Effect of Hospital Volume on Outcomes of Surgery for Cleft Lip and Palate

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Purpose: Cleft lip and cleft palate are the most common craniofacial anomalies. However, the effect of hospital volume on outcomes of surgery for cleft lip and palate is unknown.

Materials and Methods: The Japanese Diagnosis Procedure Combination database was searched to identify patients who underwent surgery for cleft lip and palate from July 2010 through March 2013. Hospital volume was divided into tertiles (≤28, 29 to 82, and ≥83 admissions/yr). Outcomes included total cost, length of hospital stay, duration of anesthesia, and length of antibiotic use. The relation between hospital volume and surgical outcomes was analyzed by multivariable regression analyses.

Results: The authors identified 7,405 admissions for cleft lip alone, cleft palate alone, or cleft lip and palate during the study period. Compared with the reference low-volume hospital category, a shorter duration of anesthesia was seen in the medium-volume group (−15 minutes; 95% confidence interval, −37 to 7 minutes) and high-volume group (−22 minutes; 95% confidence interval, −65 to 3 minutes). No statistical associations were observed between hospital volume and total cost or length of stay. Although not statistically important, a higher hospital volume was associated with a shorter length of antibiotic use after adjusting for duration of anesthesia.

Conclusion: In the present study of surgical outcomes for cleft lip and palate, hospital volume was inversely associated with duration of anesthesia and length of antibiotic use, but was not statistically associated with length of hospital stay or total cost.

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Cleft lip and cleft palate are the most common congenital craniofacial anomalies. The reported occurrence of cleft lip and palate is 1 in 700 births worldwide and 1 in 500 births in Asians and Native Americans.[1] Cleft lip and palate affect facial appearance, psychiatric functions, and physical functions (speech, hearing, and feeding). Patients with cleft lip and palate require professional care from birth through early adulthood.

Care for children with these defects generally spans several areas of medicine: nursing, plastic surgery, maxillofacial surgery, speech therapy, counseling, orthodontic treatment, and dental treatment.[2] In many countries, these treatments have tended to be fragmented and decentralized, leading to variations in the management of cleft care and a resultant lack of standardized care.

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The relation between hospital volume and outcomes of cleft repair remains unknown. In 1996, a nationwide study on surgeon volume and outcomes of cleft repair was conducted in the United Kingdom.[3] The study found that approximately 40% of surgeons performing cleft repair performed only 1 case per year, and the outcomes were generally poorer than those in other European countries.[4,5] These results prompted the centralization of cleft care in the United Kingdom. Centralization results in a lower rate of corrective surgery, a shorter in-hospital stay, and standardization of the timing of surgery.[6,7] However, these studies did not account for possible effects of hospital volume or surgeon volume on the outcomes of surgery for cleft lip and palate because of their before-versus-after study design and limited adjustment for confounders. In addition, a few years after centralization, 1 study reported that surgeon volume did not affect the outcomes of cleft repair.[8] Furthermore, few studies to date have focused on the volume-versus-outcome relation in cleft repair in countries other than the United Kingdom.

The aim of this study was to examine the relation between hospital volume and short-term outcomes of surgery for cleft lip and palate.

Materials and Methods

DATA

The authors searched the Diagnosis Procedure Combination database, a national inpatient database in Japan, from July 2010 through March 2013. The details of the database are described elsewhere.[9] In brief, the database includes administrative claims data and discharge data. All 82 academic hospitals are obliged to participate in the database, whereas participation by community hospitals is voluntary. In 2012, approximately 7 million inpatient data were collected from approximately 1,000 hospitals, constituting approximately half of all acute hospitalizations in Japan. The database includes the following clinical information: age; gender; diagnoses, comorbidities at admission, and complications after admission recorded in accordance with the *International Classification of Diseases, Tenth Revision* (*ICD-10*) codes and text data in Japanese; Japanese original surgical codes (K-codes); duration of anesthesia (time of anesthetic induction to awakening in recovery); and length of hospital stay.

The institutional review board at the University of Tokyo (Tokyo, Japan) approved this study. The requirement for informed consent was waived owing to the anonymous nature of the data.

PATIENTS

The authors identified patients who underwent cleft repair from July 2010 through March 2013. The

following data were extracted: age, gender, type of institution (academic or nonacademic), additional anomalies, type of surgery, total cost, length of stay, duration of anesthesia, and length of antibiotic use. Age was categorized as no older than 2, 3 to 5, and at least 6 years.

The authors also examined several additional procedures for patients with cleft lip and palate, including bone grafting and tympanostomy. Bone grafting of the maxillary and alveolar defect is a common part of cleft surgery.[10] Tympanostomy is routinely performed in cleft repair because middle ear disease is almost universal in patients with cleft lip and palate.[11]

The list of *ICD-10* codes from a previous study[12] used to identify additional congenital anomalies and syndromes in these patients is presented in Appendix 1.

OUTCOMES

The primary outcomes were total cost, length of hospital stay, and duration of anesthesia. The secondary outcome was the number of days that antibiotics were administered after surgery for cleft lip and palate.

STATISTICAL ANALYSIS

Hospital volume was defined as the number of discharges for cleft repair procedures performed annually at each hospital and was categorized into 3 groups (low-, medium-, and high-volume groups), with approximately equal numbers of admissions in each group. The χ^2 test was used for categorical variables and 1-way analysis of variance was used for continuous variables. Multivariable linear regression analyses were conducted to examine the association between hospital volume and outcomes. Generalized estimating equations were applied for linear regression models to adjust for within-hospital clustering. All tests were 2-tailed, and *P* values less than .05 were considered statistically significant. All statistical computations were performed with SPSS 22 (IBM SPSS, Armonk, NY).

Results

During the study period, the authors identified a total of 7,405 surgeries for cleft lip and palate performed in 248 institutions. At the time of surgery, approximately 30% of patients were 0 year old and 37% were at least 6 years old. The mean and median annual hospital volumes were 33.5 and 59.0 discharges per year, respectively. Hospital volume was divided into tertiles (low, ≤28 discharges/yr; medium, 29 to 82 discharges/yr; high, ≥83 discharges/yr).

Table 1 lists the patient demographics divided into the 3 hospital volume categories. The proportions of surgical procedures performed for cleft palate alone and tympanostomy were highest in the