Pursuing Excellence in Neurosurgical Innovation

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Neurosurgeons continue to strive to lead in innovation while maintaining a standard of excellence because of their instinctive tendency for better and more efficient patient care. Involving neurosurgeons in the research and development of innovative procedures and tools makes perfect sense because their knowledge of neuroanatomy and neuropathology gives them unique insight to foresee possible problems and solutions. This article describes key points for neurosurgeons who choose to be at the forefront of technological advances to follow.

KEYS TO EXCELLENT INNOVATION

First, it is imperative that neurosurgeon-innovators be willing to learn from others, both those within their own and those in a separate specialty. Ideas for innovation often come from technologies that may exist for other disciplines of medicine or outside medicine altogether.

Second, although new skill sets may be obtained by learning from those outside the field, once the neurosurgeon has decided to become an innovator, he or she should strive toward becoming an expert in the field. Possession of the skills to use an instrument or new technology does not necessarily mean that one understands the indications for its use. Therefore, it is crucial not only to gain expertise in the technical aspects of the specialty but also to master the theory and treatment paradigms. In other words, the neurosurgeon should learn a new skill set as well as master it. The neurosurgeon should innovate and become a leader.

Finally, excellent innovation does not happen in a vacuum. Even if one masters a specific subspecialty and spends hours at the drawing board, one will always fall short if one fails to include support staff in these endeavors. Innovators must surround themselves with brilliant individuals to make up for their shortcomings or areas of ignorance. For example, collaborators at the Toshiba Stroke Research Center are integral in contributing to neuroendovascular innovation at our institution, the University at Buffalo. This center is an example of a true multidisciplinary partnership that includes specialists in basic science, radiation physics, biomedical and aerospace engineering, polymer chemistry, neuroradiology, neurology, and neurosurgery to further innovation for the treatment of intracranial pathological conditions.

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KEYS TO SUCCESSFUL INNOVATION

When inventing new products or improving old technologies, an innovator needs to answer 3 key questions: What do users need? What are the limits of current technology? And is the product marketable?

What Do Users Need?

Although innovators may have the ability to develop devices or tools with innumerable bells and whistles, consideration must be given to whether these products actually improve patient care and whether the technology is relevant with a true indication for use. Furthermore, it is not necessary to reinvent the wheel. For example, the neurosurgical management of epidural hematomas is well established, safe, and effective. There is little need for innovation for the treatment of this condition. However, many relatively new and/or rapidly evolving subspecialties in neurosurgery such as neuroendovascular surgery and spine and functional neurosurgery lend themselves naturally to innovation. In addition, within these subspecialties, new or immature technology exists. For these reasons, users will continue to desire to make treatment more effective, efficient, and safe. This is a breeding ground for innovation. For example, consider flow-diversion devices for the treatment of intracranial aneurysms. Flow diversion is a technology that was born out of treatment for peripheral vascular aneurysms and, preliminarily, has been very successful for intracranial aneurysms that are difficult or impossible to treat by conventional means (Figure).[1]

What Are the Limits of Current Technology?

Keep in mind that technology does not refer only to the limits of medical or neurosurgical technology. One must consider possible neurosurgical applications from everyday technologies. Ideas can come from outside the medical industry. In addition, innovation does not necessarily have to be complicated. One should consider simple concepts from other technology-driven industries when trying to innovate.

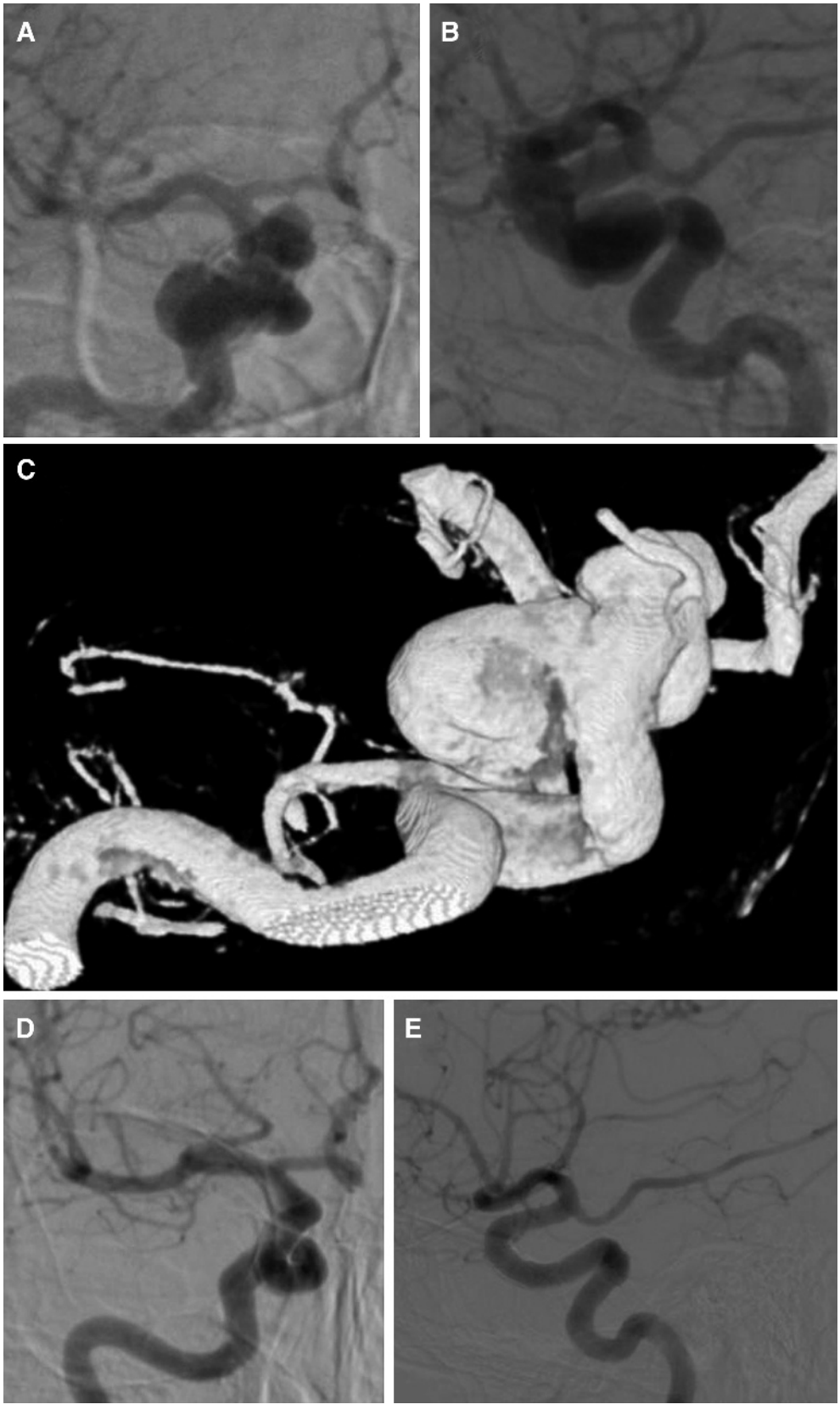

FIGURE. A, 62-year-old woman presented with thromboembolic symptoms related to this right internal carotid artery aneurysm. The aneurysm was treated with the Pipeline embolization device (Covidien Vascular Therapies, Mansfield, Massachusetts) for flow diversion. A, anteroposterior; and B, lateral 2-dimensional angiographic images. C, 3-dimensional angiographic image. D, anteroposterior; and E, lateral 2-month follow-up angiographic images.

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Is the Product Marketable?

Finally, medical innovation must be viable in the marketplace. Devices and technology should be reproducible, simple enough to be used by all operators, amenable to widespread production, safe, and effective.

MAKING INNOVATION A REALITY AND MAINTAINING AN OPEN RELATIONSHIP WITH INDUSTRY

Increasingly, the financial contribution of industry supports the ideas of neurosurgeons and enables the development and production of new devices that improve patient care. The neurosurgeon's relationship with industry can be the key to turning an idea into reality. This relationship is not free. It is heavily regulated and heavily scrutinized. For this reason, working closely with industry can be a chore but can be rewarding.

In September 2008, the Congress of Neurological Surgeons (CNS) released its guidelines on the neurosurgeon-industry relationship and conflicts of interest.[2] In general, the guidelines acknowledge that the collaboration between neurosurgeons and industry is important for the innovation of safe and effective technology. The testing of new devices, the improvement of existing devices, and research are all necessary to guarantee that patients have the best possible outcomes with the safest tools.

The CNS states the following:

The neurosurgeon's relationship with industry, when properly structured, is an appropriate, beneficial, and collaborative partnership to improve patient care. Neurosurgeons are necessary collaborators with industry for technical innovation by providing ideas and feedback, conducting research trials, serving on scientific advisory boards, and serving as faculty to teach the use of new technology related to neurosurgical practice. Neurosurgeons with innovative ideas to improve patient care rely on industry to bring their creative ideas to practical application in the healthcare market. The collaborative relationship between neurosurgeons and industry must be structured to avoid pitfalls of improper inducements or incentives….[2]

In general, when pursuing academic or commercial endeavors, neurosurgeons must be aware of potential conflicts of interest. Specifically, any patient-care decision that may be influenced by the self-interest of the neurosurgeon is a potential conflict of interest. In these cases, it is essential to disclose any potential conflict of interest to patients, the public, and colleagues.

Individual institutional or professional societies should be consulted when a potential conflict of interest exists to help resolve and address the possible conflict. Again, the safety of the patient and the patient-physician relationship must be at the center of all concerns.

CONCLUSION

The innovative neurosurgeon and industry need not work in opposition but should find a comfortable working relationship that promotes excellence in innovation without significant conflicts of interest. During the forging of an affiliation with industry, the physician-patient relationship should be the central focus. Nonetheless, neurosurgeons should embrace innovation because excellence in innovation happens when those who create the technology understand and use that technology on a regular basis. Neurosurgeons should not fear collaboration with industry. They must simply remember to disclose their relationships.

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