Journal of Cardiovascular Magnetic Resonance

BioMed Central

Oral presentation

Open Access

3.0 T contrast-enhanced whole-heart coronary magnetic resonance angiography for the evaluation of the cardiac venous anatomy

Heng Ma*[1], Qi Yang[1], Han Li[1], Xiangying Du[1], Jing An[2], Lixin Jin[3], Lan Ge[4], Renate Jerecic[3], Debiao Li[4] and Kuncheng Li[1]

Addresses: [1]Xuanwu Hospital, Capital Medical University, Beijing, PR China, [2]Siemens Mindit Magnetic Resonance Ltd, Shenzhen, PR China, [3]Siemens Ltd, China, Healthcare Sector, Shanghai, PR China and [4]Department of Radiology, Northwestern University, Chicago, IL, USA

Introduction

In cardiac resynchronization therapy (CRT), left ventricular (LV) pacing is achieved by positioning the LV lead in one of the tributaries of the coronary sinus (CS). Pre-implantation knowledge of the venous anatomy may help to decide whether transvenous LV lead placement for CRT is feasible. A recent study using navigator-gated whole-heart steady-state free precession coronary artery imaging demonstrates that MR can depict the anatomy of the venous system at 1.5 T [1]. Contrast-enhanced whole-heart coronary magnetic resonance angiography (CMRA) has been used to evaluate coronary artery disease at 3.0 T [2]. The purpose of the work is to assess whether contrast-enhanced whole-heart CMRA can be used to evaluate the coronary venous anatomy as well.

Purpose

To evaluate the value of 3.0 T contrast-enhanced whole-heart CMRA to depict the cardiac venous anatomy.

Methods

Fifty-one subjects (45 patients and 6 volunteers; 26 men; age 59 ± 11 years) underwent contrast-enhanced whole-heart CMRA at 3.0 T (MAGNETOM Tim Trio, Siemens) after written informed consent was obtained. Data acquisition was performed using ECG-triggered, navigator-gated, inversion-recovery prepared, segmented gradient-echo sequence with slow infusion of 0.15 mmol/kg gadobenate dimeglumine. A 32-element cardiac coil was used for data acquisition. Images were retrospectively analyzed and the visibility of the coronary veins was graded visually using a 4-point scale (1: poor, 2: moderate, 3: good, and 4: excellent). The presence of the following cardiac veins was evaluated: CS, posterior interventricular vein (PIV), posterior vein of the left ventricle (PVLV), left marginal vein (LMV), vein of Marshall (VM), and anterior interventricular vein (AIV).

Results

Data from 3 subjects were discarded on the basis of poor image quality. Table 1 lists the anatomic observations and quantitative data of the PIV, PVLV, LMV, and AIV.

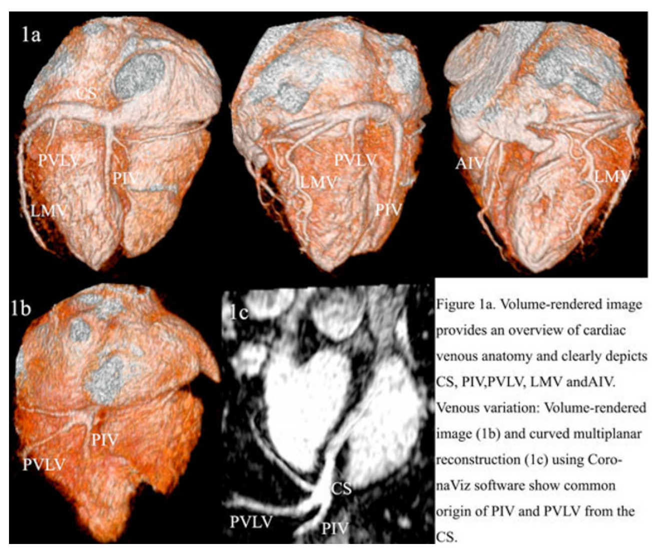

Figure 1

a Volume-rendered image provides an overview of cardiac venous anatomy and clearly depicts CS, PIV, PLV, LMV and AIV. Venous variation: Volume-rendered image (1b) and curved multiplanar reconstruction (1c) using CoronaViz software show common origina of PIV and PVLV from the CS.

Table 1: Anatomic observations and quantitative data

	Anatomic observation	Ostial diameter (cm)	Length (cm)	Distance from the ostium of the CS (cm)	Angle between the indentified veins and the CS or the great cardiac vein
CS	48 (100%)	0.82 ± 0.19 antereposteriot, 1.13 ± 0.26 suerpoinferior	-	-	-
PIV	48 (100%)	0.44 ± 0.14	3.08 ± 1.81	0.59 ± 0.40	81° ± 19°
PVLV	42 (88%)	0.29 ± 0.10	2.75 ± 2.46	3.00 ± 1.00	108° ± 26°
LMV	33 (69%)	0.23 ± 0.07	2.09 ± 1.98	6.48 ± 1.14	119° ± 30°
AIV	38 (79%)	0.28 ± 0.06	4.53 ± 1.56	9.91 ± 1.49	132° ± 17°
VM	0 (05%)	na	na	na	Na

Table 2: Distribution of visibility grades of the cardiac veins

	Visibility grade n (%)				
	1	2	3	4	Mean
CS	0 (0)	0 (0)	0 (0)	48 (100)	4.0
PIV	0 (0)	0 (0)	27 (56)	21 (44)	3.4
PVLV	0 (0)	0 (0)	26 (62)	16 (38)	3.4
LMV	2 (6)	5 (15)	18 (55)	8 (24)	3.0
AIV	0 (0)	0 (0)	27 (71)	11 (29)	3.3

Reconstructed image examples are shown in Fig. 1a (normal) and b (variation). The angle of the CS ostium was 59° ± 7°. The visibility is displayed in Table 2.

Conclusion

3.0 T contrast-enhanced whole-heart CMRA can clearly depict the cardiac venous anatomy.

References

1. Yang Q, *et al*: *J Am Coll Cardiol* 2009, **54(1):**69–76.
2. Stoeck CT, *et al*: *J Magn Reson Imaging* 2009, **29(6):**1293–9.