**Supplementary Appendix**

MAIC Methods

Individual patient data (IPD) for TDR (ie, activL and ProDisc-L) from the activL trial, and summary data for fusion from the Zigler et al.16 trial, were used in unanchored matching adjusted indirect comparisons (MAICs). Before performing the MAIC, indirect treatment comparisons for TDR and fusion were derived using the Bucher approach. In the first step of the MAIC, inclusion/exclusion criteria were aligned between the two studies by modifying the TDR population to align with the fusion population from the Zigler et al. study. Baseline characteristics between populations were then compared and adjusted for potential imbalances by applying an approach similar to that used for propensity score weighting. Patients from the TDR IPD were assigned a weight such that their baseline characteristics matched those in the fusion arm of the Zigler et al. study as closely as possible. Weights were estimated using the generalized method of moments based on the IPD and summary data. Baseline characteristics used for matching were available from both studies and consisted of age, BMI, gender, smoking status, index level, blood loss, and hospital stay. The impact of weighting on the available statistical information in the TDR IPD was captured through the calculation of the effective sample size (ESS). A large ESS (ie, an ESS close to the actual sample size of the TDR population) implies that adequate matching was performed. A small ESS indicates some patients are receiving extreme weights, which may indicate imbalances between populations still exist. Odds ratios (ORs) and 95% confidence intervals (CIs) were reported for each outcome, ΔALD and clinical adjacent-level disease, and were derived by comparing the outcome odds for TDR with those for fusion. Odds for TDR were estimated using a weighted logistic regression fit to the TDR IPD and odds for fusion were from the Zigler et al. study. Sensitivity analyses using an anchored MAIC approach were also performed to determine the benefit of activL compared with fusion on ALD outcomes. In the anchored MAIC, the ProDisc arm from each trial acted as the anchor treatment, which connected the activL and fusion arms from the two studies, thereby allowing the indirect comparison (ie, anchor treatment). This sensitivity analysis not only provides comparative efficacy data for activL compared with fusion, but also serves to validate the unanchored MAIC. An anchored MAIC has advantages over unanchored MAIC, namely it only requires consideration and adjustment for relevant treatment effect modifiers. In contrast, an unanchored MAIC requires consideration and adjustment for both treatment effect modifiers and prognostic factors, which is inherently more difficult. Analyses were performed using SAS version 9.4 (SAS Institute, Cary, North Carolina, USA) and R version 3.3.1.

Supplementary Table 1

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Fusion**  **(Zigler et al., 2012)** | **TDR Before Matching**  **(activL trial)** | **TDR After Matching**  **(activL trial)** |
| **N** | 43 | 175 | 175 |
| **ESS** | - | - | 139 |
| **Age (mean [SD])** | 40.50 (8.00) | 39.54 (8.92) | 40.50 (8.03) |
| **BMI (mean[SD])** | 27.30 (4.70) | 26.67 (4.04) | 27.30 (4.72) |
| **Gender (N [%])** |  |  |  |
| **Male** | 41.86% | 54.86% | 48.19% |
| **Female** | 58.14% | 45.14% | 51.81% |
| **Smoking status (N [%])** |  |  |  |
| **Yes** | 37.21% | 38.86% | 37.21% |
| **No** | 62.79% | 61.14% | 62.79% |
| **Index level (N [%])** |  |  |  |
| **L4-5** | 30.23% | 29.14% | 30.23% |
| **L5-S1** | 69.77% | 70.86% | 69.77% |
| **Blood loss (mean [SD])** | 425 (422.50) | 137.40 (128.80) | 423.61 (371.23) |
| **Length of hospital stay (mean [SD])** | 4.30 (1.80) | 3.09 (1.10) | 4.28 (1.71) |

BMI = body mass index; ESS = effective sample size; SD = standard deviation

Supplementary Table 2

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Fusion**  **(Zigler et al., 2012)** | **activL Before Matching** | **activL After Matching** |
| **N** | 166 | 175 | 175 |
| **ESS** | - | - | 141 |
| **Age (mean [SD])** | 38.79 (7.78) | 39.54 (8.92) | 38.79 (7.80) |
| **BMI (mean[SD])** | 27.00 (4.40) | 26.67 (4.04) | 27.00 (4.42) |
| **Gender (N [%])** |  |  |  |
| **Male** | 48.19% | 54.86% | 48.19% |
| **Female** | 51.81% | 45.14% | 51.81% |
| **Smoking status (N [%])** |  |  |  |
| **Yes** | 25.30% | 38.86% | 25.30% |
| **No** | 74.70% | 61.14% | 74.70% |
| **Index level (N [%])** |  |  |  |
| **L4-5** | 36.75% | 29.14% | 36.75% |
| **L5-S1** | 63.25% | 70.86% | 63.25% |
| **Blood loss (mean [SD])** | 263.47 (301.16) | 137.40 (128.80) | 263.47 (302.89) |
| **Length of hospital stay (mean [SD])** | 3.71 (1.44) | 3.09 (1.10) | 3.65 (1.39) |

BMI = body mass index; ESS = effective sample size; SD = standard deviation