Purpose

Transforaminal lumbar interbody fusion (TLIF) cages that expand to fit and fill the interspace are popular, without clinical or radiographic data to define where and how they should be used. This study compares clinical and radiographic outcomes after TLIF with static cages (SC) vs expandable cages(EC), controlling for disc height and segmental lordosis. This is the first study to define the relative advantages and therefore the potential indications for EC use based on pre-op disc height and segmental lordosis.

Methods

Prospective data was retrospectively reviewed for 157 consecutive adults who underwent arthrodesis for degenerative disease, with minimum 2 year follow-up. Inclusion criteria: posterior spinal fusion (PSF) at 1-2 levels between L2-S1, with 1-2 level TLIF. Cohort was divided into two groups: SC vs EC. Standing AP/Lateral radiographs pre-op, 1 year, and 2 years were measured for disc height in 3 areas (Anterior, Middle, Posterior), and disc angle (angle of endplates) at TLIF levels. To analyze SC vs EC impact based on pre-op disc morphology, patients were placed into TLIF Disc Height Disc Height groups (Short: 0-8mm, Medium: 9-12mm, Tall: >12mm), and Segmental Lordosis groups (Low angle: 0-4°, Medium angle: 5-11°, High angle: >12°). Clinical: Visual Analog Pain scores (VAS), Oswestry Disability Index (ODI), pain med records, and complications were recorded pre-op, 1 year, 2 years, and yearly thereafter. Mann Whitney, Wilcoxon signed rank test, t-test, and multivariate linear regression were used in statistical analysis. Changes in disk height were compared by level using the t-test.

Results

Follow-up averaged 44months (24-68months). There was no difference SC (n=73, 103 cages) vs EC (n=84, 111 cages) for age (63 years, range 20-86 years), smoking (11% vs 10%), or prior surgery (58% vs 49%), pre-op lordosis T12-S1, distribution into disc height or disc angle groups, or the surgery performed. PSF averaged 2.4 levels, 1-level TLIF (57%), 2-level TLIF (43%). Series complications: Nonunion-1, infection-3, neuro-3, revision surgery-16, without difference SC vs EC. At 2 years, improved disc heights were noted with both cages ($p<0.001$), the largest increases in disc height at L4-5 (EC-4.7mm vs SC-1.7mm) and L5-S1 (EC-5.0mm vs

SC-0.7mm). Two year results by level: L2-3 EC had higher anterior disc height (12.3mm vs 10.0mm, p=0.059) and mid-disk height (9.9mm vs 7.8 mm, p=0.018); L3-4 EC had higher anterior disc height (13.5mm vs 11.4mm, p=0.01) and mid-disc height (10.0mm vs 8.6mm, p=0.03); L4-5 EC had greater anterior disc height (14.7mm vs 11.9mm, p<0.001), mid-disc height (10.6mm vs 8.3mm, p<0.001), and posterior disk height (6.8 vs 5.4, p<0.001); L5-S1 EC had greater anterior disc height (16.4mm vs 14.0mm, p<0.001). Two-year posterior disc heights at all other levels were similar EC vs SC (p>0.05). Two-year lordosis (T12-S1) was the same SC vs EC. Both EC and SC groups improved VAS and ODI (p<0.01) after surgery without difference at 2 years.

Conclusions

Both EC and SC improved disc height and segmental lordosis at 2 years, though EC improvements were significantly better. EC appears to have particular advantage over SC for tall and highly lordotic discs, short discs, and for all disc heights and angles at L4-5 and L5-S1. Segmental lordosis declined in highly angled discs treated with SC. Follow-up and sample size were likely insufficient to demonstrate potential differences in adjacent level degeneration between groups.