Whole-body MR detects unsuspected concomitant vascular disease in CHD patients

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Purpose

It is well known that approximately 60% of all patients with symptomatic atherosclerotic peripheral arterial disease (PAD) show simultaneous cerebro- and cardiovascular manifestations (coronary heart disease, CHD; cerebrovascular disease, CVD) of atherosclerosis, which underlines the systemic nature of this disease. The presence of atherosclerosis in one vascular territory, beyond the impact for this single pathology, often hints at other severe diseases. With the introduction of contrast-enhanced 3D sequences, MR angiography (MRA) has experienced a noteworthy expansion. Today it is possible to image the whole peripheral arterial tree from the carotids to the ankles with high accuracy. Cardiac fast cine-imaging for the evaluation of global and regional contractility as well as late-enhancement studies for the detection of myocardial scars have already entered clinical routine. In the cerebrum, the detection of microangiopathic changes can be regarded as a predictor of hemorrhagic and lacunar infarctions.

Materials and Methods

With the use of clinically established sequences, we developed a "whole-body" MR protocol consisting of a combination of four MR examination parts: head, heart (functional imaging and late enhancement study, exclusive of the coronary arteries), whole-body arterial tree (AngioSURF, MR Innovation, Essen, Germany on a 1.5T Sonata system, Siemens Medical, Erlangen, Germany), and thoracic and abdominal organs (axial 3D gradient echo imaging).This protocol theoretically offers a comprehensive survey over possible arterial pathologies and consecutive structural changes in the dependent organs supplied by the various vessels. We examined 160 patients (mean age 66.4y). The prevalence of vascular disease in the assessed vascular territories was assessed and compared to patients' histories.

Results

The protocol requires a total in room time of 40 minutes. Of all 160 CHD patients, 78 (48.8%) had a stenosis >50% in at least one artery (other than the coronaries); 28 (17.5%) had relevant renal artery stenoses, and 24 (15.0%) showed relevant intra- and/or extra cerebral internal carotid artery stenoses.

The rate of previously unknown myocardial and cerebrovascular infarctions was 14.8% and 68.8%, resp. (Table 1).

Conclusion

This whole-body atherosclerosis MR screening program allows detecting previously unknown concomitant vascular disease in CHD patients. Its prospective value should be assessed in further studies.

Fig. 1: Normal MR angiogram

	Medical history	MR findings	Patients N	Patients %	Observed agreement N	Observed agreement %
Myocardial	+	+	69	45.1	102	66.7
infarction	+	-	39	25.5		
N_{tot}=153	-	+	12	7.8		
	-	-	33	21.6		
Stroke	+	+	5	3.2	139	89.6
N_{tot}=155	+	-	5	3.2		
	-	+	11	7.1		
	-	-	134	86.5		
Ilio-femoral-	+	+	11	7.1	130	84.4%
popliteal artery	+	-	7	4.5		
stenoses > 50%	-	+	17	11.0		
N_{tot}=154	-	-	119	77.3		

Table 1: Correlation between patients' history and MR findings. N_{tot}: number of patients with available corresponding anamnestic data.