Can early cage integration in anterior cervical discectomy and fusion improve patient reported outcomes?

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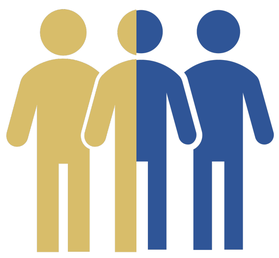
Study cohort:

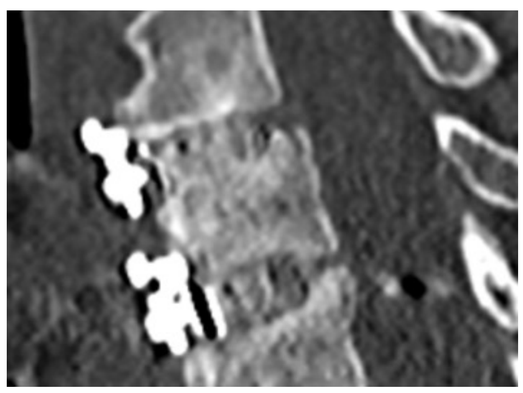
A total of 89 patients:

48
in the NMRT group

41
in the NM group

Mean Age:
62±10.5 years
52% were male





High quality fusion with use of a NMRT cage 3 month post operatively

Background Context:

Fusion rates after anterior cervical discectomy and fusion (ACDF) are high, but most reoperations are for symptomatic pseudoarthrosis. Fusion between adjacent vertebrae is achieved by on-growth and in-growth of vertebral endplate bone to both interbody cage and graft. Interbody cages combining the mechanical and radiolucent properties of the polyether ether ketone (PEEK) modulus with the surface benefits of titanium (Ti) endplate osseointegration appear advantageous. NanoMetalene (NM) cage technology provides a continuous Ti layer molecularly bonded to PEEK to resist Ti flaking. Undercut macrostructure topography on and within an interbody cage may improve biomechanical stability and interbody fusion. Evidence regarding correlations between clinical outcomes and fusion after ACDF surgery remain inconclusive.

AIM

We aimed to compare clinical outcomes and fusion rates in patients undergoing ACDF with one of two different interbody cages, the only difference being the presence or absence of machined porous features to promote bone-ingrowth/interlocking. This controlled study design isolated the effects of endplate interlocking features to directly determine the potential early clinical and radiologic benefits of these features.

Study Design and Method

Multicentre, prospective, observational, cohort study of consecutive patients undergoing ACDF from March 2020 to June 2021. One group received traditional NM cages, and the other group received NM cages with machined porous features (NMRT). All cages had an integrated Ti 2-hole plate-screw fixation and were filled with demineralized allograft fibres. VAS, NDI, and SF-12 scores were evaluated preoperatively and at 6 weeks, 3 months, and 6 months postoperatively. Plain radiographs were obtained on postoperative day 2 to assess instrumentation positioning, and CT was performed at 3 and 6 months postoperatively to assess interbody fusion (Bridwell grade). We also determined Medicare charges for cervical radiographs and CT scans and assessed radiation dose reports from postoperative CT scans to determine the effective radiation dose.

Results:

The mean patient age was 62±10.5 years, and 46 (52%) were male. All clinical outcomes improved progressively and significantly from baseline to 6-month follow-up in both groups. By 3 months, the NMRT group had significantly higher CT fusion rates than the NM group (79% vs 56%, p=0.02). By 6 months, there were no significant difference in fusion rates between NMRT and NM groups (83% vs 78%, p=0.69). The mean Bridwell grade at 6 months was 1.4±0.7 in the NMRT group and 1.8±1.0 in the NM group (p=0.08).

Key findings:

With both NM and NMRT cages, serial improvements in postoperative clinical outcomes correlated with fusion progression on CT. However, NMRT cages were associated with significantly better fusion at 3 months and a trend toward higher quality of fusion at 6 months, compared with NM cages. These results suggest earlier cage integration with NMRT. An early 3-month postoperative CT is adequate for fusion assessment in almost 80% of patients undergoing ACDF with a NMRT cage. The traditional 12-month postoperative CT for ACDF may not be justified when using either NM or NMRT cages; in most patients, it will merely confirm the presence of more consolidated interbody bone.