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Clinical commentary

Scoliosis surgery in the elderly: Complications, readmissions, reoperations and mortality

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ABSTRACT

The operative management of scoliosis in the elderly remains controversial. The authors of this study sought to evaluate outcomes in elderly patients with scoliosis undergoing deformity correction. Patient data was obtained from a 5% sample of the Medicare Provided Analysis and Review database (MEDPAR). Patients over 65 years of age with scoliosis undergoing corrective surgery were identified between the years 2005 to 2011. A total of 453 patients were analyzed: 262 (57%) between ages 66 to 74 years, and 191 (42%) over the age of 75 years. Female predominance (78%) was observed in this sample. Pre-diagnosis follow-up averaged 118 months. Post-surgery follow-up averaged 33 months. Patients between 66 and 74 years old were mostly discharged home, while patients over the age of 75 years were discharged to skilled nursing facilities (SNFs) (38.55% versus 34.04%, p value = 0.0011). Readmission rates were lower in patients between 66 and 74 years old when compared to patients over the age of 75 years (9.92% versus 17.28%, p value = 0.0217). Complication rates 30-days after discharge were less in patients between 66 and 74 years, compared to those over 75 years (21% versus 26.6%, respectively), but this was not statistically significant. These findings suggest varying outcomes following scoliosis surgery in the elderly, but interpretation of these results is weakened by the inherent limitations of database utilization. Future prospective studies are needed to understand risk factors and other confounding variables, such as discharge disposition, that may influence outcomes.

1. Introduction

Scoliosis is characterized by lateral curvature of the spine measured by a variety of techniques (e.g., Cobb method) and can be congenital, neuromuscular-related, or idiopathic in nature. Idiopathic cases are stratified into age subgroups (infantile, juvenile, adolescent and adult). Adult (over the age of 18) idiopathic scoliosis is often associated with degenerative changes in the spine. Adult idiopathic and degenerative scoliosis are rare with an estimated prevalence ranging from 2% to 32%. Incidence and prevalence increases in the elderly population spacing seems off here, possibly one too many spaces (up to approximately 68%) [1,2]. The condition is often asymptomatic and found incidentally. Symptomatic patients present with pain, postural imbalance, functional limitations, and in severe cases, signs and symptoms of spinal stenosis [1,2]. Non-operative (conservative) measures, such as activity modifications, physical therapy, bracing, pain medications, and cortisone injections, generally lose their efficacy. As such, surgical management has become a mainstay for treatment of symptomatic scoliosis. A current topic of controversy is whether radiologic improvements in scoliosis curvature translate to improved clinical outcomes.

Multicenter database studies analyzing adult scoliosis are abundant in the literature. Smith et al. used the Spinal Deformity Study Group database and reported variability in age-dependent outcomes. These authors showed that elderly patients have greater improvements in pain and disability despite higher risks and complications associated with surgery, when compared to younger patients [1]. Smith et al., in a later study using the same database, reported age-stratified predictive factors of outcomes in scoliosis patients. They found that patients between the ages of 46 and 85 years, had positive predictive factors of clinical outcome that were different than younger patients aged 18 to 45 years old. Older patients' outcomes were driven by body mass index, visual analog scale score, narcotic use, and depression, as opposed to age [2].

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Other database studies focus more on analysis of the adolescent population and on socioeconomic factors. To our knowledge, this is the first study to stratify elderly patients undergoing scoliosis surgery into two subgroups and to identify differences in outcomes and discharge disposition between subgroups.

The current study is based on patient information from the national Medicare Provider Analysis and Review (MEDPAR) database. We choose to focus on the elderly population, which we define as patients older than 65 years of age and further stratify these patients into two subgroups: patients age 66 to 74 years (relatively younger patients) and patients over 75 years of age (relatively older patients) with idiopathic and degenerative scoliosis (as defined above) undergoing corrective spine surgery, which we define as the normalization of a degree of lateral curvature with the use of spinal instrumentation. The aim of our study was to stratify the risk of surgery in the elderly population by focusing on short and long-term complications, overall morbidity and mortality, and discharge disposition. We hypothesize that patients over 75 years of age are less likely to receive surgery and experience poorer outcomes.

2. Materials and methods

2.1. Data source

Patient data was extracted from a 5% sample of the MEDPAR database, records from 2005 to 2011. The MEDPAR contains information regarding Medicare beneficiaries admitted to inpatient hospitals and skilled nursing facilities (SNFs).

2.2. Patient selection

Inclusion criteria: age greater than 65 years (enrolled in Medicare, based on age alone) with a primary diagnosis of lumbar scoliosis (International Classification of Diseases, Ninth Revision [ICD-9]: 737.30) who underwent spine surgery (ICD 9: 81.04–08) for correction of the deformity. Exclusion criteria: diagnosis of scoliosis within one year prior to index hospitalization, fusion or revision fusion surgery (ICD 9: 81.34–38) within one year prior to index hospitalization, development of cancer within 6 months of surgery, and death during index hospitalization.

2.3. Variables and outcomes of interest

Patient baseline characteristics included age, sex, race, Gagne comorbidity score, pre-diagnosis follow-up time and post-surgery follow-up time. Patients were categorized by age (66 to 74 years and over the age of 75 years). Race was categorized as White, Black, Hispanic or other. The Gagne score is a measure that combines the Charlson index and the Elixhauser measure to account for the burden of comorbidities for prediction of mortality [3]. Pre-diagnosis follow-up time was calculated by subtracting coverage start date from index admission date. Post-surgery follow-up time was calculated by subtracting index discharge date from either death or end of study (12-31-2011). No patients were enrolled in a Health Maintenance Organization (HMO) 1 year prior to index admission until death or the end of the study. Patient survival was defined as the time from index discharge date to either death or end of the study, for those who were censored. Outcomes of interest included index hospitalization (days), index hospitalization Medicare payment, with costs adjusted to 2011 USD using the medical component of the consumer price index [4], discharge disposition (home/self-care, SNF, organized home health services, inpatient rehabilitation, long-term care hospital, other), length of stay (LOS), 30-day readmission rates, 30-day mortality rates, 30-day wound infection rates, complications, and 1-, 2-, and 5-year reoperation rates after index hospital discharge.

2.4. Statistical analysis

Patient characteristics were compared using Mann–Whitney U test for continuous variables (age, Gagne score, pre-diagnosis and post-surgery follow-up times) and Chi-squared test for categorical variables, such as sex and race. Initially, outcomes were compared in unadjusted fashion. Outcomes found to be significantly different were further compared using adjusted multivariate models that included the comparative variable age group, covariates Gagne score, sex, and race. Index hospitalization, LOS, and Medicare payment were compared using log-linear models, while discharge disposition, 30-day readmission, 30-day mortality, 30-day wound infections, complications, and reoperation (at 1-, 2-, 3-, 4-, 5-years) were compared using logistic regression models. A p value < 0.05 was deemed statistically significant.

3. Results

A total of 453 scoliosis patients meeting inclusion criteria were identified. Of the 453 patients, 262 (57%) were between the ages of 66 and 74 years, and 191 (42%) were older than 75 years of age. Patient demographics are detailed in Table 1. Mean age was 73.8 years (standard deviation [SD] = 5.18). Women comprised 78% of our sample (22% men). Caucasians represented 95.58% of our sample. Mean Gagne score was 0.37 (SD = 1.08). Pre-diagnosis follow-up time averaged 118 months. Post-surgery follow-up averaged 33 months.

Characteristics for both age subgroups (66 to 74 years and over the age of 75 years) adjusted for Gagne score, sex, and race are detailed in Table 2. Median LOS was 5 days for the entire study population. Median LOS was also 5 days in patients 66 to 74 years of age. Median LOS was 4 days in patients older than 75 years, but this was not statistically significant. Median index hospitalization Medicare payment for all patients was $33,385 ($34,525 for patients aged 66 to 74 years versus $32,097 for patients older than 75 years), but this was not statistically significant. The most likely discharge disposition for patients age 66 to 74 years was home/self-care, while patients over 75 years of age were more likely to be discharged to a SNF (38.55% versus 34.04% of total discharges, respectively; p value = 0.0011). Discharge to inpatient rehabilitation was also more common in patients over 75 years of age (26.18% versus 22.14%). Discharge to long-term care hospitals was uncommon in both subgroups. Thirty-day readmission rate was significantly higher in patients over 75 years (17.28% versus 9.92%, p value = 0.0217).

Complication rates during the index hospitalization were higher in patients 66 to 74 years of age (18.32% versus 17.28%), however, this was not statistically significant. At 30-days post-discharge, the complication rate for patients 66 to 74 years increased by 2.67% compared to a 9.37% increase seen in patients over the age of 74 years (20.99% cumulative complication rate versus 26.65%, respectively), but this was not statistically significant. Thirty-day wound infection did not differ significantly between the two subgroups. Thirty-day mortality rates of patients aged 65 to 74 years was nearly half that of patients older than 75 years, but this was not statistically significant. A list of ICD-9 codes for complications is provided in Table 3. Reoperation after index hospitalization was followed at 1-, 2-, and 5-year intervals. Rates for overall reoperation were slightly higher at each follow-up interval for patients aged 66 to 74 years, compared to patients older than 75 years, but these were not statistically significant. Overall, both subgroups saw an increased rate of reoperation as time passed.