



CASE REPORT

# Application of full-balance-integrated technique in asymmetrical pedicle subtraction osteotomy for treating fixed degenerative lumbar kyphoscoliosis



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## KEYWORDS

full-balance-integrated technique;  
kyphoscoliosis;  
pedicle subtraction osteotomy;  
sagittal balance

**Summary** A 56-year-old female patient experienced mild back pain, which radiated to her legs, as well as intermittent claudication for 5 years. The symptoms became more pronounced on sitting and walking, and conservative therapy was ineffective in relieving pain. Preoperative whole-spine X-ray scans revealed degenerative lumbar kyphoscoliosis. Asymmetrical pedicle subtraction osteotomy was performed and a convex-sided posterolateral wedge osteotomy was applied to correct the scoliosis and restore sagittal balance. Pre- and postoperative sagittal balance was measured using a C7 plumb line for both scans, and the difference was calculated. Lumbar scoliosis was measured using the Cobb angle. The degree of correction required to restore sagittal alignment was 25°, which was determined on the basis of the full-balance-integrated technique. The operative time and blood loss were 365 minutes and 1620 mL, respectively. Postoperatively, the lumbar scoliosis decreased from 10.2° to 2.0°, and the sagittal vertical axis decreased from 7.6 cm to 3.3 cm. The visual analog scale and Oswestry disability index scores indicated that the patient was relieved of the symptoms after the surgery. No complications were observed during the follow-up period.  
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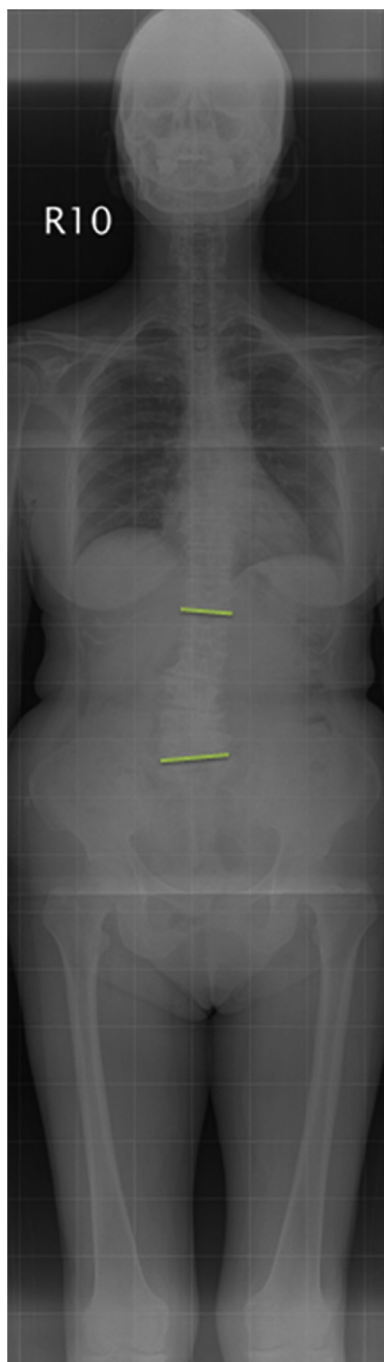
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## 1. Introduction

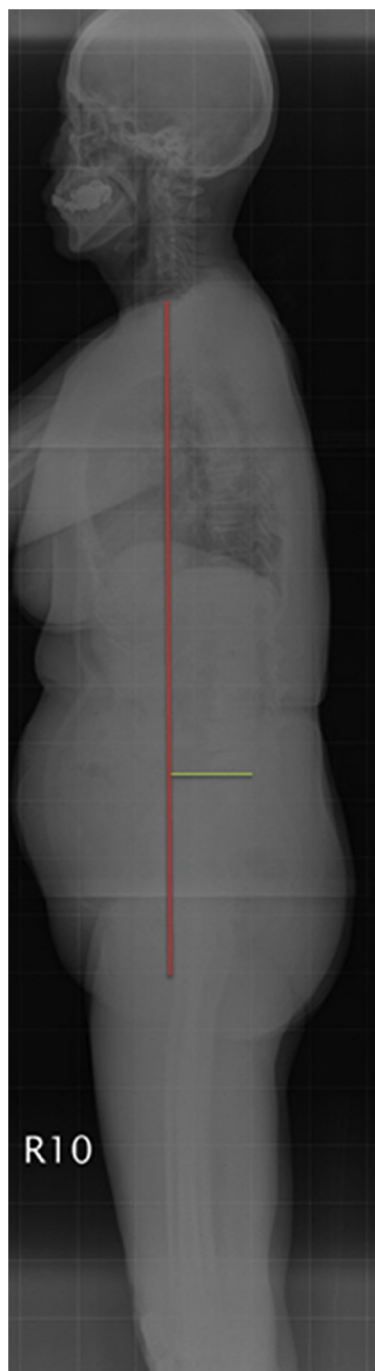
Degenerative sagittal imbalance is either flexible or fixed.<sup>1</sup> An anterior release and posterior instrumentation can be used to correct the deformity of patients with flexible degenerative sagittal imbalance, whereas pedicle subtraction osteotomy (PSO), commonly applied for treating

ankylosing spondylitis,<sup>2,3</sup> iatrogenic flat-back deformity,<sup>4</sup> and posttraumatic kyphosis,<sup>5,6</sup> is used for correcting the sagittal alignment of patients with fixed degenerative sagittal imbalance.

PSO is theoretically performed on L4, which is always the apex of lumbar lordosis, in a normal population.<sup>7</sup> However, most spine surgeons prefer L3 as the osteotomy site, because wedge resection is easier to perform on L3



**Figure 1** Anteroposterior view of the whole spine revealing a lumbar scoliosis of  $10.2^\circ$  calculated using Cobb angles between the upper end plate of L1 (yellow line) and the lower end plate of L5 (yellow line).



**Figure 2** Lateral view of the whole spine revealing the C7 plumb line (red line) falling 7.6 cm (yellow line) anterior to the posterosuperior corner of the S1 plateau.

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