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Spinal surgery and neurosurgeon: Quo vadis?

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The aim of this review was to point out some critical points in spinal surgery. We present a good idea dealing with the subspecialisation in neurosurgery. Spine surgery is a good and especially timely example for it. The technical progress in the discipline of spinal surgery since the catalytic advances of diagnostic imaging, our understanding of spinal biomechanics and bone growth physiology, and the development of spinal fixation instrumentation have allowed exponential growth in this field. As a result, there is an increasing interest in spinal surgery. In this paper, a Medline review of the literature was performed from 2000 to the present regarding spinal surgery. Today, there is an emerging field of "spine surgery" that incorporates both neurosurgery and orthopedic surgery. In the future, it is possible that there may be a well-defined medical specialty of "spine specialists" defined by its own board certification. This is not currently the case. In this paper, it was concluded that productive collegiality between neurosurgeon and orthopedic surgeon is necessary for the advancement of spine care. This could be to build an own specialisation of spinal surgery. But for that this speciality needs his own and common research, not a part done by neurosurgeons and one by orthopedic surgeons.

KEY WORDS: Spine - Neurosurgical procedures - Orthopedics.

Spinal surgery generally offers the patient a life-threatening procedure for a non-life threatening condition. At present, neurosurgical practice is confronted by an explosion of technology and spinal surgery has advanced from decompression procedures to complex spinal reconstruction and internal stabilization within the last 25 years, as a result of a broad-based technological boom that began in the 1970s with the advent of spinal computerized tomography (CT), and magnetic resonance imaging (MRI). Advancements in MR technology may be more sensitive and specific to particular tissue disruption and may assist in prognosticating the nature of a spinal disorder. In one hand, there has been an explosion of surgical and commercial interest in widely varying methods of instrumented fusion. In the other hand, there is a potential for abuse as well as a benefit in offering these services. The aim of present study is to point out some critical points in current situation of spinal surgery such as effect of competent surgeon, competition between neurosurgeon and ortopedic surgeon.

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Materials and methods

The technical progress in the discipline of spinal surgery since the catalytic advances of diagnostic imaging, our understanding of spinal biomechanics and bone growth physiology, and the development of spinal fixation instrumentation have allowed exponential growth in this field. As a result, there is an increasing interest in spinal surgery. In this paper, a

Medline review of the literature was performed from 2000 to the present regarding spinal surgery.

Results

This is the first time that current status of spinal surgery has been studied. Today, there is an emerging field of "spine surgery" that incorporates both neurosurgery and orthopedic surgery. In the future, it is possible that there may be a well-defined medical specialty of "spine specialists" defined by its own board certification. This is not currently the case.

Discussion

Major surgery is often conducted without an adequate scientific basis for making a reasonably accurate estimate of the likely outcomes. This is clearly the case for some degenerative conditions of the spine, because significant variations in the treatment of many spinal conditions exist between neurosurgeon and orthopedic surgeon. Although these variations are well known, potential explanations for this variation have not been fully evaluated. Careful handling of nerve tissue which will ultimately reduce postoperative scarring and reduce the chances of intraoperative tissue damage are more likely for the individual who is well versed in the use of microinstruments techniques and visualization with illumination. Most spine surgeons now agree that the use of high powered magnification either through a microscope or special magnifying glasses is essential for handling tissue around the spine.

A renaissance in spinal surgery began, spurred on by the visualization of spinal disorders provided by CT and MR imaging and rapid technological advancements of the last two decades have made minimal access surgery possible. Virtually, all aspects of the spinal axis can be approached and treated in a minimally invasive approach. Core to the concept of minimally invasive surgery is the reduction of iatrogenically induced injury while achieving the goals of the surgery. Today, there is a trend toward minimization in spinal surgical procedures, including percutaneous discectomy, intradiscal electrothermal coagulation, percutaneous fusion, vertebroplasty, kyphoplasty, discography. Endoscopic procedures on the spine that include the use of video-assisted high-resolution cameras to visualize surgical anatomy are being performed now with more frequency; these include procedures for thoracoscopic sympathectomy, thoracic discectomy, interbody fusion, tumor resection, and deformity corrections,[3, 4]but the use of new technology will require a new learning curve that may be discomforting for many surgeons. Special skills may be needed that are beyond those of traditional open surgery.[5] Technical improvements in endoscopy have had a major effect in the practice of minimally invasive surgery.[6] There is also currently little longitudinal long-term data on procedures of minimally invasive spine surgery to document their efficacy, indications, limitations or complications as compared to standard open techniques. Further complicating such direct comparisons is that widely used spine outcomes instruments often do not capture the relative benefits of these new procedures.[7]

The need for specialization

At the beginning of this century, neurosurgery was, like plastic surgery, in its infancy as a surgical specialty. With the exception of a few general surgeons who had acquired a special interest and expertise in neurosurgery, most of the operations were being preformed by general surgeons under the direction of neurologists.[8] By examining the history of neurosurgery, and orthopedic surgery during their early years as independent specialties, it is important to remember that the emergence of these fields as independent fields of surgery came much later in history than did their presence and importance to surgery itself. Stated otherwise, these fields traditionally were within the purview of the general surgeon or physician, long before they emerged as specialties in themselves.[8] This was caught Cushing, the leading neurosurgeon of his time, at the peak of his career. Having trained as a general surgeon with Halsted, he had been appointed as surgeon-in chief of the Peter Bent Brigham Hospital, where his efforts continued the development of modern neurosurgery. His work on spine remains largely unknown.[9] In previous years, most orthopaedic and neurosurgeons would do an occasional spine operation but it is now becoming an acceptable practice for spine surgery to be the preserve of those who have a special interest. Neurosurgeons are known for delicate work and specifically for protecting the nervous system and avoiding injury to these critical structures.

Subspecialization in neurosurgery has been increasing for years.[10-12] The first such subdivision was established within the American Associaiton Neurological Surgeons (AANS) in 1978,[13] when Albert Rhoton suggested the idea to Dr Charles Drake, who was president of the organization.[14] The scientific evaluation of outcomes for spine surgery has not kept up with the changes in operative techniques.[15] Spinal surgery has expanded with the innovation and evolution of approaches, techniques, and biomechanics as an integral and major part of neurosurgical training.[16-19]

It is clear that to be effective spine surgery must address some basic rules:

1. adequate decompression of compromised nerve elements: to achieve this, competent surgeon and sufficient surgery are important issues;

2. spine stabilization must utilize the least invasive and most effective surgical techniques available and the spinal surgery must avoid the creation of additional patient problems in the future: To do this, spinal balance is important. We think that this is a key factor for every spine surgeon. Balance is absolutely critical in spine surgery. The delineation between good and excellent surgery may depend on how well the surgeon balances the spine during the reconstruction. Significant skill is necessary to recreate spinal balance. Although various techniques may seem "state-of-the-art" or "minimally invasive" any technique which does not attempt to recreate normal spinal balance may have long lasting negative or adverse results on the patient's spine "health".

Spinal surgery should be independent from neurosurgery and orthopedic surgery

For spinal surgery, when patients are contemplating surgery, it is not uncommon for them to ask their neurosurgeon how many operations he or she has done. Neurosurgeons typically answer these queries with honest estimates but in reality have few precise data to cite. This database may enable other neurosurgeons to refine their estimates if their practice patterns are similar. At the present time, most of the spine surgery is carried out by orthopaedic surgeons or neurosurgeons who besides having a general practice take an interest in the spine. There is no agreed minimum limit but competence is maintained by continued surgical practice. Some studies indicate that the therapeutic success rate of a given operation may well correlate with the case volume and experience of a given surgeon and/or hospital.[20, 21] Surgical training has supported more subspecialization in spinal surgery, both for neurosurgeons and orthopedic surgeons.[22, 23] Subdivision may improve outcome for patients. Standardized training and operator's certification reduces the risk of complications.[24] The purely mechanistic research in spinal surgery could be the development of functional classification.[25] Presently in Turkey, there is no national standard for the formal certification of a spinal surgeon. Specialty designation as a neurosurgeon or orthopedic surgeon, with or without additional fellowship training, is generally considered to be acceptable, but it seems that there is a competion for spinal surgery. With advances in surgical technology, surgical decisions become even more complex.[23] Thus, the use of surgical resources may be influenced more by surgeon factors such as surgical training and volume than by clinical factors.[26] It is because neurosurgeons and orthopedic surgeons have different training experiences that decision-making surrounding spinal surgery is varied.[27-30] It is, therefore, not surprising that neurosurgeons perform mostly decompressions whereas orthopedic surgeons perform more fusions.[23]

Importance of sufficient surgery

For decades, lumbar discectomy has been one of the most common surgical practices performed by neurosurgeons. Although it has proved to be an effective and safe surgical procedure, life threatening complications may occur in rare cases.[31] There has been long debate about how much disc material should be removed in a patient who has a disc protrusion. A consensus is developing that only the loose fragmented material needs to be removed, along with any other loose fragments within the disc space. The surgeon is operating through a deep hole and cannot visualize the center of the disc space. Loose fragments are extracted by rongeurs and sometimes by a blunt curette. Previously, surgeons would remove large amounts of disc material from within the disc space to avoid a recurrence, but this is now considered unnecessary. It is a balance of clinical judgement as to how much or how little material should be removed and there are as yet no absolute guide lines. When carrying out a discec-

tomy, the symptomatic lesion is usually at one level. Not uncommonly, imaging will show protrusion at perhaps two levels, and there is then a dilemma about which one is symptomatic. The surgeon usually operates at the level which is compatible with the clinical features of the nerve root involved. It is good practice to limit the spinal surgery to as little as possible compatible with the clinical features.[32] Clinical success in the treatment of spinal disorders has traditionally been measured in terms of mortality, physiological changes (*e.g.*, nerve conduction), or improvement in physical findings (e.g., weakness). More recently, outcome measures have been introduced that take into account the patients self-report of their physical function and health.[33] In spinal stenosis, if stenosis is most significant and decompressive surgery is too extensive, it runs the risk of the development of postoperative scar tissue causing further stenosis and also the risk of instability and postoperative back pain. However, if the decompression is too limited, the nerve roots may not be adequately decompressed. In addition, bony ridges can develop postoperatively, tightening up the canal again. Thus, the experience and competence of the surgeon is a very important factor to consider in any outcome study of surgery including spine surgery. It is a truism that, with new evolving surgical techniques, surgeons will become more competent at performing these surgeries as they accumulate experience. In discussing the importance of experience and competence in performing surgery, it can be reminded of a quote by Einstein which further reinforces the importance of experience in any scientific endeavor: "Knowledge is experience".

What can we do?

Technological advances have resulted in advances in spinal surgery.[34] It is inevitable and unfortunate that mistakes will occasionally be made and only careful attention to detail in the preoperative assessment, meticulous surgical care and supervised postoperative management will ensure consistently good results, and spine surgeons should have an understanding of basic concepts of outcome measurement and be able to select appropriate questionnaires and incorporate them into their clinical practices and research. In the long term, most spinal conditions have a good natural history but disability can be protracted with conservative management, so the spinal surgeon needs to remain up-to-date, be disciplined with a systematic and careful approach and lead a coordinated team to maintain the highest standards. The personal supervision of the spinal surgeon who leads a co-ordinated team of dinicians, nurses and physiotherapists will ensure the best results. If a neurosurgeon is doing an operation that extensively involves bone, joint or the possibility of fusion, then an orthopedist may be involved as well.[32] Perhaps the most exciting news to report is that there is a terrific, productive collegiality developing between orthopedic surgeons and neurosurgeons who wish to devote their careers to the advancement of spine care. As an example of new methods in spinal surgery could be the example of Wallis with different viewpoints of neurosurgeons and orthopedic surgeons.[35] In Turkey, some national scientific spinal organizations now open their doors to physicians from both specialties. We no longer look at each other as competitors, rather, we look at each other as colleague with the same interests. The old walls separating these two specialties should be broken down by the shared goal of advancing the field of spine care. Because, as all neuro and ortopedic surgeon know, spinal surgery, in general, is continuing to experience an explosion of evolving new technologies where surgeons must embrace a learning curve to achieve mastery of the new procedure or surgical tool or implant. In addition, patients are demanding better treatments which support the development and implementation of new technologies. Patients are also living longer with increased comorbidities, which can increase operative and perioperative risks. Both of these facts help to explain why new technology is being introduced more rapidly, why cooperation is necessary between two specialties.

Conclusions

With the advent of new techniques for treating spine disease, the discipline of spine surgery has grown rapidly. The well trained spine surgeon will also have at his or her disposal a complete array of techniques which can be individualized to patients so though things were different many years ago, today there are a large number of both orthopedic surgeons and neurosurgeons who specialize in spine surgery. Although the benefits of surgery can be considerable, there are often potential surgical complications so spinal surgery may be accepted as

technically difficult, demanding a high level of surgical skill.[32] This review shows that although surgeon-specific factors such as background may play a role in decision making, the importance of these factors depend on the specific clinical scenarios. Further efforts should be directed toward the study of clinical outcomes for patients with similar conditions treated by different surgical and nonsurgical approaches, and a more uniform education of spine surgeons regarding available information.

We present a good idea dealing with the subspecialisation in neurosurgery. An appreciation of history allows us to understand where we are today, to respect and realize our indebtedness to the contributions of those who preceded us, and to appreciate with insight our goals and aspirations for the future. Spine surgery is a good and especially timely example for it. This could be to build an own specialisation of spinal surgery. But for that this speciality needs his own and common research, not a part done by neurosurgeons and one by orthopedic surgeons.

References

1. Kanat A, Epstein CR. Challenges to neurosurgical professionalism. Clin Neurol Neurosurg 2010;112:839-43.
2. Kanat A, Yazar U, Kazdal H, Yilmaz A, Musluman M. Neurosurgery is a profession. Neurol Neurochir Pol 2009;43:286-8.
3. 3. Kim DH, Jaikumar S, Kam AC. Minimally invasive spine instrumentation. Neurosurgery 2002;51:15-25.
4. 4. Regan JJ, Yuan H, McAfee PC. Laparoscopic fusion of the lumbar spine: minimally invasive spine surgery. A prospective multicenter study evaluating open and laproscopic lumbar fusion. Spine 1999;24:402-11.
5. Thongtrangan I, Le H, Park J, Kim DH. Minimally invasive spinal surgery: a historical perspective. Neurosurg Focus 2004;16:Article 13.
6. Sasani M, Fahir Ozer A, Oktenoglu T, Kaner T, Solmaz B, Canbulat N, Ercelen O. Thoracoscopic surgery for thoracic disc herniation. J Neurosurg Sci 2011;55:391-5.
7. Gerszten PC Welch WC. Spine: minimally invasive techniques. Peog Neurol Surg 2006;19:135-51.
8. Reath DB. Why am I here? J Trauma 2000;49:171-6.
9. Bydon A, Dasenbrock HH, Pendleton C, McGirt MJ, Gokaslan ZL, Quinones-Hinojosa A. Harvey Cushing, the spine surgeon: the surgical treatment of Pott's disease. Spine (Phila Pa 1976) 2001;1;36:1420-5.
10. Couldwell WT, Rovit RL. Rethinking neurosurgical subspecialization. Surg Neurol 2002;58:359-70.
11. Lee CN, Daley JM. Provider volume and clinical outcomes in surgery: issues and implications. Bull Am Coll Surg 2002;87:21-6.
12. Tindall GT. Trends in neurosurgery. J Neurosurg 1989;71:471-80.
13. Naderi S, Senoglu M, Kiran S. The effect of establishing the spine surgery section within the Turkish Neurological Society on the number and quality of the spinal papers presented at the annual meeting of Turkish Neurological Society. Turk Neurosurg 2003;13:1-4. Kanat A, Kayaci S, Yazar U, Sahin Y, Yaman O, Guvercin AR. One of the giants of neurological surgery left us more than a decade ago, and neurosurgical literature did not show much interest. Neurol Neurochir Pol 2011;45:63-7.
14. Gibson JN, Grant IC, Waddell G. The Cochrane review of surgery for lumbar disc prolapse and degenerative lumbar spondylosis. Spine 1999;24:1820-32.
15. Perot PL Jr, Munro DD. Transthoracic removal of midline disc protrusions causing spinal cord compression. J Neurosurg 1969;31:452-8.
16. Larson SJ, Holst RA, Hemmy DC, Sances A Jr. Lateral extracavitary approach to traumatic lesions of the thoracic and lumbar spine. J Neurosurg 1976;45:628-37.
17. Menezes AH, VanGilder JC, Graf CJ, McDonnell DE. Craniocervical abnormalities. A comprehensive surgical approach. J Neurosurg 1980;53:444-55.
18. McDonnell DE, Harrison SJ. Lateral approach to the craniocervical complex. Techn Neurosurg 1997;4:306-18.
19. Birkmeyer JD, Siewers AE, Finlayson EV, Stukel TA, Lucas FL, Batista I *et al*. Hospital volume and surgical mortality in the United States. N Engl J Med 2002;346:1128-37.
20. Gowan JA, Dimick JB, Leveque JC, Thompson BG, Upchurch GR, Hoff JT. The impact of provider volume on mortality after intracranial tumor resection. Neurosurgery 2002;52:48-54.
21. Toyota BD. The impact of subspecialization on postgraduate medical education in neurosurgery. Surg Neurol 2005;64:383-6.
22. Bederman SS, Kreder HJ, Weller I, Finkelstein JA, Ford MH, Yee AJ. The who, what and when of surgery for the degenerative lumbar spine: a population-based study of surgeon factors, surgical procedures, recent trends and reoperation rates. Can J Surg 2009;52:283-90.
23. Samaniego EA, Dabus G, Linfante: avoiding complications in neurosurgical interventional procedures. J Neurosurg Sci 2011;55:71-80.
24. Schaller B, Kruschat T, Schmidt H, Brück W, Buchfelder M, Ludwig HC. Intradural, extramedullary spinal sarcoidosis: report of a rare case and review of the literature. Spine J 2006;6:204-10.
25. Jain N, Pietrobon R, Guller U, Shankar A, Ahluwalia AS, Higgins LD. Effect of provider volume on resource utilization for surgical procedures of the knee. Knee Surg Sports Traumatol Arthrosc 2005;13:302-12.
26. Drew B, Bhandari M, Orr D, Reddy K, Dunlop RB. Surgical preference in anterior cervical discectomy: a national survey of Canadian spine surgeons. J Spinal Disord Tech 2002;15:454-7.
27. Grauer JN, Vaccaro AR, Beiner JM, Kwon BK, Hilibrand AS, Harrop JS *et al*. Similarities and differences in the treatment of spine trauma between surgical specialties and location of practice. Spine 2004;29:685-96.
28. Irwin ZN, Hilibrand A, Gustavel M, McLain R, Shaffer W, Myers M *et al*. Variation in surgical decision making for degenerative spinal disorders. Part I: lumbar spine. Spine 2005;30:2208-13.
29. Rampersaud YR, Fisher C, Wilsey J, Arnold P, Anand N, Bono CM *et al*. Agreement between orthopedic surgeons and neurosurgeons regarding a new algorithm for the treatment of thoracolumbar injuries: a multicenter reliability study. J Spinal Disord Tech 2006;19:477-82.
30. Balak N, Demirkesen O, Efendioglu M, Bolukbasi FH, Basaran R, Onoz M *et al*. Diagnostic approach to reveal retroperitoneal injury during lumbar discectomy. J Neurosurg Sci 2010;54:129-33.
31. Porter RW. Spinal surgery and alleged medical negligence. Surg Edinb 1997;42:376-80.
32. Utku S, Baysal H, Zileli M. Spine surgery database: a Turkish registry for spinal disorders. Turk Neurosurg 2010;20:223-30.
33. Arslantas A, Naderi S. The contribution of Turkish neurosurgeons to spine surgery literature. Turk Neurosurg 2005;15:45-51.
34. Sandu N, Schaller B, Arasho B, Orabi M. Wallis interspinous implantation to treat degenerative spinal disease: description of the method and case series. Expert Rev Neurother 2011;11:799-807.

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