Moving-table MR angiography in a case with multiple peripheral arterial aneurysms in the lower extremity


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Özet

Birden fazla alt extremite periferik arter anevrizması olan vakada hareketli-masa MR angiografisi

Dijital subtraksiyon anjiografisi (DSA) alt extremite de normal arteriyel anatominin ve vasküler lezonların gösterilmesinde ve postoperatif arteriyel yapıların değerlendirilmesinde altın standarttır. DSA’nın bazı dezavantajlarında bulunmaktadır. Son yıllarda vasküler lezonların tanıısı, değerlendirilmesi ve takibinde üç boyutlu, kontrastlı hareketli-masa MR angiografisi (3B K MRA) alternatif bir yöntem olarak geliştirilmiştir. Biz birden fazla alt extremite anevrizması olan bir olgu nedeniyle alt extremite perifer arter anevrizmalarının preoperatif ve postoperatif değerlendirilmesinde hareketli-masa 3B K MRA bulgularını sunuyoruz.

Anahtar kelimeler: Angiografi, Manyetik Rezonans, Anevrizma, Grefitler, Periferik Vasküler Hastalıklar

Abstract

Digital subtraction angiography (DSA) is the gold standard method to demonstrate normal arterial anatomy and the vascular lesions and evaluate the arterial structures postoperatively in the lower extremities. DSA has also some disadvantages. In the recent years, moving-table three-dimensional contrast enhanced MR angiography (3D CE MRA) is developed as an alternative method in the diagnosis, evaluation and follow-up of the vascular lesions. We described the moving-table 3D CE MRA findings in the preoperative and post operative evaluation of a case with multiple peripheral arterial aneurysms in the lower extremity.

Key words: Angiography, Magnetic Resonance, Aneurysm, Grafts, Peripheral Vascular Diseases

Introduction

Moving-table three dimensional MR angiography can demonstrate the peripheral arterial structures from aortoiliac arteries to the arteries of the ankles in an optimum quality in a short time (1-4). The gold standard method in demonstrating an arterial lesion in the lower extremity is still digital subtraction angiography (DSA) (5). The requirement of arterial intervention and catheterization, exposure to ionizing radiation and the risk of allergy and the nephrotoxic effect of the iodinated contrast material are the drawbacks of DSA. The risk increases with repetitive preoperative and postoperative DSAs (6). When the drawbacks of DSA and the advantages of three-dimensional contrast enhanced MR angiography (3D CE MRA) are taken into account, it is not surprising that the number of the arterial vascular lesions evaluated by MR angiography increased in recent years. We described moving-table 3D CE MRA findings in the preoperative and postoperative evaluation in a case with multiple peripheral arterial aneurysms in the lower extremity.

Case Report

A 46-year-old male was admitted to the hospital for a mass lesion in his right thigh. On Doppler ultrasonographic examination, a lesion consistent with aneurysm, of the right superficial femoral artery was detected. No additional clinical findings and no remarkable abnormalities in the laboratory tests were found in the case. An MR angiography examination was planned.

MR angiographic images were obtained by using 1.5 T MR (Signa, General Electric, Milwaukee, WI). The examination area was divided into three parts from the aortiliac level as pelvis (first segment), thigh
(second segment) and cruris (third segment). The extremities were surrounded with a muff to prevent the interposition of the venous structures. Images were obtained in three different planes (axial, sagittal, coronal) by 2D fast spoiled gradient-echo (SPGR) sequence. Then, the arterial structures of these three segments were determined roughly. 3D volume TOF SPGR sequence was applied (TR/TE 5.2/1.2 msec, matrix 256x128, slice thickness 3-4 mm, number of slices 30-40, FOV 44 cm) with SmartStep technique. Mask images of three segments were obtained before administration of contrast material. To image the first segment, aorta was marked at the level of renal arteries. Once the contrast agent was administrated, scanning was made from the marked area for 40 seconds. When the contrast agent was introduced into the artery, images were acquired in totally 25 seconds with 4 seconds delay and with breath-holding. Imaging of the second segment was accomplished in 18 seconds and that of the third one in 28 seconds with automatic table movement. 30 cc contrast material was used during the procedure [Dotarem (gadoterate meglumin, Gd-DOTA) Guerbet, Roissy, France]. First part of the contrast material of 15 cc was administered in approximately 5 seconds and the residual part in a manner of 1 cc per second. Then 20 cc Saline was administered in approximately 20 seconds. The total examination time was approximately 30 minutes.

On preoperative MR angiography, three peripheral aneurysms were visualized, one extending from right external iliac artery to right common femoral artery and the others in the right and left superficial femoral arteries (Figure 1A). Patient was operated without any further radiologic investigation. Patient was operated on under general anesthesia. Upon dissecting the aneurysm extending from right external iliac artery to right common femoral artery 8 mm PolytetraFluoroethylene (PTFE, Gore-Tex®) iliofemoral graft was interposed. Deep femoral artery was anastomosed to the graft in end-to-side fashion. Femoropopliteal (distal popliteal) bypass graft (6 mm PTFE, Gore-Tex®) was performed for the distal aneurysm on the right side.

On MR angiography obtained one week after the operation, stenosis and anastomatic pseudoaneurysm was seen at distal site of the right iliofemoral graft. Seventy to eighty percent stenosis was found at distal anastomotic site of the right femoropopliteal bypass graft (Figure 1B). The histopathological examination of the material revealed, the aneurysm secondary to atherosclerosis. Left femoral aneurysmectomy and femoropopliteal graft (6 mm PTFE, Gore-Tex®) interposition were performed for the left superficial femoral artery aneurysm one month after the first operation. After the second operation patient complained about the right lower extremity claudication. Pulses could not be found at the right femoral level. MR angiography was repeated. Total occlusion of the right iliofemoral graft was visualized. Stenosis in the proximal anastomosis site of the left femoropopliteal graft was also detected (Figure 1C).

**Figure 1.** Three dimensional contrast enhanced MR angiography of a 46-year-old male revealed three peripheral aneurysms (thick arrows), one within the right common femoral artery and the others within the right and left superficial femoral arteries (A). Postoperative MRA was performed one week after the right iliofemoral and femoropopliteal graft interposition (B). Just distal to the iliofemoral graft, stenosis and anastomatic pseudoaneurysm is found (arrowhead). Stenosis was seen at distal anastomotic site of the right femoropopliteal bypass graft. Aneurysmectomy and femoropopliteal graft interposition were performed for left femoral artery aneurysm. Patient complained about right lower extremity claudication and MRA was performed for the third time (C). Total occlusion of the right iliofemoral artery is seen. Stenosis is found at the proximal anastomosis site of the left femoropopliteal graft.

**Discussion**

In the present case report, we point out that 3D CE MRA could be used as an alternative method to DSA in the preoperative evaluation of lower extremity arteries, peripheral aneurysms, and in the assessment of the effectiveness and complications of the peripheral arterial graft operations.
Doppler ultrasonography is an effective, noninvasive and cheap modality in revealing the vascular lesions and in evaluating the bypass grafts. It also has some disadvantages such as being a user-dependant modality, not revealing the collateral vascular structures and having the probability of overlooking the additional lesions. Therefore, in cases when a graft lesion is suspected or visualized, detailed investigation with further modalities such as DSA is imperative (7-9). Although DSA is the gold standard method in the evaluation of the peripheral arterial system; it also have some important drawbacks (4, 10). Nowadays MR angiography is considered to be a reliable method in the diagnosis and follow-up of vascular lesions. Since arterial catheter is not used, risks such as pseudoaneurysm, hemorrhage and graft injury due to catheterization are not seen (11). Contrast enhanced MRA especially when performed with moving-table system can easily detect lower extremity lesions with a high sensitivity and specificity. It can be an alternative method to DSA (6, 11). Most of the studies in the literature are focused on the diagnosis of the peripheral arterial disease by MR angiography, studies concerning the evaluation of postoperative bypass grafts are very limited. In a study, the sensitivity and specificity of the MR angiography to detect the stenosis which are more than 50 %, is 91% and 92% respectively. The diagnosis is almost certain for the occluded segments (12). In another study, the sensitivity and specificity of MR angiography, in the detection of the hemodynamically significant stenosis were reported as 100% and 91% respectively (13).

In conclusion; with moving-table 3D CE MRA, complications such as graft injury, hemorrhage or pseudoaneurysm and hazards of iodinated contrast material such as allergy and nephrotoxicity is not possible. There is no risk of ionizing radiation exposure, as well. The duration of the examination, which is at most 30 minutes, is much shorter than DSA. We suggest that 3D CE MRA may be used as an alternative method to DSA in the preoperative diagnosis of peripheral aneurysms and in the postoperative evaluation of peripheral arterial grafts.

References:


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