Vascular calcifications in patients on hemodialysis

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Abstract

Vascular calcifications (VC) in ESRD patients are strongly associated with cardiovascular morbidity and mortality. There are two different types of VC: arterial media calcifications (AMC), a non occlusive condition, related to a mineral metabolism disturbances, and atherosclerosis with intima calcifications (AIC) of atherosclerotic plaques. The aim of this study was to evaluate arterial and intima calcifications by plain radiography and B-mode ultrasonography in HD patients, and to analyze potential risk factors on their appearance. Study included 73 HD patients (33 males), mean (±SD) age 54,30±8,52 years, and HD duration of 115,56±60,32 months. AMC were detected by plain radiography of pelvis, hands and region of vascular access. AIC were detected by B-mode ultrasonography of common carotid arteries. The influence of potential risk factors (age, gender, HD duration, diabetes, Ca, P product, plasma phosphorous, total cholesterol and albumen) on the appearance of overall AMC, AMC in different regions and AIC was also analyzed.
AMC were detected in 41(56,2%) patients: in pelvis 26(35,3%), hands 7(9,6%), and in region of vascular access 28(38,4%). In group of patients with overall VC detected by plain radiography, there was a strong association with male gender ($p<0,01$), HD duration ($p<0,01$), low TC concentration ($p< 0,05$) and diabetes. VC in region on hands were strongly associated with diabetes ($p<0,01$) and hyperphosphatemia ($p< 0,05$). VC in region of AVF is strongly associated with younger age ($p< 0,05$), diabetes ($p<0,01$) and duration of HD ($p<0,001$). There were no significant differences between parameters in group of patients with VC in region of pelvis. Frequency of calcified plaques in carotid arteries in HD patients was in 76 %. Patients with plaques were significantly older ($p<0, 01$).
In conclusion, atherosclerosis with intima calcifications are more frequent then arterial media calcifications in HD patients. AIC was usually observed in older patients and AMC was closely associated with male gender, diabetes and HD duration. Prevalence of AMC in the region of vascular access is higher in younger patients with diabetes and longer HD duration. Prevalence of AMC in the region of hands is higher in patients with diabetes and higher phosphorous concentration.

Key words: dialysis, vascular calcifications, atherosclerosis

Introduction

Cardiovascular diseases are the leading cause of death in patients with end stage renal diseases (ESRD) (1-3). The very high prevalence of cardiovascular complications in those patients is due to influence of traditional risk factors, such as older age, diabetes, dislipidemia, hypertension and anemia. Recent studies indicate that cardiovascular calcifications represent an additional non-traditional risk factor (4). There are two different types of vascular calcifications. One affects the intimal layer of arteries and occurs within atheroclerotic plaques. The other involves the medial wall, or tunica media of arteries, i.e. Mönckeberg`s sclerosis (1-5).
Plain radiography is a metods for detection of intimal pachy and diffuse, angiographic like calcifications, ehosonography for carotid and femoral arteries and aorta atherosclerotic plaques, and echocardiography for detection of valve calcifications. New techics such are spiral CT and EBCT are very sensitive methods for detection coronary and calcifications in aorta.
The objectives of the study were detection of arterial media and intima calcifications in HD patients by plain radiography and B-mode ultrasonography and evaluation of potential risk factors on their appearance.

Patients and methods

Study included 73 patients, (33 male, 40 female), mean ages 54, 30± 8,52 years, and HD duration of 115,56±60,32 months.
Plain radiography included region of hands, vascular access, pelvis. Pachy calcifications were excluded.
B-mode ultrasonography were performed using ALOCA SSD 2000 sistem equipment with 7.5 MHZ linear transducers. A trained sonographer scanned the both sides of common carotid arteries, the carotid bulbs and the first 2 cm of internal and external carotid arteries. Carotid plaque was defined as echogenic structures showing protrusion into lumen with focal widening that was 50% greater than IMT of adjacent sites.
Demografic data such as gender, age, smoking and duration of HD, and comorbidity such as diabetes were analysed. Laboratory parameters: phosporous, albumin, total holesterol concentrations and Ca/PO4 product were also analysed.

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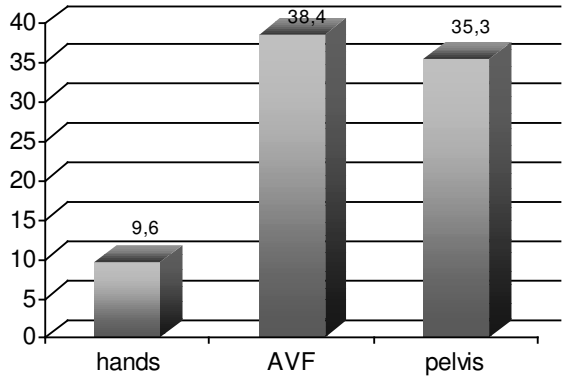
Results

The frequency of owerall arterial media calcifications evaluated by plain radiography was in 56% of HD patients (Figure 1).

Fig 1. Frequency of arterial media calcifications evaluated by plain radiography

The most frequent AMC was in region of vascular access - 38,4% patients. The frequency of AMC in region of pelvis was in 35,3% patients and in region of hands was in 9,6% patients (Figure 2).

Fig 2. Frequency of media calcifications in different regions

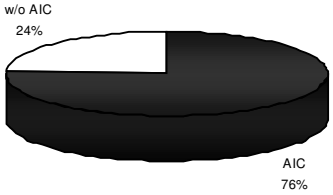


Risk factors for vascular calcifications apperance were analysed in group of patients with owerall media calcifications. Frequency of male gender and diabetes was significantly higher in this group of patients (53,65% vs. 28,13%; p<0,01), (6 vs 0) and duration of HD was significantly longer (132,85± 55,75 vs.93,41±59,49; p<0,01). Concentrations of total cholesterol were significantly lower (5,22± 1,44 vs.5,84± 1,44; p< 0,05).

In patients with AMC in region of hands, frequency of diabetes was significantly higher (28,57% vs.6,06%; p<0,01) and also mean phosphorous concentrations (1,93±0,45 vs. 1,64±0,45; p<0,05). Patients with AMC in region of vascular access were significantly younger (51,68±8,71 vs. 55,82±8,07; p<0,05), duration of HD was significantly longer (145,89 ± 57,07 vs. 96,69 ± 54,83; p<0,001), and frequency of diabetes was significantly higher (17,85 % vs. 2,22%; p<0,01) . There were significant differencies between groups in region of pelvis (Table 4).

The frequency of atherosclerotic plaques evaluated by B – mode ultrasonography was in 76% HD patients (Figure 3). Patients with atherosclerotic plaques were significantly older 55,88± 7,68 vs.48,69± 9,24; p < 0,05).

Fig 3. Frequency of arterial intima calcifications evaluated by B – mode ultrasonography



Conclusions

Atherosclerosis with intima calcifications are more frequent then arterial media calcifications in HD patients. AIC was usually observed in older patients. AMC was closely associated with male gender, diabetes and HD duration. Prevalence of AMC in the region of vascular access is higher in younger patients with diabetes, longer HD duration and lower holesterol concentrations. Prevalence of AMC in the region of hands is higher in patients with diabetes and higher phosphorous concentrations.

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