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Trends in the management of pediatric peritonsillar abscess infections in the U.S., 2000–2009

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ABSTRACT

Objectives: To analyze temporal trends in the incidence and surgical management of children with peritonsillar abscesses (PTAs), and to examine whether there has been concurrent changes in hospital charges or length of stay.

Methods: The Kids' Inpatient Database (KID) from 2000 to 2009 was examined for children less than 18 years old with ICD-9-CM diagnostic codes for PTA (475). Survey weighted frequency and regression analyses were performed across the entire study period on variables of interest in order to determine estimates of national incidence, demographics and outcomes.

Results: A total of 20,546 weighted cases of PTA were identified during the study period. There was no significant change in the incidence of pediatric PTA across the study period ($p = 0.63$) or in the rate of nonsurgical management ($p = 0.85$). There was a significant increase in the rates of I&D from 26.4% to 33.7% ($p < 0.001$) and a significant decrease in the rate of tonsillectomy from 13.0% to 7.8% ($p < 0.001$). Mean inflation-adjusted charges significantly increased from approximately $8400 in 2000 to $13,300 in 2009 ($p < 0.001$), and average length of stay was 2.15 days with no significant change during the study period ($p = 0.164$). Mean inflation-adjusted charges for patients undergoing tonsillectomy alone were approximately $1800 greater than mean charges for those undergoing I&D alone ($p = 0.003$) and length of stay was also significantly longer for tonsillectomy patients versus I&D patients [I&D 1.99 days versus tonsillectomy 2.23 days ($p < 0.001$)].

Conclusions: There was no change in the incidence of pediatric PTAs from 2000 to 2009 but there was a change in surgical management, with a significant decrease in the rate of tonsillectomy and significant increase in the rate of incision and drainage procedures. Hospital charges during this period increased nearly 60% despite no change in rates of CT imaging, surgical intervention or length of stay.

1. Introduction

Abscess in the area between the palatine tonsil and its capsule, peritonsillar abscess (PTA), is one of the most common deep space neck infections [1]. Recent reports in the literature have postulated an increased incidence of PTAs linked to fewer elective tonsillectomy procedures [2–4]. Novis et al., however, found no change in the incidence of PTAs among children in the United States between 2000 and 2009 [1]; however, they did not report on the surgical management of peritonsillar abscesses. We could find no prior studies in the literature regarding temporal trends in the utilization of quinsy tonsillectomy versus incision and drainage, although there has been considerable debate regarding which surgical option is most appropriate for pediatric patients [5–9]. Our primary objectives were therefore to (1) assess for a change in the rate of children with PTA receiving surgical management and (2) assess for a change in the type of surgical intervention provided.

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Secondary interests in resource utilization prompted us to explore length of stay and hospital charge data.

2. Methods

A retrospective analysis of inpatient hospitalizations for peritonsillar abscesses (PTA) was conducted using years 2000, 2003, 2006, and 2009 of the Kids' Inpatient Database (KID), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality (AHRQ). The KID is the only all-payer database of hospital pediatric inpatient stays for patients younger than 21 years of age in the United States, containing data from approximately 3 million pediatric discharges each year from a sample of all pediatric discharges from 2500 to 4000 U.S. community hospitals in 44 states [10]. The database is available every three years and contains both public and private hospitals. The large sample size enables analyses of both common and rare diagnoses and treatments, and a weight variable for each record can be used to arrive at national estimates of pediatric discharges within the United States. It is publicly available from the AHRQ.

The KID was queried for pediatric inpatients younger than 18 years of age with a diagnosis of PTA using the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes for PTA (code 475) assigned to any of the first 15 diagnoses. Of these children with PTA, those who had an abscess complicated by a parapharyngeal abscess (PPA) or retropharyngeal abscess (RPA) were identified by searching for ICD-9-CM codes 478.22 and 478.24, respectively, and excluded from the analysis. To establish a cohort that received surgical management, we identified patients with procedural codes for incision and drainage of tonsil and peritonsillar structures (I&D) (ICD-9-CM code 28.0), tonsillectomy (ICD-9-CM codes 28.2, 28.3, 28.99) or both. Due to limitations in the specificity of coding, it was not possible to separate those who underwent I&D from those who underwent needle aspiration of their peritonsillar abscess. Patients who did not receive either procedure were categorized as those who received no surgical intervention.

Patient-related variables obtained from the KID included age (in years), sex, race (white or non-white), and insurance status (Medicaid, private, other). Hospital characteristics included location (rural, urban), bed size (small, medium, large), and teaching status (teaching, nonteaching) as defined by HCUP [10]. Hospital variables were included to account for differences in management based on hospital setting. Hospital resource utilization was defined by length of stay in days and hospital charges. Charges are adjusted for inflation using the Medical Care Consumer Price Index to 2009 U.S. dollars and are reported in U.S. Dollars according to the value in 2009 [1,11]. Cost-to-charge ratios were not used in the evaluation as they were not available for the dataset from 2000 [1]. Additional information about the hospital course was obtained using ICD-9-CM procedure codes for computed tomography (CT) (87.03, 87.04). Incidence was calculated using U.S. Census Bureau estimates to divide the total weighted number of discharges by the age-appropriate population of the United States [12].

Differences in patient demographics obtained from the KID were analyzed using chi-square tests and ANOVA. Linear regression analysis was performed on incidence and hospitalization characteristics to determine change over time. All analyses were weighted according to HCUP recommendations in order to account for complex survey design [10]. All statistical analyses were performed using the Statistical Package for the Social Sciences software (SPSS, Version 21.0; SPSS Inc., Chicago, IL). Two-tailed *P*-values <0.05 were considered significant in analyses. This study was determined to be exempt from review by the Institutional Review Board of Northwestern University.

3. Results

A total of 20,546 weighted cases of PTA were identified during the study period. Of these patients, 10,417 (48.9%) received no surgical intervention, 6268 (29.4%) received I&D, 2127 (10.0%) received tonsillectomy, and 1734 (8.1%) received both I&D and tonsillectomy during their hospitalization. Patient demographics are displayed in Table 1.

There was no significant change in the incidence of pediatric PTA over the study period ($p = 0.63$) as shown in Table 2. There was a statistically significant increase in the rates of I&D for pediatric PTA from 26.4% in 2000 to 33.7% in 2009 ($p < 0.001$). There were also significant decreases in rates of tonsillectomy alone from 13.0% in 2000 to 7.8% in 2009 ($p < 0.001$) and of I&D and tonsillectomy from 9.5% in 2000 to 7.4% in 2009 ($p = 0.044$). There was no change in rates for the group that received no surgical intervention during the study period ($p = 0.85$). The rate of intervention for pediatric PTA is graphically represented in Fig. 1. Those receiving tonsillectomy were on average one year younger compared to those receiving I&D (11.6 vs 12.6, $p < 0.001$). Additionally, the odds of tonsillectomy were increased in the younger age groups on univariate analysis: ages 0–4 years (OR = 1.805, $p < 0.001$) and ages 5–9 years (OR = 1.487, $p < 0.001$); however, this trend was not statistically significant for those in the 10–14 age group (OR = 1.063, $p = 0.51$).

Table 3 displays hospitalization and CT imaging characteristics for pediatric patients with PTA. There was no change in the percentage of hospitalized patients undergoing CT imaging ($p = 0.645$). Due to the low number of patients undergoing imaging, further subgroup analysis based on age or other demographic variables was not possible within the confines of the data use agreement which specifies that subgroups with values less than or equal to 10 be masked to prevent identification of individuals [10]. Average length of stay was 2.15 days for all patients with no significant change during the study period ($p = 0.164$). Mean inflation-adjusted charges were $10,416.48, with a significant increase from $8419.29 in 2000 to $13,301.22 in 2009 ($p < 0.001$). Mean charges increased significantly in each region of

Table 1
Demographics for children with PTA by type of interventions.

	No surgical intervention	I&D only	Tonsillectomy only	I&D and tonsillectomy	Total	*p*-Value
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	($^*p<0.05$)
Sex, female	5410 (52.6%)	3399 (55.7%)	1156 (54.9%)	944 (55.4%)	10,909 (53.1%)	0.037*
Mean age (years)	11.3	12.6	11.6	11.6	11.7	<0.001*
Race (non-white)	3858 (48.3%)	2556 (52.4%)	550 (35.7%)	521 (39.1%)	7485 (36.4%)	<0.001*
Medicaid	3726 (64.2%)	2230 (35.6%)	674 (31.7%)	544 (31.4%)	7174 (34.9%)	0.018*
Teaching hospital	5480 (54.9%)	3734 (61.3%)	1065 (53.5%)	912 (55.4%)	11,191 (54.5%)	0.001*
Location, Urban	8483 (85.0%)	5579 (91.6%)	1687 (84.8%)	1418 (86.2%)	17,167 (83.6%)	<0.001*
Large hospital size	5260 (52.7%)	3456 (56.8%)	1054 (53.0%)	905 (55.0%)	10,675 (52.0%)	0.047*
Total no. of discharges	10,417 (48.9%)	6268 (29.4%)	2127 (10.0%)	1734 (8.1%)	20,546 (100%)	