

Introduction

After anterior cervical discectomy, a fusion (ACDF) is generally performed. Artificial disc replacement (ADR) is gaining popularity. There is little Canadian evidence available regarding the benefits of one treatment over the other. Our objective was to determine if outcomes of ADR differed compared to ACDF for patients with degenerative disc disease (DDD) of the cervical spine by conducting a multivariate analysis of the CSORN registry.

Methods

We conducted a retrospective multivariate analysis of prospectively collected national Canadian Spine Outcomes and Research Network (CSORN) database. Multivariate logistic regression was used to adjust for possible confounding effects of age, gender, diagnosis, baseline function, and American Society of Anesthesiologists (ASA) score.

Hypothesis

The outcomes of ADR differed compared to spinal fusion surgery after 12 months as determined through a multivariate analysis of the CSORN registry.

Table 1. Baseline Characteristics

Variable	ADR (N = 39)	ACDF (N = 475)	P-value
Age (years)	45.5	52.4	0.0004
Gender (% Males)	41.0%	59.0%	0.0614
BMI (kg/m ²)	27.7	28.6	0.3047
Charlson Comorbidity Index	0.33	0.46	0.2096
ASA Score	1.4	2.1	<0.0001
Current Smoker (%)	28.2%	20.8%	0.2779
Health State (EuroQol-Visual Analogue Scale, EQ VAS)	51.6	54.6	0.3922
Neck Disability Index (NDI)	44.6	47.7	0.3104
Patient Health Questionnaire-9 Score	10.7	10.6	0.9296
Arm Pain (Numeric Pain Scale, NPS)	5.7	6.4	0.1093
Neck Pain (NPS)	6.1	6.4	0.4728
Able to Work (%)	42.1%	37.0%	0.5721
Levels Operated On (%)			
1	61.5%	59.5%	0.7823
2	30.8%	29.2%	
3	7.7%	11.3%	
Hybrid Surgery - Fusion and Arthroplasty (%)	17.9%	NA	NA
Provinces Involved	6	8	NA
Number of Centres Involved	7	17	NA

Table 2. Operative Outcomes

Variable	ADR (N = 39)	ACDF (N = 475)	P
OR Time (minutes)	131.2	136.3	0.7553
Perioperative Adverse Event (%)	2.6%	10.1%	0.1577
Length of Stay	2.7	9.8	0.0334

Table 3. 12 Month Outcomes

Variable	ADR (N = 39)	ACDF (N = 475)	P
Change in Back Pain (NPS)	3.0	2.8	0.8053
Improvement in Arm Pain (NPS)	2.7	3.0	0.6235
Improvement in EQ VAS	13.8	21.7	0.0383*
Improvement in NDI	25.0	17.4	0.0364*
Able to Work (%)	60.7%	47.5%	0.3900
Note: differences in improvement in EQ VAS and NDI were not significant following multivariate adjustment with the following covariates: age, clinical diagnosis, gender, ASA score			

Results

There were 515 eligible patients: 39 had ADR in one or more spinal levels, and 476 had ACDF. At baseline, the ADR group was significantly younger, had lower ASA grades, and there trended to be more females. There was also a significantly higher proportion of neck pain and a lower proportion of myelopathy in the ADR group. Both ADR and ACDF patients had a similar number of levels operated on and there were no significant between-group differences at baseline in the percentage of smokers, neck and arm pain scores, overall health score, physical function and mental health scores. No significant differences were identified in surgery time, length of stay or improvements in PCS or MCS scores. At 12 months follow-up, overall improvement in EuroQol visual analogue scale (0-100) for ADR patients was significantly higher (mean 21.7 vs. 13.7, p=0.0383), but this difference did not maintain statistical significance in multivariate adjusted analysis. There was also a trend towards lower perioperative adverse events in the ADR group (2.6% vs. 10.1%, p=0.1233).

Conclusions

This is the first Canadian multicenter study to compare outcomes between ADR and ACDF. Although overall improvement in health-related quality of life favoured arthroplasty, we were unable to demonstrate this finding following adjusted analysis with our current study numbers.