Letters

RESEARCH LETTER

Revision Surgery After Dacryocystorhinostomy in a National Cohort

Dacryocystorhinostomy (DCR) is the standard treatment for nasolacrimal duct obstruction.[1] Despite limited data from predominantly small single-surgeon studies showing clear benefit for patient outcomes, silicone stents are commonly placed, and we believe endonasal approaches are increasing in use.[1-4] In this study, we examined the rate of revision after DCR and evaluated associated risk factors in a national patient cohort.

Methods | Data from all patients undergoing DCR from January 1, 2000, to December 31, 2012, were extracted from the Clinformatics Data Mart Database (Optum). This study was exempt from review by the University of Pennsylvania Institutional Review Board owing to the deidentified data. The primary outcome was the rate of revision DCR within 1 year. For inclusion, patients were required to have 12 or more consecutive months of plan enrollment prior to and after the date of initial DCR. Use of this inclusion period reduced the possibility of a second DCR being considered an initial surgery. Exclusion criteria included insufficient laterality documentation. However, if the initial DCR was bilateral, a second DCR was counted as a revision. Multivariate logistic regression was performed using Stata software (version 14; StataCorp LLC). All *P* values were 2 sided, and statistical significance was set at $< .05$. All variables with $P < .20$ in uni-

Table 1. Cohort Characteristics

Characteristic	DCR Without Revision, No. (%) (n = 1117)	DCRs With Revision, No. (%) (n = 98)	Total (n = 1215)
Mean age, y (SD)	67.4 (15.0)	66.2 (20.2)	67.3 (15.5)
Age by category, y			
<30	30 (2.7)	8 (8.2)	38
30-60	218 (19.5)	13 (13.3)	231
>60	869 (77.8)	77 (78.6)	946
Sex			
Female	832 (74.5)	71 (72.4)	903
Male	285 (25.5)	27 (27.6)	312
Race			
White	844 (75.6)	77 (78.6)	921
Black	94 (8.4)	6 (6.1)	100
Hispanic	45 (4.0)	2 (2.0)	47
Asian	40 (3.6)	3 (3.1)	43
Unknown	94 (8.4)	10 (10.2)	104
Placement of a stent			
Yes	576 (51.6)	58 (59.1)	634
No	541 (48.4)	40 (40.1)	581
Surgical approach[a]			
External	953 (85.3)	83 (84.7)	1036
Endonasal	115 (10.3)	12 (12.2)	127
Glaucoma medication use	50 (4.5)	3 (3.1)	53
History of sinus surgery	40 (3.6)	3 (3.1)	43
Leukemia or lymphoma	27 (2.4)	0 (0)	27
Any prior facial fracture	16 (1.4)	4 (4.0)	20
History of I 131 use	16 (1.4)	0 (0)	16
Sarcoidosis	15 (1.3)	0 (0)	15
Granulomatosis with polyangiitis	5 (0.5)	0 (0)	5
History of docetaxel use	5 (0.5)	0 (0)	5
Nasal/septal fracture	4 (0.4)	1 (1.0)	5
History of fluorouracil use	3 (0.3)	0	3
Lichen planus	1 (0.1)	0	1
Naso-ethmoid fracture	0	0	0

Abbreviation: DCR, dacryocystorhinostomy.

[a] Fifty-two patients (4.4%) had both an external and endonasal procedure code for the same eye on the same day.

Table 2. Final Multivariate Logistic Regression Model Results[a]

Characteristic	OR (95% CI)	*P* Value
Age by category, y[b]		
<30	2.66 (1.15-6.15)	.02
30-60	0.69 (0.38-1.27)	.24
Placement of stent	1.30 (0.85-1.98)	.23
Endonasal surgical approach	0.97 (0.69-1.35)	.84

Abbreviation: OR, odds ratio.

[a] Factors listed in Table 1 but not in Table 2 were found to be insignificant (*P* > .05) in either initial univariate or final multivariate analysis.

[b] Age greater than 60 years was the reference group.

variate analysis were included in the final multivariate model.

Results | We found that 1215 patients who underwent DCR met inclusion criteria (903 [74.1%] were female and 312 [38.0%] were male; mean [SD] age, 67.3 [15.5] years), and 98 (8.1%) had a revision within 1 year (**Table 1**). The category of younger age (patients <30 years) was associated with revision (OR, 2.66; 95% CI, 1.15-6.15; *P* = .02). Other preexisting diagnoses known to predispose to nasolacrimal duct obstruction were not associated with revision surgery.[5]

There were 634 patients (52.2%) who received a lacrimal stent at initial surgery. Fifty-eight revisions (9.1%) were performed in the patients who initially received a stent. Stent placement was not associated with rate of revision in multivariate analysis (OR, 1.30; 95% CI, 0.85-1.98; *P* = .23) (**Table 2**).

A total of 1036 patients (89.1%) underwent external DCR and 127 (10.9%) endonasal. Ninety-five (8.2%) underwent revision, with 83 (8.0%) having had external and 12 (9.5%) endonasal DCR initially. The rate of revision was not associated with surgical approach in multivariate analysis (OR, 0.97; 95% CI, 0.69-1.35; *P* = .84) (Table 2).

Discussion | Our study from a large North American database supports findings of smaller single-surgeon studies.[1,2,4] Stent placement was not associated with revision. Although stents can maintain patency during the postoperative period, at least 1 study has suggested stents may promote ostial granulation.[4] Another study has shown an association between positive *Pseudomonas aeruginosa* culture on stents and surgical failure.[6] Surgical approach, external or endonasal, was not associated with revision surgery. Patients younger than 30 years had higher odds of revision; however, the small sample size (38 [3.1%]) within this age category limits generalizability about this finding.

The current study has several limitations related to claims data research. First, prior studies have defined DCR success by resolution of epiphora or patency on irrigation.[1-4] We defined failure through the surrogate outcome of revision surgery, which may underestimate the number of cases with residual mild epiphora or partial obstruction on irrigation that did not require further surgery. Second, we were unable to review medical records to verify billed procedure codes. Third, because physician choice determined stent placement or surgical approach, we cannot determine if severity of canalicular or nasolacrimal disease biased management.

Conclusions | We found that of 1215 patients, 98 (8.1%) had undergone revision DCR within a year after initial surgery. Numerous medical and surgical factors were evaluated, including the insertion of a lacrimal stent or surgical approach, and we found no association with revision surgery. Knowing the rate of revision in the typical clinical setting may assist prognostic counseling and set performance measures for quality reporting in registries.

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