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Older age and larger cyst size in children with spontaneous rupture of periorbital dermoid cysts

Nathaniel L. Simmons, MD,[a]
Richard M. Robb, MD,[b]
David J. Tybor, PhD, MPH,[c]
and Aubrey L. Gilbert, MD, PhD[d]

We analyzed clinical and histopathologic data of 97 pediatric patients who underwent excision of dermoid cysts. On review, 16.5% of the sample population demonstrated localized chronic inflammatory changes, including the presence of giant cells and epithelial disruption. These features were considered indicative of prior cyst rupture. Age at time of initial presentation was significantly older and cyst size was significantly larger in patients with histopathologic signs of previous rupture. Longer time to presentation and time to excision were associated with increased odds of spontaneous rupture.

Author affiliations: [a]Department of Ophthalmology, Flaum Eye Institute University of Rochester, Rochester, New York; [b]Department of Ophthalmology, Children's Hospital Boston and Harvard Medical School, Boston, Massachusetts; [c]Department of Public Health and Community Medicine, Tufts University School of Medicine, Boston, Massachusetts; [d]Department of Ophthalmology, Kaiser Permanente Northern California, Vallejo, California

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Correspondence: Nathaniel L. Simmons, MD, 601 Elmwood Ave Box 659, Rochester, NY 14620 (email: nathaniel_simmons@urmc.rochester.edu).

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Periorbital dermoid cysts are lesions commonly seen in pediatric ophthalmology. The congenital lesions are typically benign, grow slowly, and are asymptomatic. The cysts possess a keratinizing, stratified squamous epithelial lining with dermal structures in their wall. Frequently they are located in the supratemporal quadrant along the orbital rim.[1] There is no universally accepted algorithm for management of these lesions, which are often either observed or surgically removed for cosmetic reasons. Surgery is also performed to avoid the potential for persistent inflammation that can be associated with spontaneous cyst rupture.[2] Spontaneous cyst rupture can be thought of as clinically evident, histopathologically evident, or both. Generally, clinically evident rupture is found in older patients with deep, complex cysts and associated with pain; histologically evident cyst rupture, however, may be clinically silent, but evidence of localized inflammation may be seen on histopathologic review. Previous studies have demonstrated the relationship between chronic granulomatous inflammation and epithelial disruption on histology with cyst rupture.[3] The aim of the current study was to find relationships between patient and dermoid characteristics and histopathologic signs of prior cyst rupture.

Subjects and Methods

This study was approved by the Boston Children's HospitalInstitutional Review Board and complies with the requirements of the US Health Insurance Portability and Accountability Act of 1996. The medical records of consecutive patients with pathologically confirmed periorbital dermoid cysts who underwent excisional surgery between 2005 and 2015 at Boston Children's Hospital were reviewed retrospectively. Cysts that were ruptured during excision, as noted in the operative report, were excluded. The cysts evaluated in our study were all periorbital and did not have extension into the orbit or orbital bones. Patients with with incomplete data were also excluded. Our primary dependent variable of interest was histopathologic evidence of prior cyst rupture, including disruption of the epithelial cell layer and presence of chronic inflammatory changes in the cyst wall from a single representative pathologic slide section. Independent variables included patient age at presentation, patient age at the time of surgical removal, sex and race, size (calculated as the square area from the pathology gross specimen report) and location of the dermoid, history of dermoid size fluctuation, history of trauma, and presence of pain. For data analysis, we dichotomized the self-reported race variable into patients who self-reported their race as white versus all others; we dichotomized the

Table 1. Baseline characteristics of included patients (N = 97)

Characteristic	Result
Sex, no. (%)	
Male	56 (57)
Female	41 (43)
Median age, years (IQR)	
At presentation	1.25 (0.59-2.06); range, 0.05-18.87
At time of surgery	1.62 (1.05, 2.50); range, 0.45-19.10
Race, no. (%)	
White	68 (70.1)
African American/black	2 (2.1)
Asian	1 (1.0)
Other	7 (7.2)
Declined/unknown	19 (19.6)
Median dermoid size, cm^2 (IQR)	0.72 (0.48, 1.12)
Patients with specific orbital dermoid characteristics, no. (%)	
Presence of giant cells and disruption of epithelial layer	16 (16.5)
Fluctuating dermoid size	66 (68.0)
Reported history of trauma to dermoid location	3 (3.1)
Pain	1 (1.0)
Lateral dermoid location	76 (78.3)

IQR, interquartile range.

Table 2. Factors associated with prior dermoid rupture

	Evidence of prior rupture (n = 16)	No evidence of prior rupture (n = 81)	*P* value[a]
Mean patient age at presentation, years	5.1	1.6	<0.001
Female, no. (%)	8 (50)	34 (42)	0.88
Dermoid size, mean, cm^2	1.00	0.79	0.02
Size change in dermoid, no. (%)	10 (63)	56 (69)	0.82
Presence of pain, no. (%)	1 (6.3)	0 (0)	0.37
History of trauma, no. (%)	0 (0)	3 (3.7)	0.43
Lateral location, no. (%)	14 (87.5)	62 (76.5)	0.52

[a]A *P* value of <0.05 was considered statistically significant.

location variable to lateral versus medial; and we calculated the size by multiplying the two largest dimensions on the pathology report. Masked to the clinical data, a pathologist reviewed each patient's preserved pathology specimen in serial sections and selected a single representative slide, which was then analyzed for signs of chronic inflammation, including disruption of the epithelial layer and the presence of giant cells.

We calculated descriptive statistics for all variables of interest. Continuous variables were reported as median values and interquartile ranges (IQR) because of the right skew of the data. To determine associations between signs of spontaneous rupture and our other independent variables, we conducted χ^2 tests, two-tailed *t* tests, and separate logistic regression models with "signs of spontaneous rupture" as the outcome and each independent variable as predictors. The Fisher exact test was used to evaluate the significance between the presence of dermoid pain and a history of trauma due to the small number of subjects with these histories. All statistical analyses were performed using Stata version 14.1 (Stata Corp LLC, College Station, TX) with a two-sided *t* test with an alpha level of 0.05.

Results

A total of 124 cases were reviewed, of which 97 (42 females) were included in the final analysis. Sixteen patients (17%) had signs of prior cyst rupture on pathological review (Table 1). The median age at the time of presentation was 1.2 years (IQR, 0.59-2.06), with a range of 0.1 to 18.8 years. The median age at the time of surgical excision was 1.6 years (IQR, 1.05-2.50), with a range of 0.5 to 19.1 years.

The median size of the periorbital dermoid cysts was 0.72 cm^2 (IQR, 0.48-1.12). Most cysts were located temporally (78.3%). A total of 68% of the cysts were noted or reported to fluctuate in size. Only 1% of periorbital dermoid cysts included in the study were reported by the patient or parent to be painful. Only 3% of patients or parents reported a history of trauma to the area of the periorbital dermoid. Finally, there were no known cases of dermoid recurrence at the time of analysis.

Mean dermoid size was significantly larger (1.00 cm^2 vs 0.79 cm^2) and mean age at presentation was significantly older (5.1 vs 1.6 years) for patients with evidence of prior dermoid rupture (Table 2). The two groups did not differ significantly for the other variables reviewed. Statistically significant associations were discovered between signs of prior spontaneous rupture and the patient's age at time of presentation and at time of dermoid removal. For every year waited from birth until a provider was seen, there was a 1.29 times increase in the odds of finding spontaneous rupture on pathology review (95% CI, 1.07-1.55). For every year waited from birth until dermoid removal, there was a 1.38-fold increase in the odds of finding spontaneous rupture on pathology review (95% CI, 1.12-1.70). The following variables were not significantly associated with increased odds of prior rupture: female sex, white race, size, lateral dermoid location, fluctuation of dermoid size, history of trauma, and the presence of dermoid pain.

Discussion

Surgical excision and observation of periorbital dermoid cysts have both been previously demonstrated as treatment options.[4] Currently, there are no evidence-based guidelines for management. Typically, the cysts are removed for cosmetic reasons or fear of rupture. Although our study is limited by its retrospective nature, the data provide potential evaluation targets when assessing orbital dermoids, including age at presentation and dermoid size, to reduce the likelihood of spontaneous rupture. In our study cohort, the mean cyst size was significantly larger for those with evidence of prior rupture than for those without evidence of prior rupture. Additionally, the mean age at the time of presentation was significantly older for patients with evidence of prior rupture than for those without evidence of prior rupture, and there were increased odds of finding spontaneous rupture on pathological review in patients who underwent surgical removal later in life. These data suggest that spontaneous rupture is more likely to occur with a larger dermoid that has been present for a longer period of time compared to a smaller dermoid that has been present for a shorter period of time. Therefore, larger size and older patient age are factors to consider when deciding whether to remove a dermoid to avoid the chance of spontaneous rupture.

Only 1 of our 16 patients with signs of cyst rupture reported pain. This may be because our patient population was largely nonverbal; in another study, up to 18% of patients reported painful dermoids.[5] However, pain may not be the most sensitive indicator of acute rupture. Sherman and colleagues[6] presented histological evidence of prior rupture in 6 patients, all of whom were asymptomatic. Our data demonstrated no significant difference between those patients who reported pain and those who did not with respect to signs of prior cyst rupture, but the only patient who did report pain had signs of cyst rupture on the pathology report.

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Securing extraocular muscles in strabismus surgery: effect of cautery on suture strength

Carolina Adams, MD, and Steven E. Brooks, MD

An experimental study was performed to evaluate quantitatively the effect of cautery on the tensile strength of sutures commonly used in strabismus surgery. This in vitro study was conducted in a controlled fashion using 6-0 polyglactin 910 suture, two different forms of cautery, and a precision digital force gauge. The results suggest that thermal electrocautery with a wire tip can substantially weaken or break 6-0 polyglactin threads only if direct contact is made, but bipolar cautery at typical ophthalmic surgical settings does not.

Strabismus surgery requires a strategy to secure extraocular muscles to sclera until adequate scarring develops. An unstable attachment may result in a lost or slipped muscle. Potential points of failure include a breakdown in the suture, rupture of the scleral fibers, inadequate muscle imbrication, and breakage or loosening of the surgical knot. Previous studies have addressed the maximum forces generated by human rectus extraocular muscles[1] as well as the time course of healing between a reattached muscle and the sclera.[2-6] Recent studies have also evaluated the tensile characteristics of the sclera,[7] the technique used to imbricate the muscle,[8,9] the surgical knot,[9] and various aspects of the suture itself.[10] The current study was performed to objectively address the effect of cautery on suture strength.

Methods

Ten threads of 18-inch, double-armed, 6-0 coated polyglactin 910 suture (Vicryl, Ethicon Inc, Sommerville, NJ) were divided into 3.5-inch lengths. For each suture, the suture segments were randomly distributed into five groups, such that each experimental group received one segment from each of the 10 individual threads. Group 1 served as a "no cautery" control. In group 2 a low-temperature ophthalmic wire electrocautery (Cardinal

Author affiliations: Department of Ophthalmology, Columbia University Medical Center, New York, New York
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Correspondence: Steven E. Brooks, MD, Edward S. Harkness Eye Institute, 635 West 165th St., New York, NY 10032 (email: seb2204@cumc.columbia.edu).
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