Complications of Stand-alone Lateral Lumbar Interbody Fusion and Predictors of Outcome

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**Purpose:** Minimally invasive transpsoatic lateral lumbar interbody fusion (LLIF) is traditionally performed as a part of circumferential fusion and has gained growing interest in recent years. However, skepticism related to this technique as a stand-alone procedure is regards to non-union, loss of correction of deformity, subsidence of cage and axial pain. The objective of this study was to retrospectively review patients who underwent LLIF as a stand alone procedure at our institute. Patients were followed up with CT scan and dynamic flexion-extension radiographs. 8 patients required posterior instrumented fusion due to complications including non-union, subsidence, loss of correction of deformity and pain.

**Methods:** Under institutional IRB approval we retrospectively reviewed preoperative parameters including diagnoses, medical co-morbidities, body mass index, Dual emission X-ray absorptiometry (DEXA) scan for osteoporosis, standing scoliosis radiographs for calculation of Cobb's angle and sagittal balance as well as other radiographic parameters including individual disc height, anterior and lateral spondylolisthesis in order to ascertain the modality and causation of failure. We reviewed peri-operative parameters inclusive of level of fusion, cage sizes and bone graft materials. Patients were followed up with radiographs post operatively and then at 3 months, 12 months and final follow-up. 53 patients received CT scan and 26 dynamic flexion-extension radiographs to assess fusion at 7.1 and 9.1 months respectively.

**Results:** 8 patients required posterior fusion at a second stage for non-union, loss of correction and progression of deformity, axial back pain, end plate fracture and subsidence of cage. 37.5% of the above had score below -2.5 on DEXA scan, mean positive sagittal balance of 81.7mm, one patient had previous laminectomy at level of interbody fusion. Mean body mass index (BMI) for the above was 28.1. End plate fracture was observed at 21 levels in 78 patients, 11 levels of which were in the 8 failures of stand-alone procedure. Grade III subsidence was noted in 4 levels, grade II in 6 and grade I in one level in the failure group.

**Conclusion:** LLIF is a valuable tool for achieving fusion through a minimally invasive approach with little risk to neurovascular structures and low peri-operative morbidity. However, the indications and outcome of this technique as a stand-alone procedure has not been reported. Our results indicate astute selection of the surgical candidate is of primary importance. Findings of positive sagittal balance and lumbar kyphosis are probable predictors of poor outcome. Additional factors like high BMI, osteoporosis, previous laminectomy and undersized cage selection may be contributory to non-union rates and requirement of a second stage posterior fixation surgery. We believe in appropriately selected patients that multi-level LLIF procedures can be successful.