

# AneuRx® Stent Graft

## Clinical Update Vol. IV

Frank Arko, MD; Ali Azizzadeh, MD, FACS; and Rodney White, MD, discuss the AneuRx 5-year data, how they compare to their own experiences, and the future implications for physicians.

### PANEL



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***What do these data represent to the physicians who perform endovascular aneurysm repair (EVAR)?***

**Dr. Arko:** Overall, I am pleased with these data to date. These data are important to physicians who perform EVAR because these data allow them to give excellent 5-year data to their patients about this procedure. The primary outcomes after EVAR are to prevent aneurysm rupture, aneurysm-related death, and finally, to prevent patients from having open surgical repair. With these data, patients can be told that there is a 97% freedom from rupture, a 96% freedom from aneurysm-related death, and a 92% freedom from surgical conversion with very low peri-operative mortality rates. These results are all quite good and should be reassuring to both patients and physicians alike who are concerned with longer-term outcomes.

**Dr. White:** The data set is the largest US clinical trial cohort with the largest number of patients (N=600) with data out to 5 years for any approved endoluminal graft in the US.

***What information can one take away from these data to influence the standard of EVAR therapy?***

**Dr. Arko:** Although the data obtained are excellent, they are certainly not perfect. These data have allowed physicians and manufacturers to determine what will lead to excellent clinical outcomes, and more importantly, what can lead to adverse clinical outcomes. A short, angled, proximal neck is going to be associated with a higher risk of migration compared to a longer, straight neck. Device strategies to overcome these adverse factors are certainly warranted because all of the current devices have shortcomings in this type of anatomy.

**Dr. Azizzadeh:** Superiority of EVAR in normal-risk patients is well established by data from DREAM and EVAR-1. Although EVAR-2 questioned the utility of endovascular repair in high-risk patients, the Society of Vascular Surgery's review of investigational device exemption (IDE) data confirmed that EVAR is the treatment of choice for these patients. These data add to the growing

body of evidence that support the use of EVAR for all abdominal aortic aneurysm (AAA) patients with suitable anatomy.

**How do these data compare to the other devices' data that are on the US market?**

**Dr. Arko:** It is difficult to compare the data sets because each trial used different criteria for patient selection, the definitions for the endpoints were different, and the patients are at different periods of follow-up. As one of the first approved devices, it has longer follow-up than any of the other currently approved devices. When evaluating this data set compared to other endograft data sets, one must consider that in the AneuRx clinical trial, there were no exclusions made for early-generation devices, emergency, high-risk, or off-protocol use, as there were in other trials. In addition, the AneuRx clinical trial used more liberal criteria for patient selection and had the influence of physicians' early learning curve, which is different from other US clinical trials. One must remember that during the AneuRx clinical trial, the inclusion criteria only required a 10-mm neck, whereas with the other stent grafts, a 15-mm neck was required. By allowing for this shorter neck in the original clinical trial, there is the potential for having a higher adverse event rate compared with the other devices.

**Dr. Azizzadeh:** In general, they are comparable. The four FDA-approved devices have different characteristics, as well as strengths and weaknesses. Despite enormous improvement that has taken place during the last decade, this technology is still in its infancy. I think, in the not-so-distant future, we will consider today's devices archaic.

**Dr. White:** Data from all the devices that underwent postmarket approval (PMA) study in the US are available and published from reports in the Life Line Registry. The most recent updates on those data were used to compare event rates reported in the EVAR-1 and EVAR-2 trials in Europe. The data from the US PMAs represent comparable and excellent results and show significantly better outcomes when compared to these European data sets.

**How do the AneuRx clinical trial data compare to the AneuRx Post Surveillance and Lifeline Registry results?**

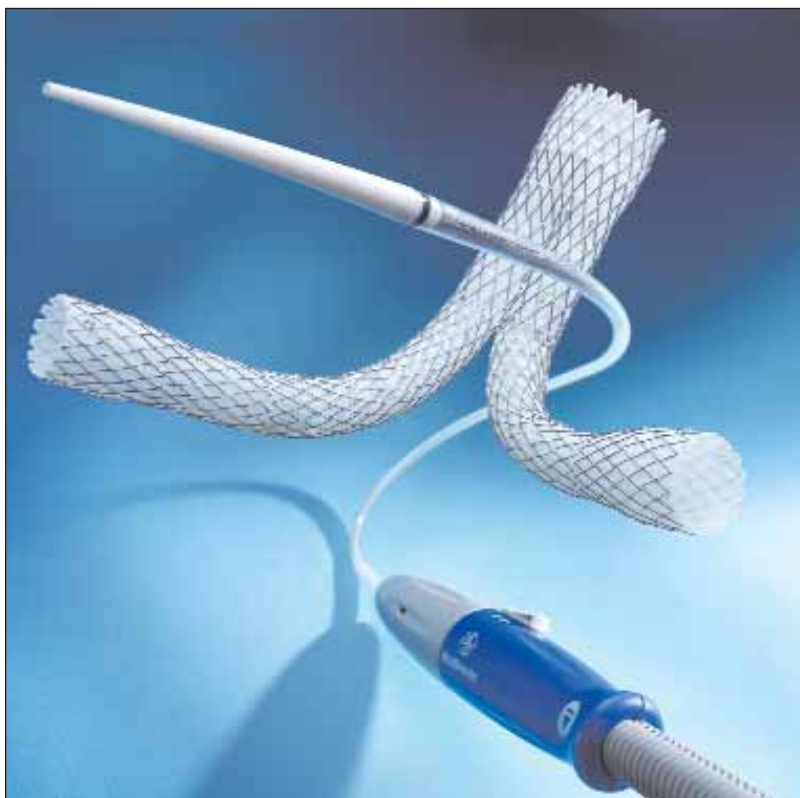


Figure 1. The sixth generation AneuRx AAAAdvantage stent graft system.

**Dr. Arko:** Both the Post Surveillance Registry and the Life Line Registry are similar to the US AneuRx clinical trial cohorts, with no statistically significant differences in freedom from death, rupture, or surgical conversion between the registries and the phase II IDE cohort. Furthermore, there has been only one migration reported out of 334 patients in the postmarket registries, representing a low rate of migration: .3% at the 2- to 3-year interval. The subjects in the registries are doing as well as or better than the phase II IDE cohort.

**Dr. Azizzadeh:** The primary outcome measures, including mortality, surgical conversion, and rupture, are similar among the three groups.

**How do these data compare to your own experience with the AneuRx stent graft?**

**Dr. Arko:** I have been using the AneuRx stent graft since the original clinical trial. My own personal results with this stent graft have been excellent in appropriately selected patients, and I continue to use it. Since its first approval, it has certainly undergone multiple improvements, including the delivery system, lengthening of the main body and limbs, and changing of the graft material. Regardless of the stent graft, if you treat hostile anatomy, you will

increase the risk of adverse events if the patient lives long enough.

**Dr. White:** We have a large volume of patients in that data set because we were the first center worldwide to implant devices. What is reflected in the data set, in many cases, is our longest endograft follow-up; some of those patients are undergoing 11 years of surveillance.

***What are the differences between the clinical trial results and the contemporary results from the Post Market Registries related to the endpoint of migration?***

**Dr. Arko:** As one of the first devices in the clinical trial, I believe that there was a significant learning curve for many of the physicians implanting these devices. I believe that placing the device close to the renals and maximizing the proximal fixation, as well as placing the device close to the iliac bifurcation at the time of the original procedure, are done more routinely now than in the past. Secondly, I think that patient selection may not have been as closely scrutinized in the past, and patients with necks <10 mm or severely angled necks were treated in the original trial without knowing what the adverse outcomes might be. Furthermore, I think that the poor imaging and the early delivery system were associated with initial poor placement of the device, leading to an increased risk of migration as well. Finally, the original clinical trial also included a very stiff-body, early-generation device that was associated with a significantly higher risk of requiring secondary interventions.

***There are a number of single-center experiences in the literature that have reported higher migration rates than in the clinical trial. Can you comment on these data?***

**Dr. Arko:** Yes, there are a number of small single-center experiences that have reported migration rates greater than the US clinical trial. However, the investigators typically analyzed the cause of migration, and a number of factors were found to increase this risk. These include inappropriate oversizing and low initial device deployment, both of which are easily overcome after the initial learning curve. Even more important, severe neck angulation and short necks (<15 mm) were both associated with a higher risk of migration. Hostile neck anatomy has been associated with a higher risk of migration in the literature with all devices.

**Dr. Azizzadeh:** There are some potential explanations. I think the early, real-world, postmarket experience with this device included patients with suboptimal anatomy who had very limited options. The long-term results of this sub-

group are obviously less favorable. In addition, there is always a learning curve with new technology. In 1999, most of the interventionists who were implanting this device were working with a novel technology; now, in 2007, physician skill sets have improved. We have learned a great deal over the years about patient selection, device selection, implantation techniques, and device behavior.

**Dr. White:** Single-center experiences vary. If you look in the clinical trial itself, the migration rates vary from center to center. Some are low and some are higher. That has to do with patient selection and imaging. These are the oldest patients treated with PMA devices in the US. It includes a learning curve for the entire country related to how you put the devices in and the selection criteria over an 11-year period of time. Since that early experience, we have learned how to do this better.

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***What is your viewpoint on AAA sac enlargement with this device?***

**Dr. White:** The enlargement rate that we have on new data sets related to volume is not nearly as high as the clinical trial. The data set of the PMAs is diameter; diameter enlargement occurs if an angle changes, the diameter measurements vary, and the accuracy of those measurements on an actual data set that may be acquired at a greater interval does not necessarily translate to volumetric increase, which is the concern. The concern with enlargement is the volumetric increase of the aneurysm when compromised with a fixation site proximal and distal. In any analysis of a 3D data set that looks at these types of patients, the number is not nearly 17%. New graft materials that have been introduced in the past 2 years may have an impact on the sac enlargement issue.

**Dr. Arko:** It should be noted that the AneuRx stent graft has undergone two significant changes to the graft material since the original device in the clinical trial. Most recently, the AneuRx stent graft incorporated a

change in its stent graft material in 2004. The Resilient graft material is a Dacron graft material that is 50% more dense than the graft material (reduced porosity material [RPM]) implanted during the clinical trial. The increase in density has resulted in a 50% decrease in porosity, which may result in improved AAA shrinkage rates. There have been reports of aneurysm enlargement with the Gore Excluder (Gore & Associates, Flagstaff, AZ) as well, but it has also undergone changes to the graft material. We recently reported our results with these contemporary graft materials and found that these changes were associated with significantly greater sac shrinkage than reported with the older devices. However, Dacron stent grafts were associated with greater sac shrinkage than polytetrafluoroethylene stent grafts.

**What specific changes to the stent graft (AneuRx AAAAdvantage [Figure 1]) do you think will have the greatest effect on clinical outcomes?**

**Dr. Arko:** I think that the 1-cm increase to the main body of the stent graft will give greater fixation and seal in the proximal neck. Furthermore, we have seen significantly greater sac shrinkage with the Resilient graft material. In addition, longer limbs and flared limbs have made the procedure simpler and quicker by allowing the use of fewer pieces and treating a greater number of patients with iliac artery ectasia.

**Dr. Azizzadeh:** The evolution of the AneuRx stent graft has included modifications to the fabric, nitinol stents, radiopaque markers, body length, and the delivery system. Although each alteration has played a major role in improving the device, I suspect the greatest benefit was derived from the flexible body design, which facilitates conformation of the graft to the anatomy.

**Dr. White:** Over time, there have been changes. The initial changes were made to the stiff-body device, which did play a role in early migration rates. A segmented stent was added to address the issue of flexibility. There were changes made to the fabric, which increased the density of the material to improve wear capabilities over time. This change should resolve some of the issues related to enlargement that may be showing up in those longest-term patients. Other changes that have occurred are the addition of flared limbs and longer devices. As with many of the manufacturers, clinical needs are identified, and subsets of patients are added. There have been a series of improvements, including enhanced deliverability in the catheter systems.

**Given the changes to the AneuRx stent graft, the improved implant techniques, and revised patient selection guidelines, how relevant do you think the clinical trial data are to present-day expected clinical outcomes?**

**Dr. Arko:** I think the present clinical trial data are important. It gives a benchmark for what we need to do and how we need to improve things. I am not exactly certain that the clinical trial data are relevant to the current AneuRx stent graft because there have been multiple changes to the graft, the delivery system, and the implantation technique.

**Dr. Azizzadeh:** In the past 5 years, we have learned a lot about patient selection and device behavior. We know more now about how the device will react to certain stresses. Early on, interventionists had very limited options, and the experience was limited. Given these modifications, one would only expect the outcomes to improve in the future.

**Dr. White:** The data set a standard because they are highly verifiable and represent the best information that we can give patients as far as 5-year results go. With any of the data that are available, there are no particular concerns that they raise when you are talking to a patient. In fact, it actually shows, for a new technology that had never been used in high-risk patients where problem areas were expected, that the data still perform exceptionally well. The data include some of these older patients with older devices, which may have had problems that have been fixed in the interim. These data are older, we have learned a lot, we should be able to perform the procedures better, select patients better, and the devices are better, so the expected outcomes in centers that are trained and appropriately deploying the devices should be better. The original patient groups that were treated were people who were willing to have the devices and wanted to avoid an open surgical procedure with no data available at all. They were willing to take a risk with a new device, aware of the possibility of having an operation later, but wanted to avoid that operation. Based on what their risk profiles were, these patients, compared to a surgical data set, have by far the best choice in terms of secondary interventions and avoiding mortality. They appreciate the technology. It has performed well for a first-time go-around longest data set, and it is our responsibility to continue to collect data with the same degree of integrity so we can make serial improvements. It sets a standard for current clinical trials, where the value of a very accurate data set has pointed out problem areas, and if we follow through on those, we ought to be able to make serial improvements and improve the technology very quickly. ■