

Interview with Dr. Joel Dunning (James Cook University Hospital, Department of Cardiothoracic Surgery)

for Joongang Ilbo

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► What were your thoughts on the ArtiSential when you first tried out the device?

Dr. Dunning: I travel the world regularly and have had access to some of the most exciting new robotic technologies and other fantastic devices that are in development around the world, including the latest new developments in Silicon Valley, San Francisco and in Geneva, Switzerland. But when I saw these novel instruments that have just been created in South Korea, I was stunned. They were perfectly designed and were the answer to so many problems and issues we have in thoracic surgery. In addition, I had previously seen another company try to develop instruments like this, but their instruments were very difficult to use. I couldn't believe how great these instruments were and I said to myself that I just had to try to use these in my own practice as soon as possible and ask more about them.



► What do you consider the benefits of ArtiSential?

Dr. Dunning: In thoracic surgery we use fairly unsophisticated instruments endoscopically in order to achieve complex surgeries in the chest. Our most common procedure is lobectomy, a lung cancer operation to remove the cancer by taking away some of the lung. The lung has particularly large blood vessels that are much more delicate than other blood vessels in the body and have half of the body's blood volume going through them, so we are always looking for more meticulous and safe ways to achieve this operation minimally invasively. We need to do these operations through small holes, as open operations use a very large incision called a thoracotomy, which is the most painful incision in all surgery. The reason for this is that you cannot keep it still as you have to keep breathing and also each rib has exquisitely sensitive nerves under each one called intercostal nerves.

Currently the endoscopic instruments that we use are basically long thin sticks with a grasper on the end. They cannot go around vessels and they are difficult to use.

As a result, more surgeons are looking to robotic surgery to resolve the difficulty in performing endoscopic surgery. In contrast to the difficult to use and unsophisticated instruments available in endoscopic surgery, robotic arms are like having your own hands in the chest. They can bend round vessels in all directions,

grasp, and help you to perform the operation far more meticulously. But the disadvantage of robotic systems is clearly the cost. Robots can cost as much as \$2 million per system, and for many healthcare systems this is just not sustainable.

So, the ArtiSential instruments are the highly cost-effective solution to have the dexterity of a robotic system without the cost. They have the 7 degrees of freedom that robotic systems have. They also mimic the human wrist and allow the surgeon to feel that they truly have their own hands in the operative field without the larger incisions. However, the ArtiSential instruments can actually be superior to robotic systems. The robots cannot provide tactile feedback to the user so you can accidentally knock into blood vessels. There have been cases of surgeons tearing delicate tissue and vessels as a result. But with ArtiSential you can still feel the tissue through the instruments, and therefore many would argue that they will prove to be safer than robotic systems as well as orders of magnitude cheaper.

Also, no other company has managed to design a complete suite of these instruments for use in both hands. This is the only system that has solved the engineering challenges to achieve this.

► ArtiSential is a laparoscopic instrument, but is often compared to the da Vinci robot because of its similarity of the joints. What would be a strength compared to da Vinci?

Dr. Dunning: As mentioned above, the ArtiSential instruments give the exact same dexterity as a robotic arm, but their huge advantage is that

they also provide tactile feedback to the surgeon, which is a very large safety advantage. I don't think that any robotic manufacturer will ever resolve this issue as even trying to provide this tactile feedback on a robotic system never accomplishes what you can truly feel when you have the instrument in your hand. The second major advantage of the ArtiSential Instruments is that you can be by the patient's side. Non surgeons may not realize the importance of this but currently for all robotic systems you have to take off your gown and gloves and walk away from the patient to sit on a control console. You then have to leave either a junior surgeon or sometimes just a nurse by the patient's bedside. Surgeons don't like to talk about when things go wrong but if something goes wrong where would you like to have your senior surgeon? Away from the patient so he has to go and scrub up and put on his gown and gloves again to resolve the problem, or right by the patient's side? If a blood vessel bleeds then it can bleed at 2 liters per minute, so you absolutely need to be able to control this in a matter of seconds. Thus, ArtiSential instruments allow the surgeon to be right by the bedside for safety as well as allowing the dexterity of a robotic system, at a fraction of the cost.

Also, in thoracic surgery and in many other branches of surgery we use staplers to divide vessels, which is the most delicate part of the operation. In robotic surgery the robots don't have staplers and so you have to delegate this job to the junior person by the bedside under your instruction, as you sit away from the patient. Delegating the most delicate part of the operation to the most junior surgeon or sometimes a nurse does not make sense. With the ArtiSential system the surgeon will be back in control of the use of the stapler.

►What kind of patients, diseases, and surgeries will you use for clinical studies with ArtiSential?

Dr. Dunning: Due to the extreme cost saving of the ArtiSential instruments, I can use these instruments for all the endoscopic operations that I do. Currently I use our robotic system for the more complex operations that we do, including lobectomy or pneumonectomy for lung cancer and thymectomy for cancer. But the ArtiSential instruments will be able to bring the superior dexterity and instrument control to my more minor operations that include wedge resections and pleural biopsies to diagnose lung cancer and endoscopic operations for empyemas (infections of the chest cavity). In addition, we could use these instruments for collapsed lungs in young people for pneumothorax surgery. In fact, as the more minor operations are the majority of our work, I envisage that I will be using ArtiSential instruments more than my robotic system.

► Can you explain the expected results compared with the existing surgery methods?

Dr. Dunning: Compared to my endoscopic lobectomy for lung cancer I will have increased safety and accuracy, as I will be able to bring the quality of this operation up to the quality that I see with robotic surgery. Compared to my robotic surgical operations, ArtiSential will be much quicker and cheaper. Robotic operations take a very long time to set up the robot and make the preparations for surgery. The ArtiSential instruments require no set up time at all. Typically, I can only do 2 robotic lobectomies in a whole day but 3 endoscopic lobectomies so replacing our robotic lobectomy by ArtiSential Lobectomies will allow us to perform 50% more operations on our list than on a robotic list.

►Do you think ArtiSential should be widely used?

Dr. Dunning: Yes. For people who do not have access to robotic systems for all their endoscopic operations, which is the majority of the world's surgeons, these instruments will greatly help all surgeons complete their endoscopic operations more easily and more safely.

► You stated the ArtiSential is "the future of surgery." Can you expand on this?

Dr. Dunning: The ArtiSential is the future of surgery because I cannot see how the expensive robotic systems can be the solution to the problem of inadequate endoscopic instruments that we currently have. We want to mimic our hands in the body and the ArtiSential does this. So the question is therefore why would you need a robot to do this if it takes far longer to set up, it is more expensive and it takes you away from the patient and puts you in a control station remote from the operative field. Robotic surgery has created almost as many problems as it has sought to solve. ArtiSential, not robotic surgery, is the solution to poor endoscopic instruments.