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ARTICLE

Nonoperative Management of Perianal Abscess in Infants Is Associated With Decreased Risk for Fistula Formation

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ABSTRACT

OBJECTIVE. We sought to determine the frequency of progression in infants of perianal abscess with and without surgical drainage to fistula in ano to optimize a treatment plan for these children.

METHODS. A retrospective cohort study was conducted of all patients who were ≤1 year of age and presented with perianal abscess to 2 pediatric tertiary care institutions during a 10-year period (January 1995 to February 2005, inclusive). Patients were divided into those who underwent surgical drainage and those who did not, and the rate of subsequent fistula formation was determined.

RESULTS. Of 165 children initially identified, follow-up was available for 140. Ninety-four percent of children were male. Mean age was 4.2 ± 3.1 months. Of the 140 patients, 83 abscesses were drained and 57 were not drained. Of patients who underwent surgical drainage, 50 developed a fistula, whereas of those who did not undergo drainage only 9 developed a fistula. Synchronous administration of antibiotics (intravenous or oral) used in 57 of 58 patients from 1 institution was associated with an even greater decrease in fistula formation (12.5%) in the undrained population.

CONCLUSIONS. Perianal abscess formation in infants who are younger than 12 months is a separate entity from abscess formation in older age groups. In this largest study to date, a combined center series of patients who presented to 2 academic pediatric hospitals with infantile perianal abscess, local hygiene and systemic antibiotics without surgical drainage minimized formation of fistula in ano.

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Key Words
perianal abscess, fistula in ano

Abbreviations
ICD-9—*International Classification of Diseases, Ninth Revision*
MGHfC—Massachusetts General Hospital for Children
HSC—Hospital for Sick Children

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Perianal abscess in infants who are younger than 12 months is associated with a 20% to 80% overall rate of progression to fistula in ano.[1,2] Despite the relative frequency with which perianal abscesses are encountered, no consensus exists regarding their optimal management. Choosing among observation, antibiotics, or incision and drainage is often based on the treating physician's personal bias rather than on established guidelines.[1–10] This lack of standardization results from the absence of data regarding the incidence of recurrence or the progression to fistula in ano among the various treatment modalities.

The practice at many institutions is to incise and drain perianal abscesses in children who are younger than 12 months. We hypothesized that lower rates of subsequent fistula formation are seen if surgical drainage is not routinely performed. To test this hypothesis and obtain more insight into the natural history of surgically treated and untreated perianal abscess, we retrospectively examined the outcomes of infants who presented with perianal abscess.

METHODS

Institutional review board approval was obtained at both hospitals to conduct a retrospective review of in-hospital medical charts and outpatient charts in all patients who were younger than 12 months, assigned an *International Classification of Diseases, Ninth Revision* (ICD-9) code corresponding to perianal abscess (ICD-9 566) or fistula in ano (ICD-9 565.1), and presented during a 10-year period (January 1995 to February 2005, inclusive) to the Massachusetts General Hospital for Children (MGHfC) or to the Hospital for Sick Children (HSC; Toronto, Ontario, Canada). A total of 165 infants were identified, and follow-up was available for 140 (MGHfC: $n = 82$; HSC: $n = 58$). All abscess were described as fluctuant, and laudable pus was expressed when they were incised; however, size was not recorded for any. Data abstraction included demographic information, presenting symptoms, medical and surgical management, complications, progression to fistula in ano, and length of follow-up. Patient outcomes were examined for each institution, as well as in aggregate.

Data were summarized with percentages and means with SDs. Hypothesis testing was conducted with a 2-tailed χ^2 test for categorical data and Student's t test for continuous data. An α value of $<.05$ was deemed significant.

Forward stepwise multivariable logistic regression was performed using SPSS 14 (SPSS, Inc, Chicago, IL). The dependent variable was development of a fistula in ano. Covariates included in the model were hospital site, gender, surgical drainage, antibiotic use, and age (in months). All variables were dichotomous with the exception of age, which was continuous. Probability for entry and removal into the model was set at .05 and .10, respectively.

TABLE 1 Population Characteristics

Characteristic	MGHfC ($N = 82$)	HSC ($N = 58$)	Total ($N = 140$)	P[a]
Gender, *n*				
Male	79	52	131	.20
Female	3	6	9	
Age, mean ± SD, mo	3.9 ± 2.6	4.7 ± 3.6	4.2 ± 3.1	.10
Presence of comorbid immunodeficiency	0	6	6	.01

[a] MGHfC versus HSC.

RESULTS

Of the 165 infants identified by ICD-9 code at the MGHfC and HSC, complete records were available for 140 (82 and 58, respectively). Seventy-nine (96%) of 82 of the MGHfC patients and 52 (90%) of 58 of the HSC patients were male. The mean age of infants who presented to the MGHfC was 3.9 ± 2.6 months. The mean age of infants who presented to HSC was 4.7 ± 3.6 months. The median age of patients at both institutions was 3 months. Patients from MGHfC and HSC had comparable genders and age (Table 1). Six (10%) of the 58 HSC patients were immunocompromised: 4 of these had autoimmune neutropenia, and 2 had neutropenic leukemia and were undergoing chemotherapy. None of these patients' abscess was drained, and no patient developed a subsequent fistula. None of the patients at MGHfC was immunocompromised. Although the HSC patients showed a significantly greater incidence of immunocompromise, eliminating these patients from subsequent analysis did not have an impact on the results.

In aggregate, between the 2 institutions, 83 (59%) of 140 abscesses were drained and 57 (41%) were not drained. Of those drained, 33 (40%) developed a fistula in ano, compared with 9 (16%) of 57 of those that were not drained ($P < .001$). Although the frequency of abscess drainage differed between the 2 institutions, drainage was associated with a significantly increased incidence of the development of fistula in ano (Table 2, Fig 1).

TABLE 2 Comparison of Subsequent Fistula Formation in Patients Who Did and Did Not Undergo Surgical Drainage

Parameter	Drained, *n* (%)	Not Drained, *n* (%)	*P*
MGHfC ($N = 82$)	65 (79)	17 (21)	.01
Fistula	45	4	
No fistula	20	13	
HSC ($N = 58$)	18 (31)	40 (69)	.20
Fistula	5	5	
No fistula	13	35	
Combined ($N = 140$)	83 (59)	57 (41)	.001
Fistula	50	9	
No fistula	33	48	

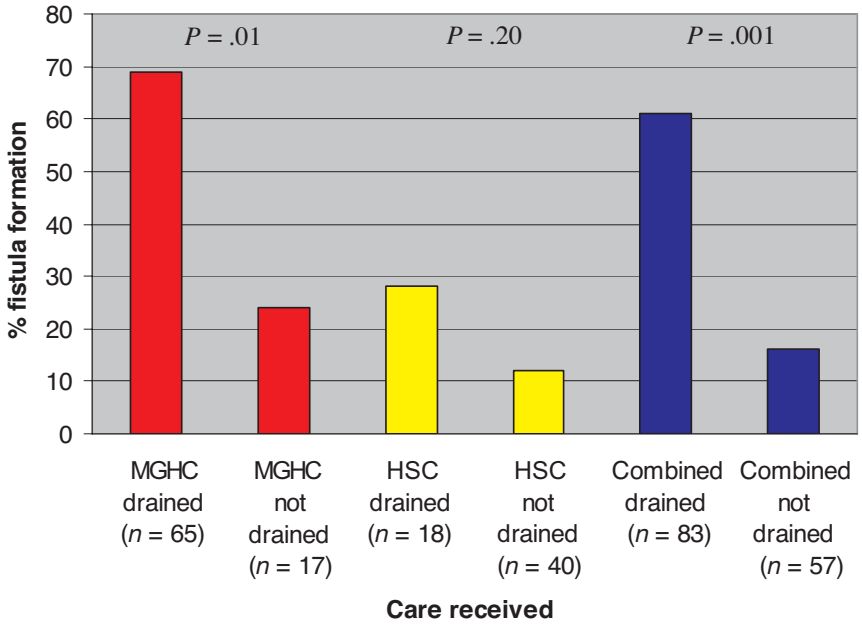

FIGURE 1
Rate of fistula in ano formation after drainage or non-drainage of perianal abscess.

On multivariate analysis, variables that were significantly associated with development of fistula in ano included history of surgical drainage and use of antibiotics (Table 3). Surgical drainage was associated with an increased risk for fistula in ano (odds ratio: 5.1; 95% confidence interval: 2.0–13.1). Use of antibiotics, whether parenteral or oral, was protective and associated with a decreased risk for fistula formation (odds ratio: 0.14; 95% confidence interval: 0.06–0.33).

At MGHfC, historical preference has favored surgical drainage of perianal abscess with 65 (79%) of abscesses drained either in the emergency department or in the outpatient setting. Of abscesses drained, 45 (69%) of 65 developed a fistula in ano. Of abscesses not drained, 4 (24%) of 17 developed fistula in ano. All abscesses except those that were already draining spontaneously were surgically drained. The use of adjunctive antibiotics was not consistently documented. The subsequent development of fistula in ano was not related to age at time of drainage, although sample size limited statistical analysis of these data.

At HSC, 18 (31%) of 58 patients underwent surgical drainage. All but 2 patients received adjunctive antibiotics (oral or intravenous), 1 patient received topical antibiotics only, and 1 patient did not receive antibiotic therapy. Five (28%) of the patients whose abscess was drained developed a fistula in ano, compared with 5 (12.5%) patients whose abscess was not drained (P = .20). Although this trend did not reach statistical significance at the 95% confidence level, this greater than two-fold difference in rate of fistula formation may be clinically significant and may have reached significance had the sample size been larger.

Gender, age, and hospital site (MGHfC versus HSC) were not significantly associated with fistula formation (Table 3). The overwhelming majority of the study cohort was male; therefore, gender was not associated. Age in months was also not significant, either considered as a continuous variable or dichotomized into > or <4 months. It is interesting that hospital site was initially significant, but when antibiotic use was put into the model, hospital site fell out. Therefore, the effect of hospital site is related to (confounded by) the differential use of antibiotics between institutions.

TABLE 3 **Multivariate Model Variables and Association With Fistula Formation**

Variable	*P*	OR	95% CI
Significant association with fistula formation			
Drainage	.001	5.1	2.0–13.1
Antibiotics	.0001	0.14	0.06–0.33
No significant association with fistula formation			
Site (MGHfC vs HSC)	.75		
Gender	.17		
Age	.673		

OR indicates odds ratio; CI, confidence interval.

DISCUSSION

Whereas in children who are older than 1 year there seems to be an increased risk for associated underlying disease, the development of perianal abscess in the infant population is idiopathic. Fistula in ano during infancy occurs almost exclusively in boys,[10,11] leading to the suggestion that it may result from infection in abnormally deep crypts that are under the influence of androgens.[7,11] In a retrospective analysis of 40 cases of fistula in ano, Al-Salem et al[11] identified no girls. Various other pathogenic abnormalities have been speculated to

play a role, including congenital abnormalities of the anal glands or crypts of Morgagni or the presence of ectopic epithelium, but no 1 factor has emerged as predominant.[9] We present the largest study to date, a combined center series of patients who were younger than 1 year and presented with perianal abscess, and find that nonsurgical treatment with local care is associated with a significantly lower rate of fistula formation than incision and drainage.

Despite the relatively common incidence of perianal abscess in infants, estimated at 0.5% to 4.3% of all infants, few series have examined the connection between perianal abscess and fistula in ano.[1,2,4,7,10] Moreover, in the few published series, there exist discrepancies in the percentage of abscesses that evolve into fistula in ano as well as differences of opinion in treatment paradigms, with some authors advocating local care, some needle aspiration, and others surgical incision and drainage. Festen and van Harten[4] reported development of a fistula in 35% of perianal abscesses that were treated by incision and drainage but defined initial incision and drainage as the preferred treatment method. MacDonald et al[1] reported a fistula rate of 20% in all-comers with perianal abscess, aged 0 to 12 years, regardless of drainage. Piazza et al,[2] however, reported a fistula rate as high as 85.7% in patients who were younger than 2 years and presented with an abscess, as opposed to a lower rate of fistula in ano (54.8%) in older children. In a retrospective study of 77 patients age who were younger than 24 months, Serour et al[10] differentiated between the rates of fistula in ano in 4 groups of patients: those who underwent drainage without concurrent antibiotics, those who underwent drainage with concurrent antibiotics, those who received local care without antibiotics, and those who received local care in addition to antibiotics. Fistula in ano was significantly more frequent in children who underwent drainage (principally needle aspiration) without antibiotics (66.7%) versus those who underwent drainage with concurrent antibiotic treatment (27.9%). Patients who received local care with or without antibiotics had fistula rates of 33.3% and 42.1%, respectively.

On the basis of the observation that infants with fistula in ano follow a self-limited course, Rosen et al[9] at the Schneider Children's Hospital prospectively followed a conservative approach to infants (<1 year) who presented with perianal abscess and formed fistulas in ano after surgical drainage. Drainage was performed only when the infant was subjectively evaluated to be "very uncomfortable" or was febrile (4 patients). Of 18 patients who presented during a 10-year period with perianal abscess, 14 (77%) developed subsequent fistula in ano. Antibiotics were administered in 2 of the 18 patients. All of these patients healed without operation with a mean follow-up of 37 months. Watanabe et al[12] supported these data in a study of 87 infants, in whom approximately one third developed fistula in ano with a 90% rate of spontaneous resolution. Despite these data, many infants with fistula in ano are subjected to fistulotomy or fistulectomy because development of a fistula leads to chronic drainage.

In concordance with previously published series, our series consisted predominantly of boys who were younger than 4 months, supporting the hypothesis of a hormonal basis for this condition (Fig 2). Total testosterone levels in male infants reach peak values that approach the low-normal range for male adults between 1 and 3 months of age before falling to juvenile levels by 6 to 8 months of age.[13] Moreover, the free androgen index, the ratio of testosterone to sex hormone–binding globulin, is greater in boys than in girls by a factor of 10.[13,14] Girls who presented with perianal abscess did so later in infancy with a mean age of 7.6 months (median: 9 months). It is interesting that the distribution of ages of

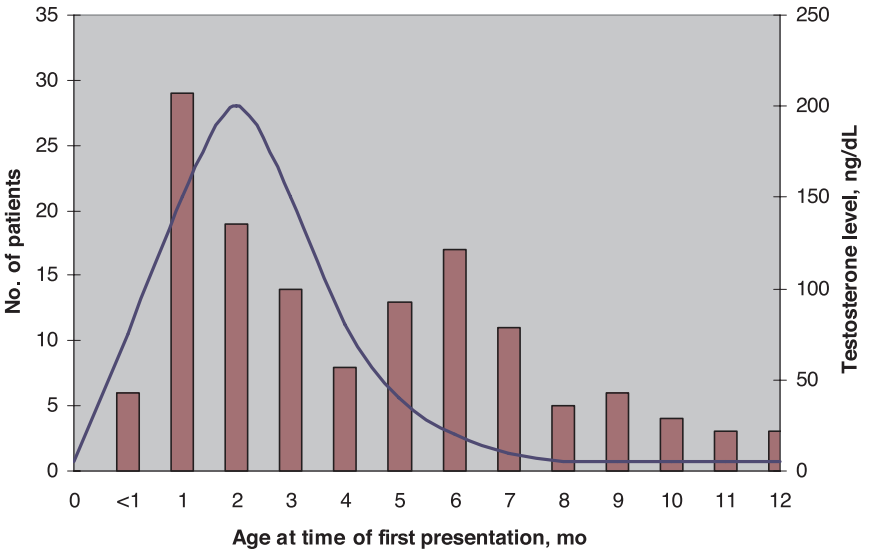

FIGURE 2
Distribution of age of children with perirectal abscess and correlation to postnatal testosterone levels. Peak incidence of abscess formation occurs in conjunction with neonatal testosterone surge.

infants with perirectal abscess in our study seemed bimodal; however, a major peak in incidence was observed between 1 and 2 months. This corresponds to peak infant androgen level within the first year of life (Fig 2).

The rates of fistula formation in both the drained and undrained abscess groups differ significantly between the 2 institutions, with MGHfC demonstrating a fistula rate on the higher end of the reported literature and HSC demonstrating a lower rate. Results of our multivariate analysis suggest that this discrepancy may be attributable to variability in the administration of antibiotics. Whereas at HSC the administration of antibiotics is routine, at MGHfC antibiotic prescription is individualized. A second important variable, not examined in this study, may be the time from diagnosis to follow-up, especially because Rosen et al[9] suggested that all patients who developed a fistula in ano went on to heal without operation with a mean duration of symptoms of 4 months. Therefore, it is possible that at HSC, a "window" of fistula formation was missed during a follow-up office visit. This is unlikely, because all patients were reexamined within 1 month of their initial presentation and discharged from clinic when the abscess was healed. It is interesting that examination of the pathology reports of patients who underwent a fistulectomy at MGHfC revealed the presence of granulation tissue without epithelialization in some cases, suggesting that these fistulas may in fact be healing inflammatory tracts.

Despite the trend toward drainage at MGHfC and local care with antibiotics at HSC, both centers demonstrated reduced fistula formation associated with no intervention. This suggests that the formation of fistulas is not simply more common in more severe forms of disease, a criticism that might arise from looking at the MGHfC data independently. Rather, it seems that the act of drainage itself and the failure to use antibiotics predispose to subsequent fistula formation.

CONCLUSIONS

On the basis of our results, we propose that nonoperative management emphasizing hygiene, sitz baths, and antibiotics is an appropriate paradigm for the management of perianal abscess in infants. Incision and drainage is associated with a significantly higher rate of fistula in ano. Although the results are provocative, this study has limitations, and we would advocate a prospective, randomized study to clarify the role of drainage in this population.

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