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Cost comparison of different treatment approaches of dacryocystitis and dacrocystocele

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Abstract

Purpose: Congenital dacrocystocele with potential for dacryocystitis are common ophthalmic findings in children. There are multiple surgical approaches to open the mucocele. In this study, we look at the financial impact of these different approaches.

Methods: A retrospective chart review of 17 patients with dacrocystocele or dacryocystitis was performed. We examined four approaches: (1) bedside nasal endoscopy with marsupialization of nasolacrimal duct (NLD) cyst, (2) surgically performed nasal endoscopy with marsupialization of NLD cyst, (3) NLD probe, and (4) a combination of procedures. Cost of the procedure and length of anesthesia were collected. Reoccurrence of symptoms and disease post-procedure were also collected.

Results: The lowest cost billed procedure was bedside nasal endoscopy performed by an otolaryngologist (US$435; $n = 1$). A nasal endoscopy ($n = 2$) performed in the operating room (OR) had an average OR fee of US$14,557 [standard deviation (SD): US$7598] for 108.5 (SD: 87.0) min of operating time. An NLD probe ($n = 5$) performed by pediatric ophthalmologists resulted in an average OR fee of US$5540 (SD: US$1752) for 31.0 min (SD: 8.6 min) of operating time. A combination of both nasal endoscopy and NLD probing ($n = 9$) had an average OR fee US$10,325 (SD: US$4137) for 69 min (SD: 34.5 min) of operating time.

Conclusion: This is the first study looking at cost benefit of four different approaches to treating dacrocystoceles/dacryocystitis. A NLD probe was a low-cost OR intervention and had the shortest operating time. The combination procedure was more cost-effective than nasal endoscopy or NLD probing alone.

Keywords: cost-effectivity, dacryocele, dacryocystitis

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Introduction

Nasolacrimal duct obstruction (NLDO) is a common finding, present in around 5–10% of newborns.[1] Symptoms most commonly include discharge and/or tearing. Less commonly, symptoms can include feeding difficulty or respiratory compromise.[1,2] Early interventions, in the absence of airway symptoms, are often limited to supportive care. Observation is preferred as the obstruction resolves spontaneously in over 90% of patients by 12 months of age.[3–5] Along the spectrum of NLDO, newborns can develop a saccular outpouching (dacryocystocele) or infection of the obstruction (dacryocystitis). In these cases, or in the case of persistent symptoms beyond 12 months, surgical intervention is pursued. The most common intervention performed by ophthalmologists includes nasolacrimal duct (NLD) probing with or without stenting of the system.[6] Often the treatment of this condition falls to otolaryngologists as they have several approaches to management.[7,8] In recent years, the use of nasal endoscopy with marsupialization of the NLD cyst by them has become more popular as a standalone treatment or in conjunction with NLD probing.[9–11] This has been effective even when

performed bedside with minimal sedation.[12] Fischer and colleagues found that an interdisciplinary approach had a higher overall success rate compared with conventional probing.[10] Other studies have shown effective treatment with probing alone.[6,13]

Given multiple surgically effective approaches to treatment of dacryocystocele, there is a demand for cost-effectiveness. Medical cost and reimbursement have been a rising topic in the medical community.[14] There are no prior studies looking into cost in the treatment of dacryocystocele. An ideal procedure in this treatment algorithm would be a procedure with a short length and lower operating room (OR) fees and would have a high success to eliminate the need for further procedures and cost. Therefore, our study is a preliminary examination into costs associated with the surgical treatment of dacryocystocele at Children's Hospital of Colorado (CHCO).

Methods

The Colorado Multiple Institutional Review Board (#15-1801) approved this study. A retrospective chart review of 17 patients with the diagnosis of dacrocystocele ($n = 9$) or dacryocystitis ($n = 8$) was conducted. Given the retrospective nature, no written consent was obtained from patients. All patients received care at CHCO (October 2012 to September 2015). Patients with a diagnosis of NLDO without complication or resolution at 12 months of age were excluded as their treatment approach was conservative and did not require surgery. There were four surgical approaches included in this analysis: nasal endoscopy preformed at the bedside by otolaryngology ($n = 1$), nasal endoscopy performed in the OR by otolaryngology ($n = 2$), NLD probing by a pediatric ophthalmologist ($n = 5$), or a combination of endoscopy and NLD probing by an ophthalmologist and an otolaryngologist in the same procedure ($n = 9$). Nasal endoscopy was defined as simple visualization of the dacrocystocele with an endoscope with subsequent marsupialization of the nasolacrimal sac.

Costs were collected from the CHCO billing department and reflected the amount billed to the insurance company, not billed to patients. Data were collected on the cost of the procedure, which included length of anesthesia and length of operating time, location of procedure, and specialties involved. Additional cost for stents placed at the time of surgery was also collected. Data were averaged based on specialists performing the procedure and OR time and cost are presented with means and standard deviations (SD). When the procedure was performed while the patient was admitted, inpatient fees were analyzed separately, and not included in the overall cost of each procedure as some were performed on an outpatient basis.

Results

The average age of patients with the diagnosis of dacrocystocele was 32 days (range: 5–45 days). The average age of the patients with the diagnosis of dacryocystitis was 930 days, range 32–1342 days. The presenting symptoms were discharge ($n = 9$), tearing ($n = 7$), and difficulty breathing ($n = 1$). The lowest billed procedure was a single-bedside nasal endoscopy performed by otolaryngology on the inpatient floor. The total cost for this approach in the one patient who underwent this procedure was US$435 in addition to inpatient fees. There was no anesthesia with this procedure other than pain control. All other procedures for the treatment of dacryocystocele/dacryocystitis were performed in the OR with general anesthesia. Baseline OR fee was either US$3131.45 or US$3453.21 based on patient complexity of care assigned by case length. Average OR cost per minute was US$69.60 (range: US$41.75–US$98.82). Average general anesthesia cost per minute was US$12.97 (range: US$9.47–US$20.22); however, there was no data on differences in anesthesia medications administered. Additional fees for recovery and observation were included. Although the data are not presented, the medians were very similar to means for both length of operating time and OR cost.

As outlined in Figures 1 and 2, nasal endoscopy alone resulted in an average OR fee of US$14,557 (SD: US$7598) for 108.5 min (SD: 87.0) min of operating time. NLD probe had an average OR fee of US$5540 (SD: US$1752) for 31.0 min (SD: 8.6 min) of operating time. Combination of both NLD probe and nasal endoscopy had an average OR fee of US$10,325 (SD: US$4137) for 69 min (SD: 34.5 min) of operating time. The cost of a Crawford stent (FCI Ophthalmics, Pembroke, MA, USA) placed in two ophthalmology patients was included and averaged as US$569 per stent.

There was no reoccurrence requiring additional surgical intervention in nasal endoscopy performed procedures or in the combined surgical

approach. NLD probing alone had one patient with reoccurrence that required additional surgery for persistent tearing, and this cost was not included in the analysis as it fell outside of the study window. Inpatient costs were analyzed for 15 of the 17 patients with a mean cost of US$21,855 (SD: US$59,342) over an average of 3.8 days (SD: 8.2 days), and the other two patients were not admitted as they did not meet admission criteria.

Discussion

There is of interest in cost-effective medicine with no prior study looking at cost-effective surgical interventions to complications of dacryocystocele. With the option for multiple effective treatments in the approach to dacrocystocele and dacryocystitis, costs associated with these procedures are important in the selection of surgery type. The lowest billed intervention was the bedside nasal endoscopy as it removed the cost of the OR and general anesthesia. It was associated with inpatient fees, but otherwise had no additional cost associated with anesthesia or reoccurrence. This intervention cannot be assumed to be the most cost-effective or less likely to have disease recurrence as we only had one patient with this intervention, and this procedure can only be performed in a few select patients. An inpatient or outpatient bedside nasal endoscopy is typically only an option for neonates under the age of 2 weeks. As the child ages, the OR with general anesthesia is preferred for safety concerns and for patient comfort.

Regarding all the procedures performed in the OR and under general anesthesia, NLD probing alone was the most cost-effective, given the shortest operating times. NLD probing remains a quick and effective surgical option. In two out of five cases, there was a small fee for the use of Crawford stents not used conventionally by otolaryngologists. From a cost analysis standpoint, there was a case of reoccurrence with NLD probing alone. This additional cost burden was not analyzed in this study but does add to the financial burden and patient dissatisfaction as well as the possible neuro-morbidity from a second general anesthetic.

The limitations of this study include the small population studied and lack of data on cost of reoccurrence. We did not analyze if the second intervention was a multispecialty approach or which procedure was performed. In addition, this presents data from one institution and a limited number of surgeons. These data present our cohort; therefore, a larger patient population over many institutions would strengthen this study in the future.

The combination of both ophthalmology and otolaryngology physicians performing a combined procedure was more cost-effective than otolaryngology performing nasal endoscopy alone in the OR. There was no reoccurrence with otolaryngology involvement, which reduces overall cost. All options remain effective surgically. In our cohort, we noticed that a multispecialty approach may be the most cost-effective option for congenital nasolacrimal duct obstruction (CNLDO) requiring surgery.

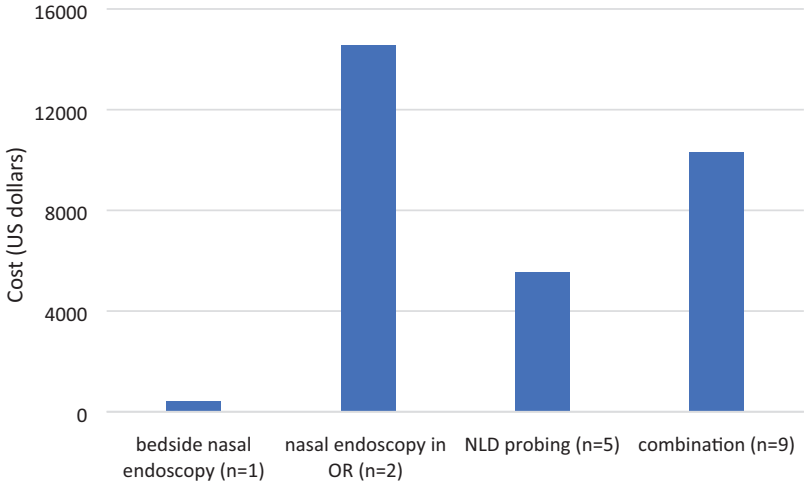

Figure 1. Average billed cost per procedure type.

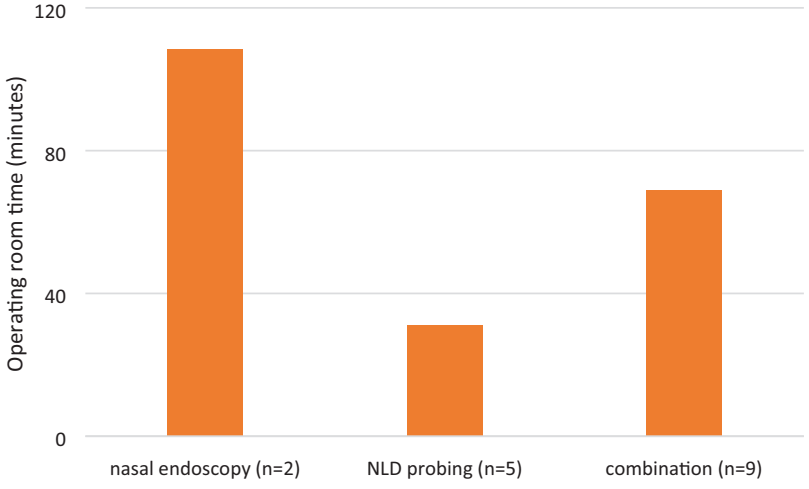

Figure 2. Average operating room time per procedure type.

Authors' note

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