Preventing Pseudoarthrosis and Proximal Junctional Kyphosis

How to Deal with the Osteoporotic Spine

Isaac O. Karikari, MD[a,*], Lionel N. Metz, MD[b]

KEYWORDS

• Spine fusion • Pseudoarthrosis • Nonunion • Osteoporosis • Proximal junctional kyphosis
• Screw failure • Compression fracture

KEY POINTS

- Patients with osteoporosis have a higher incidence of instrumentation-related complications.
- Preoperative optimization of bone quality is vital to ensure successful surgical outcome.
- Several intraoperative techniques exist to deal with some of the challenges that exist with the osteoporotic spine.

INTRODUCTION

Osteoporosis is a bony structural disorder characterized by discontinuity and thinning of the bony trabeculae leading to a decrease in the bone density despite a relatively normal biochemical composition.[1] Osteoporosis is defined by the World Health Organization as a T-score of less than 2.5, which represents a bone mineral density (BMD) 2.5 standard deviations less than the BMD of the average 25 year old.[2] There are 3 types of osteoporosis. Type I (postmenopausal) is encountered in women between 50 and 60 years of age due to low estrogen levels and in men with hypogonadic men. Type II (senile) is observed in men and women older than 70 years. Type III (secondary) osteoporosis occurs as a result of medical conditions or as side effects of medications, such as steroids.[3] The incidence of osteoporosis in patients undergoing spine surgery who are older than 50 years is reported to be 14.5% of men and 51.3% of women[4] (**Fig. 1**). Elderly patients with osteoporosis demonstrate an overall decrease in osteoblastic activity, poor vascularity, and limited functional bone marrow, which leads to less dense bone and a compromised capacity for bone healing and regeneration. Patients with osteoporosis exhibit defective osteogenic, osteoinductive, and osteoconductive abilities, which negatively impacts bone remodeling and fusion rates.[5] By virtue of exhibiting decreased pullout strength, cutout torque, and insertional torque, osteoporotic patients undergoing spine instrumentation are at a substantial risk of developing vertebral fractures, pseudoarthrosis, and instrumentation failure[6–10] (**Fig. 2**). It is, therefore, imperative for patients undergoing spinal instrumentation to undergo the appropriate screening and treatment before surgical intervention. The purpose of this article is to detail the optimal management of patients with degenerative lumbar deformity and osteoporosis, including preoperative preparation, intraoperative surgical strategies, and postoperative care.

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[a] Department of Neurosurgery, Duke University Medical Center, 200 Trent Drive, Box 3807, Durham, NC 27710, USA; [b] Department of Orthopedic Surgery, University of California San Francisco, 500 Parnassus Avenue, MU-320-West, San Francisco, CA 94143, USA
* Corresponding author.
E-mail address: Isaac.karikari@duke.edu

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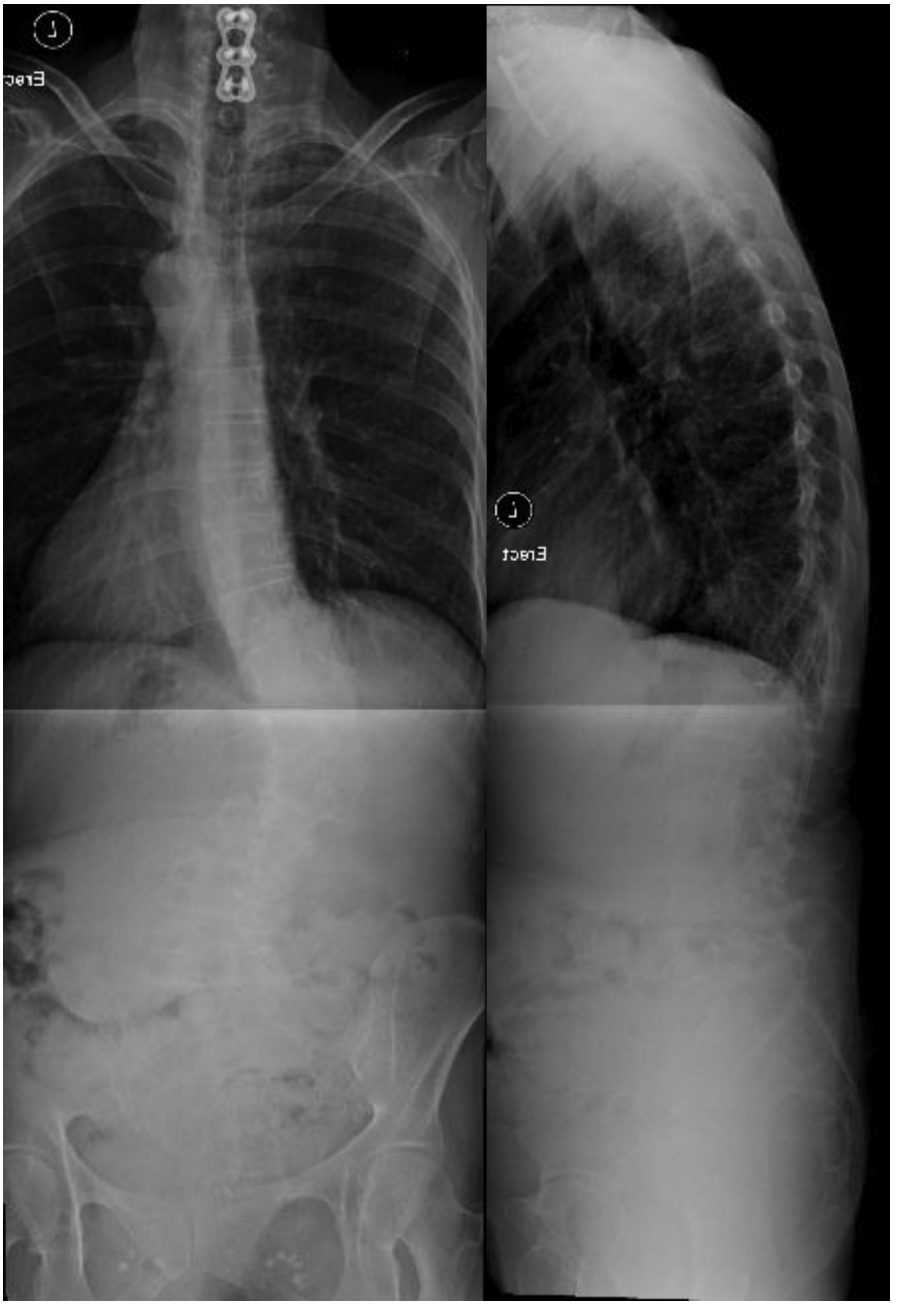

Fig. 1. Preoperative anteroposterior/lateral erect radiographs depicting poor bone quality in a 52-year-old woman with adult degenerative scoliosis. The presence of osteoporotic bone makes it difficult to visualize the spinal bony anatomy.

Preoperative Medical Treatments

It is recommended that asymptomatic women older than 65 years and men older than 70 years undergoing consideration for spinal fusion undergo screening for osteoporosis.[11] In addition, osteoporosis screening is recommended for at-risk younger patients, such as women with estrogen deficiency, low body mass, cigarette smoking, and prior history of compressive fracture. Once diagnosed with osteopenia or osteoporosis, several treatment modalities exist to optimize bone quality in preparation for surgery.[11]