Measuring thoracic aortic diameter with different MR techniques: concordance of 3D CE-MRA (contrast-enhanced magnetic resonance angiography), 4D-trMRA (time-resolved contrast-enhanced magnetic resonance angiography) and 2D SSPP (steady-state free-precession) in evaluation of thoracic aortic diameter

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Purpose

MR angiography (MRA) has become an established technique for the evaluation of a variety of aortic diseases, particularly suited for evaluating the thoracic aorta. Over the past several years, contrast-enhanced MR angiography (CE-MRA) techniques have largely replaced unenhanced MRA techniques for the evaluation of the thoracic aorta because of their high spatial resolution and reliability. However, gadolinium-containing contrast agents are contraindicated during pregnancy, because have been shown to be teratogenic in animal studies, and in patients with advanced renal failure, because of their association with nephrogenic systemic fibrosis (NSF). Also, CE-MRA is usually performed at injection rates of 2-3 mL/s, which requires a large IV catheter. Thus, in patients who are pregnant, who have extremely poor renal function or who have inadequate IV access, the use of gadolinium-based contrast material may be contraindicated or not feasible. In these patients would be desirable MRA techniques that do not require contrast material but are of equal quality and reliability as CE-MRA techniques.

Objective of our study is to evaluate the concordance of 3D CE-MRA, 4D trMRA and 2D-SSPP sequences in measurement of thoracic aortic diameters.

Methods and Materials

From 2010 to 2011, 60 patients, with suspected or note aortic dilatation, underwent a MRI using a 1,5T MRI. Patients were divided in two groups: in 40 cases we use both3DCE-MRA and 2D-SSPP sequences while in the other 20 cases we use both 4DTRMRA and 2D-SSPP sequences.

Quantitative assessment of the image sets was performed by comparing the aortic lumen diameter. Indeed, all obtained images were evaluated by three independent radiologist, expert in the field, who measured aortic size at five specified locations (aortic bulb, sinotubular junction, middle of ascending aorta, aortic arch and middle of descending aorta). We use inter-operator concordance (interclass correlation, ICC), Pearson and t-test to evaluate the concordance of this sequences.

Images for this section:

Fig. 2: Fig 2. An exemplum of 3D CE-MRA (contrast-enhanced magnetic resonance angiography) sequence.

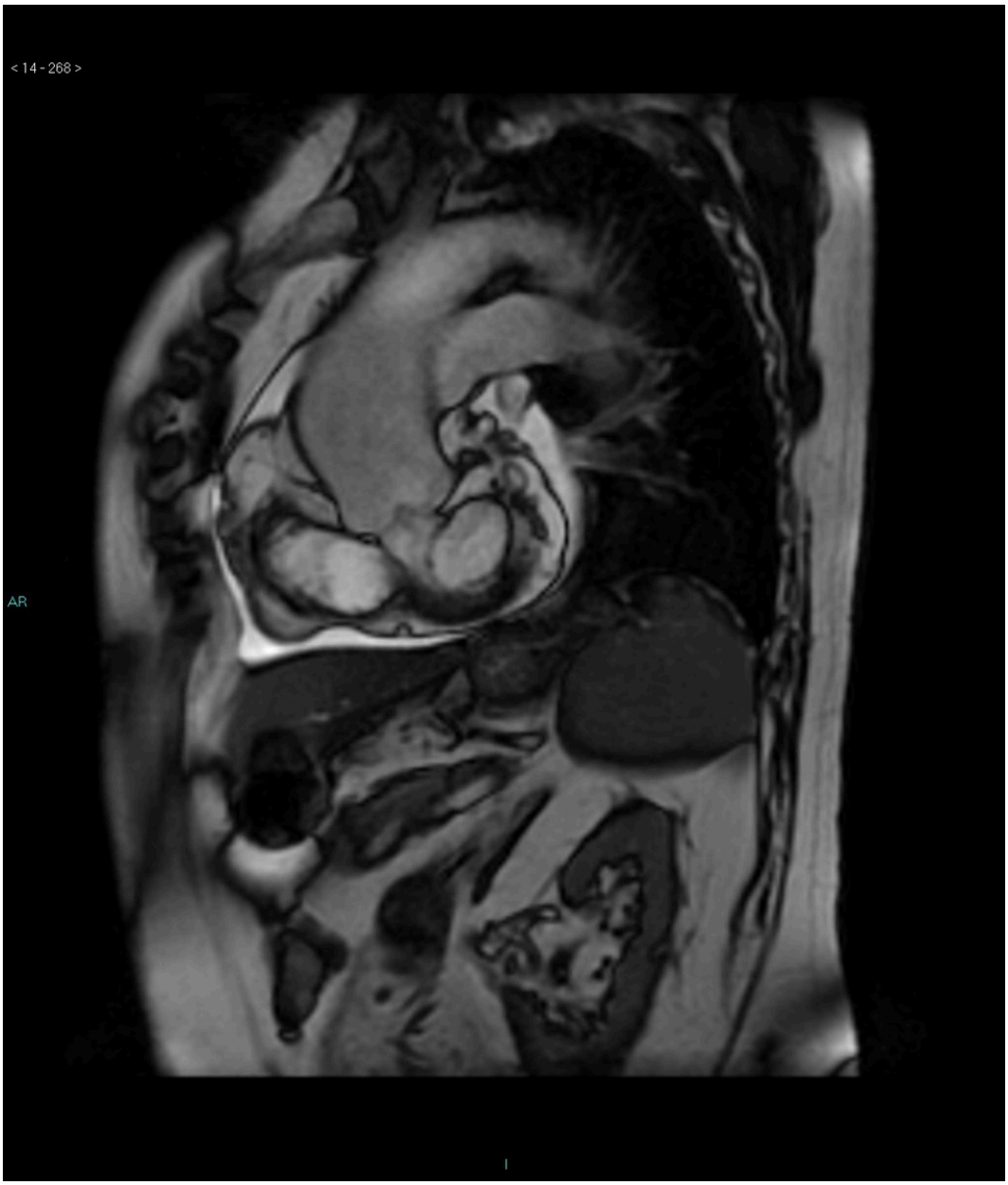

Fig. 3: Fig 3. A 2D-SSPP (steady state free precession) showing aortic bulb and ascending aorta.

Fig. 1: Fig 1. This image show the five locations of measurement (aortic bulb, sinotubular junction, middle of ascending aorta, aortic arch and middle of descending aorta).

Fig. 4: Fig 5. A 4D-TRMRA (time resolved contrast-enhanced magnetic resonance angiography) sequence.

Results

All sequences have high levels of inter-operator concordance (ICC>0.9). Especially at aortic bulb level, 4D - trMRA showed the best ICC (0.988), followed by 2D-SSPP (0.978) and by 3DCE-MRA (0.970), although we didn't found a statistically significant difference between the three sequences in none sites of measurement. Also, in both first group (3DCE-MRA vs 2D-SSPP) and second group (4DTRMRA vs 2D-SSPP), Pearson's correlation coefficient (r>0.9) and t-test suggest an optimal concordance between the sequences at the same measurement level.

Conclusion

Our data suggest that the three sequences have high levels of inter-operator concordance showing the feasibility of an unenhanced MRA technique for the evaluation of the thoracic aorta in patients who have a contraindication to a CE - MRA study. If diameter measurement is the main clinical concern, 2D-SSPP is a good choice good; on the other hand, between CE-MRA sequences, 4DTR-MRA is more advisable than 3DCE-RMA because need less quantity of contrast medium.

References

1) C.J. Francois, D. Tuite, V. Deshpande, R. Jerecic, P. Weale, J.C. Carr. Unenhanced MR Angiography of the Thoracic Aorta: Initial Clinical Evaluation. AJR 2008; 190:902-906