Most insufficiency fractures of the spine are amenable to non-surgical management. However, open surgical treatment is indicated for certain cases. Although uncommon, insufficiency vertebral fractures can be associated with immediate neurological compromise that necessitates decompression and fixation (Fig. 1). Early surgery may also be preferred over non-surgical treatment when there is significant increase in local kyphosis between supine and standing radiographs initially, particularly if the fracture is not amenable to vertebroplasty or kyphoplasty.

Patients presenting with late neurological deficit due to progressive collapse or instability also require surgery. When vertebroplasty and kyphoplasty are not indicated, patients with progressive deformity (kyphosis or scoliosis) may benefit from surgery, as well as those with stable deformity and intractable pain. Indications for surgery also include the presence of neurologic symptoms, persisting pain or progressive deformity despite non-surgical treatment, vertebroplasty or kyphoplasty (Fig. 2).

Patients affected by insufficiency fractures of the spine are often of advanced age with multiple comorbidities. These must be taken into account when surgery is considered in addition to the location and type of fracture. Thorough assessment and optimisation of the patient’s medical condition and nutritional status are essential for decreasing the mortality rate, improving healing potential and facilitating recovery.

In patients with insufficiency fractures of the spine, it is often preferable to avoid the open anterior approach due to the associated morbidity and increased risk of complications, especially when the diaphragm is taken down. For patients aged > 60 years with multiple comorbidities, the risk of complications is increased further, and a posterior-only approach is usually preferred even when anterior decompression is needed (Fig. 2).

The major challenge in the open surgical treatment of insufficiency fractures of the spine is poor fixation in osteoporotic bone (Fig. 3). Pedicle screws are most often used for short segment constructs because biomechanically they provide enhanced strength and rigidity. Pedicle screws are associated with the greatest pullout strength when compared to sublaminar hooks and wires. However when tested individually, the strength of each pedicle screw is related to bone mineral density, more so than hooks and wires that encircle the bone cortex. Therefore, the superiority of pedicle screws over hooks and wires is less marked in highly osteoporotic bone. Other strategies such as cannulated pedicle screws for cement augmentation, pedicle screws with particular thread design, and expandable pedicle screws have been devised to strengthen the fixation in the osteoporotic spine, but have not gained wide acceptance.
acceptance. The use of cement augmentation in vertebral bodies instrumented with pedicle screws can sometimes be beneficial in order to decrease the risk of pullout.²

The other main challenge in the surgical management of insufficiency vertebral fractures is the risk of proximal junctional fracture (Figs 3a and 3b). While stronger spinal fixation is needed in the osteoporotic bone to decrease the risk of implant failure, it comes with the drawback of greater local stress proximally at the upper instrumented and supra-adjacent levels. Accordingly, two types of proximal junctional fractures can occur, either a fracture of the supra-adjacent uninstrumented vertebra, or a fracture of the upper instrumented vertebra potentially associated with supra-adjacent vertebral subluxation.³ In order to decrease the risk of proximal junctional fractures, prophylactic cement augmentation of upper instrumented and supra-adjacent vertebrae has been proposed.⁴ However, prophylactic augmentation carries the same risks as for any percutaneous vertebroplasty performed without concurrent instrumentation, including the risk of adjacent fracture. Other authors have also proposed using less rigid anchors (hooks or wires) at the top of the construct in an attempt to decrease stress concentration between upper instrumented and supra-adjacent levels.⁵ ⁶ In order to minimise the risk of proximal adjacent fracture, restoration of adequate sagittal alignment and avoidance of overcorrection in patients with pre-existing sagittal malalignment are important.⁵

References