

# Minimally invasive posterior lumbar interbody fusion with isocentric C-arm fluoroscopic navigation in elderly patients 80 years of age or older

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**Objectives:** The objective is to report outcome after minimally invasive posterior lumbar interbody fusion with isocentric C-arm (Iso-C) fluoroscopic navigation in elderly patients 80 years of age or older.

**Summary of Background Data:** As the elderly population has increased, lumbar canal stenosis has become appreciated more frequently. Increasingly, surgical therapy in elderly patients has had to be considered to improve these patients' quality of life. But many studies have raised concern over increased morbidity in this population, cautioning against spinal surgery in the elderly. Recently, several articles reported the advantages of minimally invasive spine surgery, including, reduced blood loss, less postoperative back pain, shorter recovery time before ambulation, and shorter length of hospital stay than the traditional open surgery. We considered minimally invasive spine surgery was especially effective for the elderly population.

**Methods: Patients populations:** From January 2007 to December 2010, we studied a consecutive series of 19 patients aged 80 years or older with degenerative spondylolisthesis, who underwent posterior lumbar interbody fusion (PLIF) with minimally invasive approach navigated Iso-C fluoroscopy. There were eight men and eleven women whose mean age was 82 years old (range 80 - 87 years). There were sixteen one-level fusions and three two-level fusions.

Navigation system; a spinal navigation system (VECTORVISION compact; Brain LAB, Germany) and Iso-C 3D (Siemens AG, Medical Solutions, Erlangen, Germany) were used as an intraoperative navigation. Instrumentation system; SEXTANT system (Medtronic), Pathfinder (Zimmer), VIPER (Depuy), or MANTIS (Stryker) were used for percutaneous pedicle screw-rod placement. In this study, six patients underwent with SEXTANT, eight with Pathfinder, three with VIPER, and two with MANTIS.

**Operation Procedure:** Patients were in prone position on a Jackson table with chest and pelvis supported to gain correction of kyphotic deformity when necessary. We implanted 3mm K-wire to the spinous process one vertebral level cephalad from the area operated on and attached a percutaneous dynamic reference array. The fluoroscope then obtained multiple successive images throughout its automated 190° rotation around the patients. After a satisfactory image set obtained, the images were transferred to the spinal navigation system. Once the data were received by this workstation, the software conducted automated registration. The skin entry point of a tube retractor was determined by placing an image-guide probe on the skin surface. A paramedian, muscle-sparing approach was performed through a tubular retractor docked unilaterally on the facet joint. Bilateral partial facetectomy and cauda equina decompression were conducted through a tube retractor. Before discectomy, we performed percutaneous pedicle screw placement in the other side of the tube retractor. After determining the skin entry point by placing an image-guide probe, a 15mm skin incision was centered on this point, and a precalibrated 2.6mm drill guide was passed through the subcutaneous tissues until its serrated tip docked on the bone. The drill bit was then inserted into the guide, and a pedicle screw pilot hole was created. The drill bit was removed, and a guide wire was inserted into the pilot hole. Sequential tubular dilators were inserted over the guide wire, with the last dilator being left in place to serve as a protective sheath for an image-guided tap. The cannulated tap was used to tap the pilot hole, and cannulated screws were placed into the pedicle over the guide wire, and the wire was removed. A screw was then inserted. The rod placement system was then used to

attach rods across pedicle screws, and a rod was inserted. Discectomy and endplate preparation were completed through a tube retractor using customized surgical instruments. Structural support was achieved with interbody cages. Bone grafting was done with local autologous. Percutaneous pedicle screw-rod placement in the tube retractor side was then accomplished under direct vision from a small wound and a fluoroscopy.

Postoperative assessment; we evaluated operation time, estimated blood loss, complications and criteria of the Japanese Orthopedic Association for low back pain (JOA score). The maximum point is 29.

**Results:** All patients were discharged either to home or rehabilitation facility when they were medically cleared. The mean operation time was 119 minutes and estimated blood loss was 169g. Five patients had complications (four dural tears and one wound infection). The patient of wound infection required revision surgery. No new severe systemic complications occurred perioperatively. The mean JOA score before and after surgery was 14.6 and 21 points. The improvement ratio was 43%.

**Conclusion:** We reported the outcome after minimally invasive PLIF with Iso-C fluoroscopic navigation in elderly patients. Approximately this outcome was good. But, further long-term, prospective studies involving a larger study group are needed to determine the benefits of this procedure in elderly patients.