A case of ischemic osteopathy in a hemodialysis patient with advanced peripheral artery disease

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Abstract

Peripheral artery disease (PAD) or arteriosclerosis obliterans is a lethal complication highly prevalent in pre-dialysis CKD and dialyzed patients. PAD is driven by atherosclerotic process and causes ischemia of the affected limb. Given that normal bone metabolism is based on sufficient blood supply and PAD decreases intraosseous blood flow of the affected limb, it is probable that PAD can directly cause ischemic osteopathy or osteoporosis in affected limbs. We herein present a 69-year-old female patient receiving 18 years of maintenance hemodialysis therapy was hospitalized for the treatment of bilateral PAD. Angiography showed a diffuse stenosis of the right superficial femoral artery and total occlusion of the left superficial femoral artery. Right ankle brachial index (ABI) was 0.83, whereas left ABI was unmeasurable. Notably, T score of the bone mineral density (BMD) in the right calcaneus measured by quantitative ultrasound was -1.4 , while that in the left calcaneus was -2.2 , showing a huge difference between BMD in the bilateral calcaneus. Metal stent was inserted to the right superficial femoral artery, whereas femoropopliteal bypass surgery was performed for the left limb. After the surgery, her right and left ABI were 0.96 and 0.92, respectively. Our case typically showed the clinical significance of sufficient blood supply to the bone for the normal bone metabolism and reminds us of the potential need to conduct further research on the association between PAD and ischemic osteopathy in patients with CKD.

Dear Editor,

Peripheral artery disease (PAD) or arteriosclerosis obliterans is a lethal complication highly prevalent in hemodialysis patients. PAD is driven by atherosclerotic process and causes ischemia of the affected limb. Epidemiological studies have shown the association between PAD and systemic osteoporosis. This association may be simply explained by shared risk factors in these two pathologies. However, given that normal bone metabolism is based on sufficient blood supply and PAD decreases intraosseous blood flow of the affected limb, it is probable that PAD can directly cause ischemic osteopathy or osteoporosis in affected limb [1].

A 69-year-old female patient receiving 18 years of maintenance hemodialysis therapy was hospitalized for the treatment of bilateral PAD. Angiography showed a diffuse stenosis of the right superficial femoral artery and

total occlusion of the left superficial femoral artery. Right ankle brachial index (ABI) was 0.83, whereas left ABI was unmeasurable. Notably, T score of the bone mineral density (BMD) in the right calcaneus measured by quantitative ultrasound (ALOCAL AOS-100NW, Hitachi Ltd, Tokyo, Japan) was -1.3 , while that in the left calcaneus was -2.2 , showing a huge difference between BMD in the bilateral calcaneus. Metal stent was inserted to the right superficial femoral artery, whereas femoropopliteal bypass surgery was performed for the left limb. After the surgery, her right and left ABI were 0.96 and 0.92, respectively. The T scores of BMD in the right and left calcaneus measured at 3 years after the stent insertion and bypass surgery was -1.4 and -1.8 , respectively, showing the marked improvement in the BMD of the left calcaneus.

Patients with osteoporosis show compromised bone marrow perfusion. Furthermore, blood supply in aged people are decreased compared with younger people and periosteal blood supply, not medullary one, is dominant in senescent bone. Importantly, hypoxia causes bone degradation and leads to osteoporosis. One study showed that femoral neck bone volume in the affected limb was decreased in 13 patients with unilateral PAD compared with matched control

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subjects [2]. Another study showed that significant stenosis of iliac artery, which supplies blood to the femoral head and lumbar spine, was associated with a significantly decreased bone volume at these anatomic sites in patients with PAD, showing the direct involvement of decreased blood flow with decreased BMD [3]. These results and our case indicate that atherosclerosis manifested as PAD decreases intraosseous blood supply, followed by ischemic osteoporosis in the affected limb. However, we cannot deny that mechanical unloading of the affected limb might have contributed to the decreased bone volume in the present case. Hence, further clinical and histological investigation are necessary to determine whether PAD actually causes ischemia-related osteopenia or osteoporosis in the affected limb or decreased bone volume is just a manifestation of mechanical unloading related to disuse syndrome.

Compliance with ethical standards

Conflict of interest The authors have declared that no conflict of interest exists.

Human and animal rights All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional review board and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent A written informed consent for submitting this case report to medical journals was obtained by the patient.

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