Role of Osteoporosis in Spine Fusion and Treatment Options

Background

- Over 50 million Americans have osteoporosis and low bone mass.
- Osteoporosis is associated with increased rates of fracture, pseudoarthrosis (nonunion), and hardware failure in spine fusion surgery.
- Interbody graft subsidence has been shown to be significantly higher in patients with DEXA T-scores <-1.0. Subsidence has been associated with pseudoarthrosis and return of pre-operative pain.

Osteoporosis Medications

- Vitamin D and Calcium are essential to good bone quality, and are recommended for the spine fusion patient. Studies in spine fusion patients are limited, but both are inexpensive with relatively few side effects.
- Daily recommended calcium intake is 1200mg/day in divided doses. Vitamin D daily dosing is highly patient variable, with minimum intake of 1,000 I.U/daily recommended.
- One prospective human study of alendronate and lumbar fusion showed significantly higher fusion rates compared to Vitamin D alone.
- Another prospective study by the same author showed slightly lower fusion rates in the alendronate group compared to the control group.
- Animal studies suggest bisphosphonates may lead to delayed union or eventual pseudoarthrosis.
• Zolendronate (Reclast) was evaluated in two prospective human studies, and was not found to have a statistically significant impact on fusion rates compared to control. But in one study zolendronate was associated with a lower incidence of hardware loosening.

• In a prospective study, teriparatide (Forteo) has been shown to significantly increase lumbar fusion rates compared to risedronate in post-menopausal osteoporotic female. Treatment was for 2 months before surgery and 8 months after surgery.

• In another prospective study, teriparatide and risedronate were given 2 months before instrumented lumbar fusion and 10 months after, to evaluate the effect on loosening of instrumentation. There was a significantly lower incidence of hardware loosening in the teriparatide group than the risedronate group.

• Denosumab (Prolia) has not been studied in spine fusion population, and therefore is not typically recommended in this patient population.

Surgical Interventions

• Cement augmentation of vertebrae involved in fusion surgery may help to prevent osteoporosis related complications. Quality evidence is limited regarding this technique.

• Cement augmented pedicle screws are another option for the osteoporotic fusion patient. Again, quality evidence regarding the efficacy of this technique is limited.

Summary

Osteoporosis and osteopenia incidence is high in the spine fusion patient population. It is associated with a number of complications, which have a negative impact on patient outcomes, higher health care costs, and potential need for additional interventions. Preoperative evaluation of bone health and treatment of osteoporosis/osteopenia is critical for a successful outcome from spine fusion surgery. Calcium and Vitamin D supplementation is recommended for most patients over 50 during the perioperative spine fusion period. Evidence regarding treatment of osteoporosis with bisphosphonates is mixed, with some studies suggesting lower fusion rates. Teriparatide has been shown to statistically increase fusion rates and decrease incidence of hardware failure. In the patient with severe osteoporosis, treatment with Teriparatide for 2-12 months (in addition to full bone health evaluation) prior to surgical intervention is typically recommended in order to minimize complications and optimize outcomes.

References


