

Significant reduction in fluoroscopy time and radiation dosage utilizing an innovative guide wire in the placement of percutaneous MIS pedicle screws

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Introduction

Despite the benefits of minimally invasive spine (MIS) surgery including decreased soft tissue disruption, blood loss, and hospital stay, MIS surgery has inherent risks to both the patient and the surgeon. There are numerous studies demonstrating increased radiation exposure secondary to the increased use of fluoroscopic x-ray, which can increase the risk of cataracts and malignancy. Additionally, inadvertent advancement of standard guide wires through the vertebral body can occur, especially in osteoporotic bone, placing vital structures ventral to the spine at risk. This study evaluates the benefit of utilizing a novel guide wire (Safe Wire, Y-Wire) for percutaneous pedicle screw placement.

Materials and Methods

Twenty consecutive patients undergoing MIS TLIF at L5-S1 were prospectively randomized into 2 groups. Except for the type of guide wire used, the senior author (JZ) utilized the same operative technique in all 20 patients, including bicortical S1 screw fixation. In Group 1, standard guide wires were used in 10 patients. In Group 2, Y-Wire was utilized. Total fluoroscopy time and radiation dosage were recorded on a GE 9900 C-arm machine, along with operating room time and complications.

Results

Total fluoroscopy time per case for Group 1 averaged 232.1 seconds vs. 152.2 seconds for Group 2 ($P = 0.017$). Radiation dosage for Group 1 averaged 17.22 rads vs. 9.29 rads in Group 2 ($P < 0.001$). There was no significant difference in operating room time ($P = 0.18$). There was inadvertent advancement of one S1 guide wire in Group 1. Postoperative CT scan of the abdomen with contrast was negative.

Conclusion

Utilizing Y-Wire for percutaneous pedicle screw placement significantly decreased fluoroscopy time by 34% and radiation dosage to the patient and surgeon by 46%. Tapping the distal S1 cortex allows bicortical screw purchase, but there is no mechanical stop preventing inadvertent guide wire advancement. The unique design of the Y-Wire guide wire may prevent inadvertent guide wire advancement through the vertebral body, reducing the risk of injury to vital structures ventral to the spine, while reducing the patient and surgeon exposure to harmful radiation.

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