UMC Utrecht

ECG-gated CTA and its added value for seizing EVAR and TEVAR endografts: how to decrease failures

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DISCLOSURES

"No Disclosures"

Dynamic Imaging is Essential

- Planning & Seizing Thoracic / Abdominal Stentgrafts
- Prediction of Endoleaks and Dissections

Dynamic Imaging

Asymmetric aortic expansion of the aneurysm neck: Analysis and visualization of shape changes with electrocardiogram-gated magnetic resonance imaging

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Utrecht and Rotterdam, The Netherlands

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Dynamic Imaging

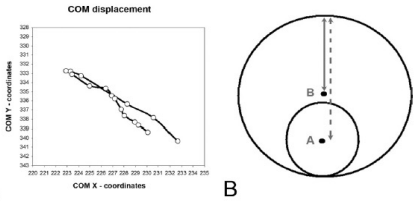


Fig 2. A, An example of typical aortic center of mass *(COM)* displacement is shown in which the COM coordinates are plotted for each cardiac phase. Radii are measured from these coordinates for each cardiac phase. **B,** Schematic image shows one circle expanding to a larger circle. Neglecting COM movement results in incorrect measurement of radial expansion. Radii during the maximum expansion should not be measured from point A but from point B.

Dynamic Imaging

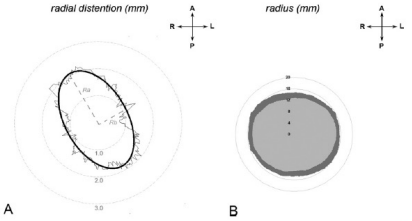


Fig 3. Plots show **(A)** radius change and **(B)** corresponding minimum and maximum diameter. An example of a preoperative measurement is shown. **A,** Radius change is measured over 360 axes and plotted. An ellipsis is fitted and the magnitude and direction of the maximum (*Ra*) and minimum radius change (*Rb*) are calculated. **B,** Illustration shows the corresponding maximum and minimum radii in mm. *A,* Anterior; L, left; *P,* posterior; *R,* right.

Dynamic Imaging

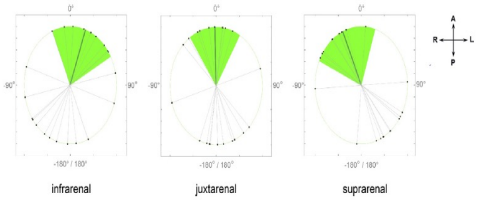


Fig 6. The major preoperative axis direction of distention is drawn for each patient (*lines*). The mean axis (*dark green line*) with −1 and +1 standard deviation (*light green*) is also shown. The mean axis is calculated with the orientation anteriorly (−90° to 90). Note that all orientations are also mirrored in the posterior direction. *A*, Anterior, *L*, left; *P*, posterior; *R*, right.

Value of ECG-gated CTA in EVAR & FEVAR

- Changes in Extensibility & Distensibility of the Aorta
- Changes in Neck-angulations over the Cardiac Cycle are of utmost importance to enhance short- and longterm outcomes of EVAR and FEVAR

Image Acquisition

- Contrast enhanced CT angiography most widely employed technique for imaging of TBAD [1,2]
- New generation CTs have sensitivities up to 100% and specificities 98-99% [3]
- A 64-slice multidetector CT is used with a slice thickness of 0.625 mm [4]

[1] *Di Cesare E, et al. CT and MR imaging of the thoracic aorta. Open Med. 2016*
[2] *Valente T, et al. MDCT evaluation of acute aortic syndrome. Br J Radiol. 2016*
[3] *Chiu KW, et al. Acute aortic syndrome: CT findings. Clin Radiol. 2013*
[4] *De-Li Zhao, et al. Multislice spiral CT angiography for evaluation of acute aortic syndrome. Echocardiography 2017*

Pitfalls CT for TBAD

- Aortic movement induces motion artefacts that can be misinterpreted as double lamina or intimal flaps[1]
- If aortic dissection is suspected, ECG-gating should be used to prevent misinterpretation
  - ECG gating synchronizes the CT scan and the cardiac cycle

[1] *Meier C, et al. Pitfalls in suspected acute aortic syndrome. Case Rep Emerg Med 2015*

Non-Gated ECG-Gated

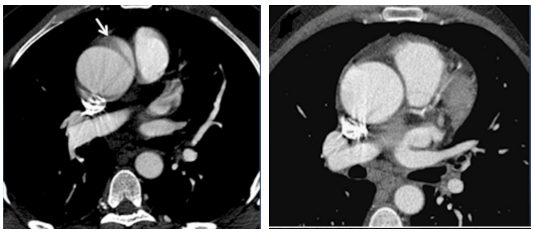
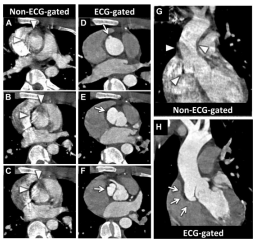


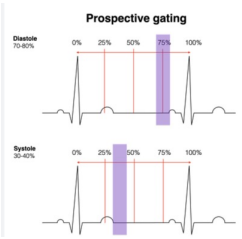
Image from: Valente T, et al. MDCT evaluation of acute aortic syndrome. Br J Radiol. 2016

Which patients?

- Dynamic information is useful in all patients
  - Blood pressure at the time of scanning
  - *Routine* ECG gated scans
- Prediction of dissection risk factors using dynamic information is important and applicable in patients **connective tissue disease**

Routine CTA = ECG-gated CTA!





Routine CTA = ECG-gated CTA!

The **upsides:**

- Accurate imaging
- Information on cardiac cycle
- Software already available on every CT scanner
- No extra costs
- No extra radiation, especially not when prospectively gated
- Only takes one minute to attach the ECG-leads

There are **no downsides**!

It is already available, all centers should use it