

Bailey A, Araghi A, et al. Prospective, Multicenter, Randomized, Controlled Study of Anular Repair in Lumbar Discectomy. Spine 2013;38(14):1161-1169.

Design: Randomized clinical trial

Population/sample size/setting:

- 727 patients (424 men, 303 women, mean age 42) undergoing discectomy for herniated lumbar disc at 34 centers in the US, with 58 participating surgeons
- All patients were over age 18 and were candidates for 1 or 2 level discectomy, having imaging evidence of herniation corresponding to symptoms, lack of response to 6 consecutive weeks of therapy (or uncontrolled acute leg pain), with anular tear presenting sufficient tissue for reapproximation
- Exclusion criteria were previous surgery at the index level, planned fusion of the spine, spondylolisthesis greater than Grade I, cauda equina, acute systemic infection, active malignancy, current chemical dependency or emotional disturbance, current or planned pregnancy, allergy to the suture material used for anular repair, and spinal fracture or deformity

Main outcome measures:

- Randomization was done in the operating room after the herniated disc material had been removed, either to anular repair with the XcloseTM system (n=478) or to no anular repair (n=249)
 - o 137 patients were excluded intraoperatively prior to randomization for a variety of reasons: unrepairable tissue, herniation too large, rim tear, or no anular defect
 - o Although 500 patients were randomized to anular repair, 22 were eliminated when the anulus was not strong enough to withstand pullout forces
 - o 34 patients had 2-level discectomy; all others were single level
 - o A surgical anulotomy was done in 77% of cases
- Outcomes were measured at baseline and again at 2 weeks, 6 months, 1 year, and 2 years
- Primary outcome was rate of reoperation for recurrent herniation through 2 years
- Secondary outcomes were Oswestry score, VAS leg and back pain, and SF-12 scores
- For both groups, VAS leg pain improved by about 80% between baseline and 2 years, with no difference between groups
 - o Similarly, both groups had equivalent improvement of VAS leg pain, by about 55%
- For repeat surgery in all randomized patients, data from the 3 month, 6 month, and 2 year follow-up periods were not significantly different between groups; at the end of

- 2 years, reherniation surgery had been done in 11.2% of the control group and in 9.7% of the anular repair group
- A *post hoc* subgroup analysis was done only for those patients who had dominant leg pain (314 of the 727 patients), and this showed lower reoperation in the first three months for the anular repair group (1.05) than for the control group (5.9%)
 - However, the cumulative number of reoperations at 2 years did not differ significantly between groups with dominant leg pain, which occurred in 12.1% of the control group and in 6.7% of the anular repair group
 - Adverse events occurred equally in the treatment groups; anular repair did not increase the risk of dural tear, spinal fluid leak, and wound infection

Authors' conclusions:

- Anular repair with the Xclose™ suture reduces the need for reoperation for recurrent disc herniation; even though the differences were not statistically significant, they were clinically positive
- Anular repair is safe, and does not increase the rate of adverse events in discectomy
- Anular repair is worth serious consideration when herniated discs are being removed

Comments:

- There are features of the study which may underestimate the effect of anular repair on the outcomes of discectomy
 - There are likely to be subgroups of herniated discs with differing risks of reherniation after surgery, based on Carragee 2003
 - Carragee classified disc herniation according to anular pathology found at operation in 180 patients, and followed them for a minimum of 2 years
 - The largest group, with 89 patients, was the fragment-fissure group, in whom the anular defect was up to 6 mm with an extruded or sequestered fragment; it had a low risk of reherniation (1%)
 - A smaller group, with 33 patients, was the fragment-defect group, where the anular defect was greater than 6 mm with an extruded or sequestered fragment, and had a high risk of reherniation (27.3%)
 - A fragment-contained group, with 42 patients, had disc herniation with an intact anulus and one or more subanular fragments which were removed by making an incision in the anulus; it had an intermediate risk of reherniation (9.5%)
 - A fourth group, the no fragment-contained group, had disc herniation and an intact anulus, but no subanular fragment, which was treated with an extensive anulotomy with removal of the anular protrusion, leaving a large anular defect; it had a 12.5% rate of reherniation

- The inclusion criteria were based on criteria for symptomatic disc herniation, not on anular pathology or size of anular defect
- One consequence of this selection method is that the study population may not represent the population at risk of reherniation, if a largely low risk population was randomized
- This is analogous to a study of screening to reduce lung cancer mortality, in which the study population, in addition to present smokers with a 30 pack-year smoking history, also included a large admixture of former smokers with a 10 pack-year smoking history; the effectiveness of a preventive medicine intervention would not be adequately tested in such a population
- The analysis of the survival for the subset of patients with dominant leg pain was done post hoc and was not preplanned; the analysis would have had more credibility if it had been part of the plan for the trial at the outset
- Although a Kaplan-Meier curve was displayed for the rates of reherniation of the two groups, the two curves were not compared with a log-rank test, the generally accepted method of testing whether two Kaplan-Meier curves are different
 - Instead, a series of chi-squares were calculated in Table 5, implying that anular repair has a significantly lower rate of early disc reherniation
 - However, a log rank test for the data in Table 5 is statistically not significant, with a p value of 0.14, which is approximately the same value as for the last row of Table 5
- The study was done in 34 centers with 58 participating surgeons; this will tend to increase the variation within treatment groups and make it less likely that a treatment effect will attain statistical significance (Deschartres et al, 2011)
- The main outcome was based on a decision to reoperate, which could have been influenced by the surgeons' knowledge of which operation the patient had undergone, potentially biasing the outcome ascertainment
- Even though there are no convincing differences in outcome between the two groups, the main problem with the comparison is that the study population does not seem to represent the population at most risk of having a disc reherniation, namely those patients with anular defects large enough to have a high probability of reherniation

Assessment: Inadequate for evidence of the effectiveness, or the lack of effectiveness, of anular repair for reducing the rate of disc reherniation (the inclusion criteria do not define the population at risk of reherniation); the effect of anular repair on high risk disc herniations may be underestimated

Reference:

Carragee EJ, Han MY, et al. Clinical Outcomes After Lumbar Discectomy For Sciatica: The Effects of Fragment Type and Anular Competence. JBJS Am 2003;85A:102-108

Deschartres A, Boutron I, et al. Single-Center Trials Show Larger Treatment Effects Than Multicenter Trials: Evidence From a Meta-epidemiologic Study. *Ann Intern Med* 2011;155:39-51