronavigation is not yet widespread in our environment due to its high cost and low availability, though it can assist in the surgical planning of difficult to access tumors, as has been demonstrated by some authors.45

CONCLUSION

The spine surgery is a complex specialty that treats a variety of diseases, so it is important to know the specifics among Brazilian spine surgeons independently from their specialty.

This study shows the profile of the professionals who work in spine surgery in Brazil with the aim of serving as a source of data for the development of health programs and performance improvements in this field of work in Brazil.

All authors declare no potential conflict of interest concerning this article.

REFERENCES


