

## Page for the General Public

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(on behalf of the Editorial Office)

The following pages summarize and review this issue's articles for an audience without a background in medicine or research.

*Tyler M. Gunn et al.: "Techniques of Proximal Root Reconstruction and Outcomes Following Repair of Acute Type A Aortic Dissection"*

"Acute Type A Aortic Dissection" is a life threatening disease in which a tear occurs in the vessel wall of the aorta, the main artery that arises from the heart and distributes oxygenated blood to the entire body. Through the tear, blood enters into the vessel wall itself, creating a disruption of vessel layers. This situation may go on to bleeding from the tear, heart failure, or failure of blood flow to any organ. Emergent surgery to replace the affected aorta is usually the only option. When the dissection includes the origin of the aorta, the aortic valve, which serves as a gate between the heart and the aorta, is often distorted, causing it to leak.

In their study, *Tyler et al.* studied different surgical techniques of addressing aortic valve dysfunction

in these patients. They reviewed data of 189 patients, of whom one group had suture repair of the valve ("resuspension"), one group had replacement of the valve, and a third group had replacement of valve and first segment of the aorta with a special prosthesis consisting of a valve attached to a tubed prosthesis to replace the vessel ("Bentall procedure")

In the study, the authors conclude that all patient groups had similar survival directly after surgery. Looking at their survival 10 years later, patients undergoing "resuspension" or "Bentall" procedure did better. They also showed that the somewhat less complicated procedure of "resuspension" in which the native valve is left in place, leads to long-term results as good as those seen with the extensive "Bentall" procedure. The latter is more difficult to perform but was previously thought to offer superior long-term performance.

However, this does not necessarily mean that the latter two techniques are always better. Which procedure is chosen depends on many factors that in-

clude the extent of damage, the function of the valve, and the surgeon's experience, as well as how sick the patient is at the time. So, these surgical alternatives cannot easily be compared. For example, patients who underwent aortic valve replacement were often older and had other health problems, thus obligating an overall lower life expectancy. Which surgical technique is best in which patient with acute Type A dissection will continue to be an individual decision in every single case.

*T. Christian Gasser: "Biomechanical Rupture Risk Assessment – A Consistent and Objective Decision-Making Tool for Abdominal Aortic Aneurysm Patients"*

Abdominal aortic aneurysm (AAA) is a condition in which the segment of the aorta (the main vessel that distributes oxygenated blood in the body) that runs through the abdomen enlarges over the years, potentially leading to life threatening rupture and internal bleeding. AAA is treated by open surgical replacement of the vessel with a tubed tissue graft or



by “endovascular stent grafting”, which consists of a similar graft that is placed inside the diseased vessel via minimally invasive access in the groin. A crucial question for patients with AAA disease has to do with the appropriate timing of the procedure. Any procedure carries risks, and it would be harmful to expose a patient to these risks if the rupture risk of his or her AAA to rupture is very low.

However, predicting AAA rupture is difficult because it depends on many different factors, some still unknown, poorly understood or impossible to measure. In common clinical application, the decision to operate is often tied to size and growth rate of the aneurysm as main criterion. Usually, repair is recommended if the aneurysm is larger than 5.5cm. This indicator, however, is not very precise. Studies have shown that many aneurysms do rupture at less than 5.5cm while others grow to much larger diameters without rupturing.

In his review, *T. Christian Gasser* discusses the current state of “Biomechanical Rupture Risk Assessment (BRRRA)”, a sophisticated computational model to calculate the risk of AAA rupture. BRRRA depends on detailed imaging of the aneurysm size and shape interpreted in a context of knowledge of biomechanical properties of the vessel wall. Also, factors such as gender and blood pressure are incorporated in order to predict risk of aneurysm rupture in an individual patient. The mathematical model also tries to predict the location of rupture by finding the “weak spot” in the aneurysm wall.

So far, different BRRRA computational models have been tested on existing patient data, showing that the model can indeed differentiate between patients who did and did not rupture. This detailed BRRRA approach promises to improve the accuracy with which we make the important decision to operate on patients with AAA.

### Case reports

#### *Madhu Bhamidipaty et al: Management of Intra-Aortic Balloon Pump Rupture and Entrapment*

An intra-aortic balloon pump (IABP) is a device with a balloon that is introduced through a vessel in the groin and positioned in the body’s main artery behind the heart. Its purpose is to improve blood circulation in case of a failing heart. Bhamidipaty and colleagues describe ways to deal with a serious potential complication of IABP use, namely rupture of the balloon and entrapment in the body. In the presented case, the device had to be surgically removed from the groin vessels. Early recognition of the complication, timely removal, and if necessary careful repair of the damaged vessels are warranted.

#### *Evan Hy Einstein et al: Anomalous origin of the Left Vertebral Artery from the Aortic Arch*

The aortic arch is the part of the body’s main artery that distributes blood into the vessels leading to arms and head, before the vessel continues downwards. The left vertebral artery leads up through the back of the vertebra of the neck to supply portions of the spinal cord and the brain. The left vertebral

artery usually originates from the vessel that supplies in the left arm (the so-called “subclavian” artery). Einstein and colleagues studied 27 cadavers and found that 14.8% had an anomaly in which the vessel arises directly from the aortic arch, which is more frequent than previously reported. This anomaly has no consequences in healthy individuals, but it is important when planning surgical procedures on the aortic arch because its disruption might impair cerebral and spinal cord blood flow.

#### *Ahmed Farag et al: Primary Percutaneous Coronary Intervention in Chronic Type A Dissection*

Farag and colleagues described the case of a patient sustaining a heart attack due to occlusion of one of the main arteries supplying the heart muscle. When trying to open the occluded vessel with a catheter via the groin vessels, the cardiologists noticed that the patient also had had an unnoticed type A aortic dissection (see *paragraph 1*). The cardiologists had to overcome technical challenges posed by the dissection to reach the occluded vessel, but eventually they succeeded and the patient managed to beat all odds by surviving both an aortic dissection as well as a major heart attack.

#### *Alan S. Chou et al: Computed Tomography Imaging Artifact Simulating Type A aortic Dissection*

Type A Aortic dissection (see *paragraph 1*) is usually accurately diagnosed by contrast-enhanced computed tomography (CT scan), a technique in which contrast medium is injected in the vessels while

a 3D X-Ray scan of the body is performed. In some cases, the pumping heart and the pulsation of the vessels can, however, produce images that look like an aortic dissection even though there is none. Chou and colleagues report the case of a patient who was thought to have an aortic dissection on his CT scan, thus apparently needing urgent surgery. A second "electrocardiogram (ECG) gated" CT scan was performed. This technique

uses information on the heart rhythm from an ECG machine attached to the patient to take heart beat and vessel pulsations into account when creating images. The repeat CT scan showed that the original images had been misleading. The patient was indeed healthy and major surgery was not necessary. This case shows how important it is to use the ECG-triggered CT technique when aortic dissection is suspected.

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