Prof. Weihai Xu: 3D intracranial artery printing transforms the future of stroke

Submitted Nov 13, 2014. Accepted for publication Dec 12, 2014.
doi: 10.3978/j.issn.2305-5839.2014.12.09
View this article at: http://dx.doi.org/10.3978/j.issn.2305-5839.2014.12.09

The Neurology Department of Peking Union Medical College Hospital was founded in 1921. After more than 90 years, the department has developed a complete specialized set-up and strong technical infrastructure. It has now become one of the country's most prestigious specialized neurological clinics. Here, a group of leading doctors and scholars tirelessly explore the development and innovation of the discipline. Medical research that may save countless lives and challenge the limits of human imagination is undertaken. This time, our Associate Editor-in-Chief, Prof. Weihai Xu (*Figure 1*), from Department of Neurology, Peking Union Medical College Hospital, would share his viewpoints on topics such as literature reading, translational medicine, 3D printing, and future directions in the field of stroke.

Prof. Weihai Xu, MD. Associate Professor of the Department of Neurology of Peking Union Medical College Hospital. He is currently a member of executive committee of the Neurosonology Research Group of the World Federation of Neurology, an editorial member of the Chinese Journal of Practical Internal Medicine, and an editorial member of Frontiers in Endovascular and Interventional Neurology (USA). Between August 2003 and August 2004, he worked in the Department of Neurology, University of Ulm, Germany. Between September 2012 and April 2013, he worked as a visiting Associate Professor at the University of Miami, USA. He is the Editor-in-Chief of "Neurology case analysis—entry and improvement", and "Illustration of cerebrovascular disease". He is the main translator of "Difficult cases in neurology—from BAYLOR School of Medicine in USA". He is the principle investigator of several research programs funded by the National Natural Science Foundation of China, Doctoral Fund of the Ministry of Education of China for New Instructors, New Investigator Awards for Doctoral Programs, and the Clinical Research Fund of Chinese Medical Association. In 2012, he was awarded the New Century Excellent Talents Fund of the Ministry of Education. He is currently the Associate Editor-in-Chief of *Annals of Translational Medicine* (*ATM*).

Figure 1 Professor Weihai Xu.

Change a thought of follower by reading literature intelligently

ATM: Prof. Xu, thank you for sparing your time for the interview. You recently wrote a popular article for AME academic database titled "The bigger picture of clinical research" (1). What do you suggest to build the ability to read the literature?

Prof. Xu: There is a positive feedback process: interests initially drive reading the literature. If you are interested in certain diseases, you would read the literature in those fields. After reading, the new knowledge stimulates your interest in continuing to read, and you will look for more literature. At different stages, the selection of literature is also different. Juniors, fellows and attendings are in a stage of building a foundation. They need to read a wide range of topics. It does not matter if they don't understand certain things; just skip them. Ultimately, through reading a lot of literature, they can build deeper knowledge. Senior physicians with associate professorships and above have limited energy for reading. They can read literature in their specialty with focus and depth but read only the abstracts of other subjects.

ATM: Do you have any advice on journal selection?

Prof. Xu: Most clinical physicians should read major journals such as *New England Journal of Medicine* and *The Lancet*. General neurologists should read more for journal names that contain "Neurology" (*Neurology*, *Annals of Neurology*, *Journal of Neurology*, *Neurosurgery*, *Psychiatry*, and so on). Senior doctors should also pay attention to specialized journals such as *Stroke*. In the era of information explosion, what's more worrying is the fragmentation of knowledge. The ideas of the excellent papers are not only present in the abstract. From introduction to discussion, there is a lot of important information. If a physician only reads abstracts, or the people who disseminate information do not understand medicine, everyone becomes vulnerable to misleading information and misused information. So reading the original text and the full text is still important.

ATM: You once said, "Within a decade, half of the knowledge we are studying now will be proven to be wrong". Even worse is that we do not know which half is wrong. How can young doctors judge the knowledge that they have access to?

Prof. Xu: First, the young doctors should not fall into agnosticism. They should not think that because anything could be wrong anyway, it makes no sense to learn and to do anything. The doctors should also dare to challenge the existing body of knowledge, to correct inaccurate perspectives. Once they have the mindset not to be a follower, they can find out the 50% wrong knowledge.

Translational stroke medicine can expect a breakthrough within 5 years

ATM: Recently, you have organized a very exciting special issue for ATM with the topic "Translational stroke: a rapidly expanding area!" What do you think of the future development of translational medicine?

Prof. Xu: Translational medicine, as a burgeoning discipline, is mainly driven by basic researchers. But I believe that the future direction of translational medicine is that the clinicians will propose the needs, and then researchers in basic medical science and other fields will make the directional transformation according to those needs. Why is it called an expanding area? Because, I think, translational medicine not only covers transforming biomedical sciences to clinical medicine but also covers transforming science, technology, and even the IT industry to clinical medicine. It should not be limited to transforming the results of animal studies to humans. Clinical needs are prerequisites. Scholars in various fields should regularly sit down together to discuss solutions to the problems, thereby forming a "loop".

ATM: You mentioned in the preface of the special issue that, in five years, translational medicine regarding stroke will change dramatically. Why do you have this opinion?

Prof. Xu: Translational medicine is a new discipline and has demonstrated unpredicted clinical potential. For example, in the past, we would never have imagined that by observing brain functions through quantitative EEG, a robot that helps us pick up objects could be made. As an emerging discipline, when people realize the potential of translational medicine, it is often easier to achieve new breakthroughs.

ATM: You mentioned that the important work in the future is "peri-core work"?

Prof. Xu: Core means that we can solve the core problem of the patient. What are the core issues? Enable hemiplegia patients to move and greatly improve their quality of life are the core issues. If we cannot solve these core issues, we are doing peri work, namely basic research. With good basic research, we can then successfully conduct the core work. This is the concept of peri-core work.

Material selection is the key for 3D printing of intracranial arteries

ATM: In the special issue, you also published an article on the 3D printing of intracranial arterial segments based on the results of magnetic resonance imaging (2). Could you tell us about the whole story of this study?

Prof. Xu: In terms of 3D printing technology, China is considered to be synchronized with Europe and America. This type of study was first proposed by Jia Liu (Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen 518055, China; the second author of the study) at the Shenzhen Institute of Advanced Technology of the Chinese Academy of Science. As we saw broad application prospects, we began collaboration and achieved satisfactory results. Of course, the early studies are a little

bit preliminary, but after all this is a new beginning, so we published the study. Now, with the support of the National Science Foundation, we will continue to improve this study.

ATM: You also mentioned in the text that further research is still needed to improve the technology. What problems will you focus on solving next?

Prof. Xu: The next major consideration should be the kind of material suitable for "representing" the blood vessels. Now Jia Liu has found a new substitute for blood vessels, which are flexible and easily undergo gliosis. The more successful the vascular simulation is, the greater the likelihood of success in further research. Once we solve the material problem, many other problems can be easily solved. At this moment, we have received samples of new materials.

ATM: Are there any difficulties in the communication between you and the engineers in this study?

Prof. Xu: Mainly through network communication, we transfer the image data to researchers in engineering technology. And they create 3D printing models. In the modeling process, we had setbacks at the beginning. They used a type of hard material, but we need glial material closely resembling blood vessels. This problem is not one that a doctor can solve. Engineers need to explore and test little by little. In this respect, the Shenzhen Institute of Advanced Technology put in a great effort and also achieved a great deal.

ATM: How far away is the clinical application of this technology?

Prof. Xu: There is still a long way to go. We will first use this model to study vascular pathophysiology. Once we get good results, we will further apply it for clinical use. The surgical department may use this technology before the internal medicine department.

Cite this article as: Li M. Prof. Weihai Xu: 3D intracranial artery printing transforms the future of stroke. Ann Transl Med 2015;3(1):13. doi: 10.3978/j.issn.2305-5839.2014.12.09

Imaging breakthroughs are important during the plateau period of stroke research

ATM: This special issue is about stroke. What are the areas for future research focus in this field?

Prof. Xu: Research on stroke has reached a relative plateau period in the past 5-10 years. In terms of drug treatment, there have not been many breakthroughs. Translational medicine gives a possibility for the future development of stroke research. The technologies for imaging stroke have also remarkably progressed. Developments in CT technology have led to thrombolytic therapy. I hope nuclear magnetic resonance techniques will bring a new revolution to personalized medicine. New breakthroughs can only be achieved once a bottleneck is broken. Consider the time window for stroke treatment as an example. Thrombolysis usually occurs within 4.5 hours, based on data obtained in clinical studies with large sample sizes. But from the individual point of view, there are patients whose time window of thrombolysis is longer than 4.5 hours. Many domestic and foreign hospitals have noticed this, but there is no good way to screen for such patients. So we should expect advances in neuroimaging or molecular markers to solve these problems.

Acknowledgements

Disclosure: The author declares no conflict of interest.

(Science Editor: May Li, ATM, editor@atmjournal.org)

References

1. Xu WH. The bigger picture of clinical research. Available online: http://kysj.amegroups.com/articles/83
2. Xu WH, Liu J, Li ML, et al. 3D printing of intracranial artery stenosis based on the source images of magnetic resonance angiograph. Ann Transl Med 2014;2:74.

