Spine Surgical Subspecialty and Its Effect on Patient Outcomes – A Systematic Review and Meta-Analysis

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INTRODUCTION: Although orthopaedic surgeons and neurosurgeons have different training backgrounds, both receive substantial spine-specific training prior to independently performing spine procedures. Unfortunately, under the guise of “comparative effectiveness research”, biased studies have started to circulate regarding the superiority of one subspecialty compared to the other. These studies oppose the current direction of spine surgery, which is focused on collaborative approaches to spinal care with both orthopaedic spine surgeons and neurosurgeons jointly consulting on complex spine cases to improve patient care. Therefore, the purpose of this study was to perform a systematic review and meta-analysis of the available literature, which compare differences in postoperative outcomes based on spine surgical subspecialty.

METHODS:

Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA) guidelines, we conducted a search of PubMed and Scopus databases for studies evaluating the clinical outcomes of spinal procedures based on specialty training. Search terms included: (orthopaedic) AND (neurosurgery) AND (training) AND ((specialty) OR (experience) OR (residency)) AND (outcomes).

We included studies if they directly compared outcomes between patients undergoing spinal surgery based on surgeon type: neurosurgeon versus an orthopaedic spine surgeon. We excluded studies if they did not include postoperative outcomes or if they did not directly compare spine subspecialists. Since all studies were retrospective, the Newcastle-Ottawa scale was utilized to determine the quality of studies.

Meta-analyses were performed to compare overall complications, hospital readmissions, reoperation, length of stay, operative time, and blood transfusion between neurosurgery and orthopaedic surgery. Studies that reported on subgroups based on procedure type or number of levels were input as separate studies for meta-analysis. Studies were not included if they did not report on the specific outcome or if they did not indicate a measure of variance for continuous variables. Forest plots were generated using mean differences (MD) for continuous variables and odds ratios (OR) for binomial variables, and 95% confidence intervals (CI) were reported. Study heterogeneity was reported using the I^2 statistic, and funnel plots were generated for each outcome. Studies in forest plots and funnel plots were labeled numerically. Subsequent meta-analyses were performed after exclusion of two studies (four subgroups labeled 1-4), which were published by a neurosurgery group and believed to be highly biased.

RESULTS:

Of 615 search results, a total of 16 studies were included. Fourteen (87.5%) studies utilized only database data. Only one study had a quality assessment score of seven or more.

Complications

Of ten studies that compared overall complications, eight (80.0%) studies found no difference in complications between orthopaedics and neurosurgery. After running a meta-analysis, no differences in overall complication rates were found based on neurosurgical and orthopaedic spine subspecialty (OR, ref: orthopaedics: 1.03 [95% CI: 0.97; 1.10]; I^2=70%).

Reoperation

Twelve studies reported on reoperation rates, and seven of these studies did not detect differences between groups. The meta-analysis found there was no difference in reoperation rates between orthopaedic spine surgeons and neurosurgeons (OR, ref: orthopaedics: 0.91 [95% CI: 0.82; 1.00]; I^2=86%). After removal of the two most heterogenous studies (labelled 1-4; which were performed by a single neurosurgery group and had the lowest quality assessment), there was still no difference in reoperation rates, but less heterogeneity existed (OR, ref: orthopaedics: 1.03 [95% CI: 0.96; 1.12]; I^2=76%) (Figure 1).

Length of Stay, Operative Time, and Blood Transfusions

Six studies reported on postprocedural hospital length of stay, and neurosurgeons were found to have a significantly shorter length of stay in three of these studies. Following removal of the two studies that most influenced heterogeneity and had the lower Newcastle-Ottawa quality assessment scores, length of stay was significantly shorter for orthopaedic spine surgeons and there was less study heterogeneity (MD: 0.13 days [95% CI: 0.08; 0.18]; I^2=66%).

Operative time was reported in five studies, and four of these found orthopaedics to have a lower operative time than neurosurgery.[3,4,17,28] Meta-analysis demonstrated orthopaedic spine surgeons were found to have a shorter operative time when compared to neurosurgeons (MD: 14.28 minutes, [95% CI: 8.07; 20.49], I^2=97%).

Nine studies compared the rates of blood transfusion, and neurosurgery was found to have lower rates of blood transfusion in seven of these studies. Review of the meta-analysis demonstrated neurosurgery to have a significantly lower rate of blood transfusions when compared to orthopaedic spine surgeons (OR, ref: orthopaedics: 0.49 [95% CI: 0.41; 0.57]; I^2=75%).

DISCUSSION AND CONCLUSION: Orthopaedic spine surgeons and neurosurgeons are equally capable of performing either cervical spine or lumbar spine surgery. Recently, two biased studies were published by a group of neurosurgeons based on NSQIP databases, which suggested that neurosurgeons have substantially better spine surgical outcomes with adverse events and readmission rates. These studies conflict the existing literature and were found to be highly biased based on our meta-analysis of the data. Spine surgeons should continue to focus on collaboration to work on advancing the field of spine surgery and optimizing patients' surgical outcomes.