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Early and Rarely – A Unique Case of Calcification in Stage 2 Chronic Kidney Disease

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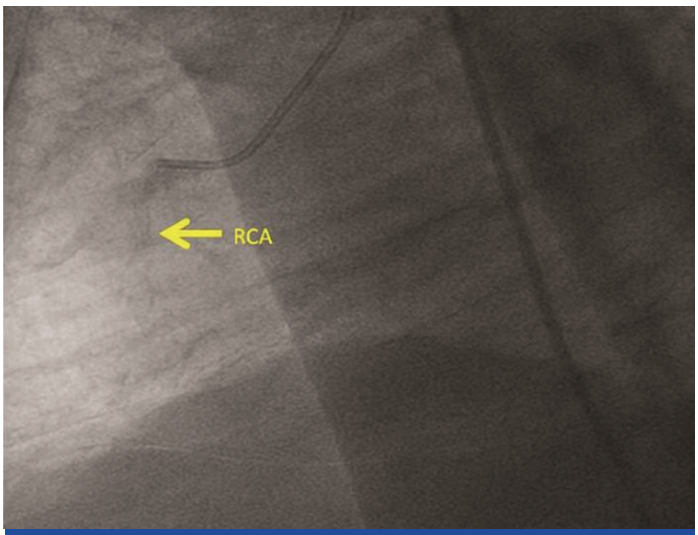
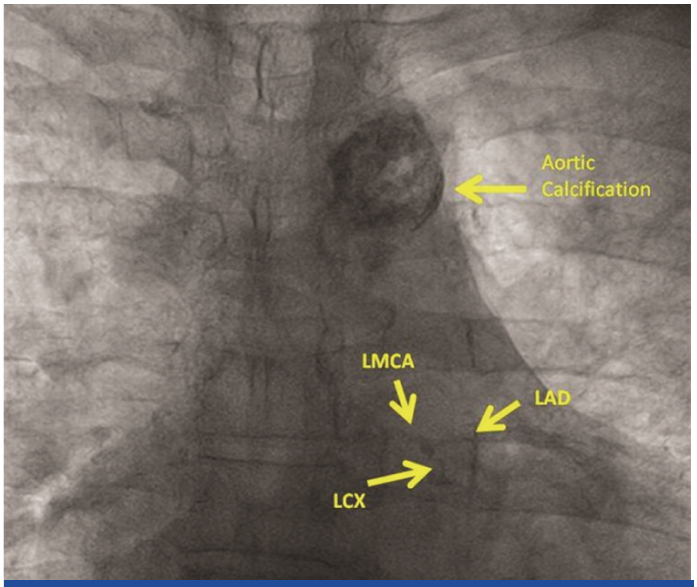
A 60-year-old male presented to the hospital with ischemic heart disease (IHD), unstable angina and acute left ventricular failure. The patient had a history of diabetes mellitus (DM) and hypertension for last 10 years. He was also found to have renal dysfunction for last four months (CKD stage 2). Patient was taken for diagnostic coronary angiography, after taking precautions to prevent contrast induced nephropathy (CIN). For coronary angiography, femoral route was navigated initially, but the wire did not cross the lesion, so radial route was opted for performing angiography. The coronary angiogram revealed extensive calcification of all coronary arteries. Left anterior descending (LAD) artery and left circumflex (LCX) artery showed insignificant disease but proximal mid right coronary artery (RCA) junction showed 80% stenosis [Table/Fig-1,2]. We also observed unusual 'round magic ball' like appearance of extensive aortic calcification.

The term 'chalky arteries' is no more a 'rare' term when, debating about chronic kidney disease. The aortic and vascular calcification is an active metamorphic process involving phenotypic change of vascular smooth muscle cells (VSMCs) into bone forming cells. A fusillade of various events like high phosphate environment, excess of calcium, high dose of active vitamin D therapy and increased expression of osteoblastic markers like Runx-2, alkaline phosphatase and osteocalcin causes mineralization of VSMCs [1]. After phenotypic change in VSMCs and production of bone matrix protein, the role of matrix vesicles and apoptotic bodies come into picture to concentrate calcium and phosphate in preparation for mineralization [2].



[Table/Fig-1]: Right coronary artery (RCA) calcification



[Table/Fig-2]: Calcification of aorta, left main coronary artery (LMCA), left anterior descending (LAD) artery and left circumflex artery (LCX)

The voluminous literature demonstrates that prevalence of vascular calcification (VC) in CKD patients ranges from 47% to 92% [3]. But, the prevalence is mostly spotted in end stage renal disease (ESRD) [4]. A study reported the prevalence of coronary artery calcification (CAC) in young dialysis and peritoneal dialysis patients to be 80% [5].

The uniqueness of the case lies in the stage of chronic kidney disease, at which extensive calcification was observed. The aortic and coronary calcification in our case is seen in stage 2 of CKD, which is considered to be quite germinal for calcification. But still, in one of the pre-clinical studies, it was demonstrated that CKD stimulated vascular calcification begins early in the disease prior to even hyperphosphatemia [6]. The early stimulated calcification process worsens as the disease progresses [7]. This holds ground for our case, but the extensive calcification observed in all the coronary arteries [Table/Fig-1,2] at stage 2 CKD, directs us to look beyond the obvious. In a study by Yamada et al., multivariate logistic regression analysis was carried out, and it demonstrated that CKD in combination with DM, as well as hypertension in combination with CKD, were key relationships affecting the risk of arterial calcification, especially at the aortic arch and its orifices [8]. In our case, the patient has hypertension and DM for last 10 years. These co-morbid conditions may act as aggravating factors, along with CKD, in early predisposition of aortic and vascular calcification.

The other typical presentation of the case is 'round magic ball' like appearance of aortic calcification [Table/Fig-2]. Usually, the calcification is present in the form of pigmentation adhered to the wall. But in our case, it is observed as round ball of calcified tissue in aorta. To the best of our knowledge, till now, none of the cases have reported such a distinct and startling ball-like calcification of aorta.

In such cases, radial route should be preferred over femoral route. In our case, we initially tried femoral route, but the wire did not cross the calcific part of aorta at the junction of aortic arch and descending aorta. Aggressive manipulation in that part may lead to cerebral embolism. The radial route overcomes the junction of aortic arch & descending aorta, thereby reducing the chances of cerebral embolism.

To sum up, the case provides insight into a different aspect, where calcification seems not only a threat to ESRD patients, but also as an early culprit. Aortic and vascular calcification in patients with CKD is a multifactorial interwining process, the pathologic mechanisms leading to such early calcification still remains to be elucidated.

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