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Letter to the Editor

Polymethylmethacrylate-induced Modic 1 changes following percutaneous vertebroplasty and intradiscal cement leakage: A case report



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Percutaneous vertebroplasty aims at decreasing vertebral fracture-related acute back pain. It is offered when pain persists despite first-line treatment [1]. The Cochrane collaboration highlighted potential harms [1]. We report a case of intradiscal cement (IDC) leakage with subsequent adjacent Modic 1 changes and persistent low back pain (LBP).

In November 2016, after falling down the stairs, a 72-year-old woman reported acute LBP revealing a L2 fracture. She had no remarkable medical history. Spinal MRI showed a recent osteoporotic L2 compression fracture with oedematous signal and cortical disruption involving L2 superior endplate and mild L1-L2 and L2-L3 degenerative disc diseases (DDD), without adjacent Modic changes (Fig. 1). In January 2017, because LBP persisted despite bed rest, morphine and thoraco-lumbar brace, she had a

L2 vertebroplasty (7cc of polymethylmethacrylate) and complementary T12 and L1 vertebroplasties on February 2017. No immediate pain increase was reported and no other complications than L1-L2 IDC leakage occurred.

In July 2017, because LBP persisted (60/100 on a numeric rating scale), the patient was referred to our department. On physical examination, she was afebrile. Spinal stiffness and discogenic pain were present from T12 to L2. Neurological examination was unremarkable. Blood cell count, C-reactive protein and histological analyses of vertebral biopsies were normal. MRI showed Modic 1 changes adjacent to L1-L2 IDC, without adjacent vertebral fracture (Fig. 2). Infectious spondylodiscitis was ruled out based on clinical, biological and imaging findings. The patient was treated with supervised and home-based exercises. She reported a short-term 50%-reduction in LBP intensity. One-year follow-up, MRI showed a switch from L1-L2 Modic 1 signal to Modic 0 and no rapid destructive disc disease.

IDC leakage occurs in 8.2 [2] to 38.3% [3] of percutaneous vertebroplasties. In a retrospective study of 292 treated vertebrae, Ding et al. identified 3 risk factors of IDC leakage: fracture severity ($RR=2.4[1.0-5.9]$), cortical disruption ($RR=1.4[1.1-1.8]$) and cleft ($RR=1.2[1.1-1.5]$) [4]. In the absence of cortical disruption, IDC leakage never occurs [5]. Evidence suggests that IDC could promote DDD. In 20 patients with IDC compared to 104 without, followed-up for 20.6 months, 29.4 versus 12.8% had a decreased disc height [6]. DDD severity is associated with greater amount of IDC [7]. IDC also increases the risk of adjacent vertebrae fracture [8]. In human cadavers, IDC induces changes in segmental biomechanics

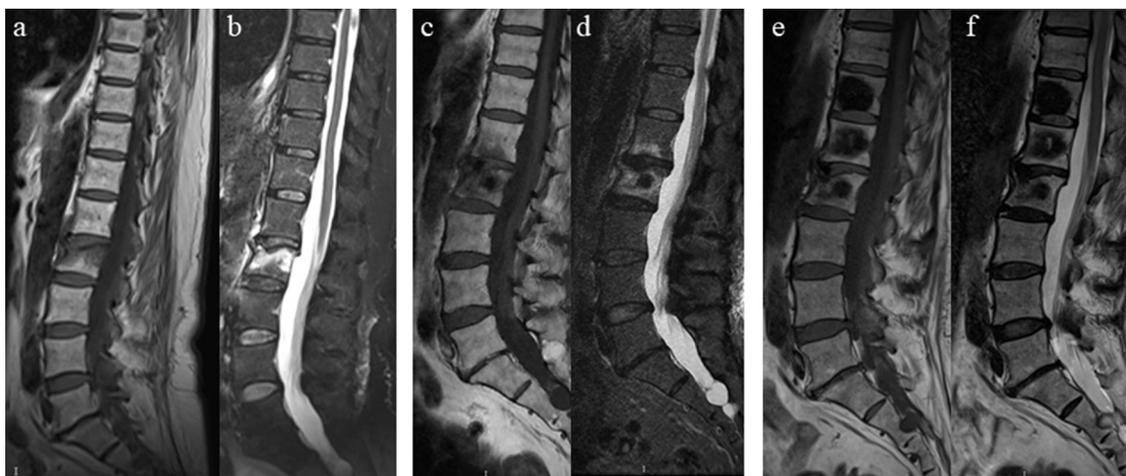


Fig. 1. Sagittal views of dorso-lumbar MRI in T1- (a) and T2 Fat Sat (b)-weighted sequences before vertebroplasty showing a recent L2 compression fracture with T1 hypointense and T2 hyperintense oedematous signal and cortical disruption involving L2 superior endplate and mild L1-L2 and L2-L3 degenerative disc diseases, without adjacent Modic changes. Sagittal views of dorso-lumbar MRI in T1- (c) and T2 Fat Sat (d)-weighted sequences after the first vertebroplasty showing a reduction in L2 oedematous signal but cement leakage in L1-L2 disc with Modic 1 changes involving adjacent L1 inferior vertebral endplate subchondral bone. Sagittal views of dorso-lumbar MRI in T1- (e) and T2 (f)-weighted sequences at one-year follow-up MRI showing a switch from Modic 1 to Modic 0 signal.

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Fig. 2. Sagittal views of dorso-lumbar X-ray (left panel) and CT-scan (right panel) after vertebroplasties showing the amount of cement in the intervertebral space through the disrupted cortical and ruling out adjacent L1 vertebral fracture.

[9]. In rabbits and dogs, IDC promotes DDD. Its severity is associated with time period after injection, IDC quantity and type [10]. Polymethylmethacrylate induces more severe DDD than calcium phosphate, and 24 weeks after polymethylmethacrylate ID injection, MRI shows Modic 1 changes [10]. Both cement types affect *nucleus pulposus* cells' viability, in a time- and dose-dependent manner, and the expression of genes involved in matrix metabolism (e.g. collagens, aggrecan, small proteoglycans) [11].

In our patient, cortical disruption was a risk factor for IDC leakage. In such cases, one might consider using calcium phosphate- or sulfate-based bone cements [11] or injecting a smaller amount of cement. IDC leakage is often considered as an unremarkable complication of percutaneous vertebroplasties. However, persistent LBP in patients who had IDC must prompt to investigate other causes of pain such as adjacent vertebral fracture and IDC-induced Modic 1 changes, because treatments are different [12].

Disclosure of interest

The authors declare that they have no competing interest.

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