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ORIGINAL ARTICLE

Perianal abscess and fistula-in-ano in children: clinical characteristic, management and outcome

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Abstract
Purpose The aims of this study are to evaluate the clinical characteristics of perianal abscess and fistula-in-ano in children, and to assess our experience in treatment, and to identify factors that affected the clinical outcomes.
Methods A retrospective review of children with perianal abscess and fistula-in-ano was carried out in a tertiary care children's hospital from January 2005 to December 2010. Demographic information of the patients, localization of the lesions, treatment procedures, microbial organisms in pus, usage of antibiotics, abscess recurrence, development of fistula-in-ano, and duration of symptoms were recorded. Patients with systemic diseases and inflammatory bowel diseases were excluded from the study.
Results A total of 158 children (146 males, 12 females) treated for perianal abscess and fistula-in-ano with a median age of 7.2 months (ranging 16 days to 18 years) were eligible for the study. Initial examination of the 136 patients revealed perianal abscess and 22 patients with fistula-in-ano. Primary treatment was incision and drainage (I/D) for the fluctuating perianal abscess (73.5%), and local care for the spontaneously (S/D) drained abscess (26.5%) with or without antibiotic therapy. Patients were divided into two groups according to age distribution, 98 of the patients were younger than 12 months, and 60 were older than 12 months of age. There was no significant difference in sex distribution, localization of the lesions, treatment procedures, recurrence of abscess and fistula-in-ano formation between the two age groups ($p > 0.05$). Recurrence rates (27% in I/D and 30.6% in S/D, $p > 0.05$) and development of fistula-in-ano (20% in I/D and 27.8 in S/D, $p > 0.05$) were not significant I/D and S/D groups. Kind of the microorganisms in pus swaps did not effect the fistula-in-ano formation. Usage of antibiotics significantly reduced the development of fistula-in-ano ($p = 0.001$), but did not effect the recurrence of perianal abscess ($p > 0.05$). The mean follow-up period was 10.6 ± 8.6 months. While the 9 of the overall 52 fistula-in-ano (22 initial, 30 after abscess treatment) were resolved spontaneously, 43 of the remaining needed surgical intervention (fistulotomy/fistulectomy).
Conclusions Although management of perianal abscess is still controversial, simple drainage of the perianal abscess with additional antibiotic therapy reduces the development of fistula-in-ano. Fistula-in-ano within children has a chance of spontaneous resolution thus the immediate surgical intervention should be avoided.

Keywords Perianal abscess · Fistula-in-ano · Child · Drainage · Fistulotomy · Fistulectomy

Introduction

Perianal abscess (PA) and fistula-in-ano (FIA) are the common diseases of the same origin that arise from an abnormal crypt, and have an overwhelming male predominance in childhood. Infants tend to have a relatively higher incidence [1]. The disease initiates as a cryptitis of Morgagni, progresses to perianal abscess, and heals without any sequel or develops a fistula-in-ano [2]. FIA

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development rates are reported to be 20–85% in various studies [3–9]. The usual treatment is incision and drainage of the PA, and fistulotomy or fistulectomy of the FIA. Over the time, while some of the authors advocated the probing of the PAs and proposed un-roofing of the coexisting fistula [2, 3, 5, 10], the others supported conservative management of the PAs leaving them for spontaneous drainage with local toilet and sitz baths with or without addition of antibiotics [8, 11–13]. The optimal treatment of PA and management of FIA are still unclear. We aimed evaluating clinical characteristics of PA and FIA in children, assessing our treatment experience, and identifying factors that affect the clinical outcomes.

Materials and methods

A retrospective review of patients with perianal abscess and fistula-in-ano was carried out from the patient records of our hospital from January 2005 to December 2010. Patients with systemic diseases and inflammatory bowel diseases were excluded from the study. Demographic information of the patients, localization of the lesions, treatment procedures, and microorganisms isolated from pus cultures, usage of antibiotics, abscess recurrences, development of fistula-in-ano, duration of symptoms, need of surgical attempt, and postoperative follow-up were analyzed. Patients were divided into two groups according to age distribution; (i) 0- to 1-year old (infants) and (ii) older than 1 year (children). Groups were considered through investigation of risk factors for development of fistula-in-ano. In supine position perianal region centering the anus was divided into 4 quadrants and named first (12 to 3 o'clock), second (3 to 6 o'clock), third (6 to 9 o'clock), and fourth (9 to 12 o'clock) through the clock wise direction. For each quadrant localization of abscess and fistulas, and effects of abscess localization on the abscess recurrences and development of fistulas were analyzed.

Statistical analyses were performed with the SPSS Statistics for Windows version 15 package software (SPSS Inc., Chicago, IL, USA). Age distributions of the patient groups were differed significantly from normal, thus ages compared using the Mann–Whitney U test. Fisher's exact test and Chi square test were used for comparing categorical data. A p-value of <0.05 was considered statistically significant for all analysis. Hospital ethical committee approval was obtained for this study.

Results

A total of 158 patients were in the study group which was consisted of 146 boys and 12 girls. The age distribution of the patients ranged from 16 days and 18 years (median: 7.2 months). Ninety-eight (62%) of the patients were infants and 60 (38%) were child. Male predominance was remarkable both in the infants and children with the percentages of 94.9 and 88.3, respectively. Gender distribution was found similar in both groups ($p > 0.05$).

Initial examinations of the patients revealed 22 FIAs and 136 PAs. Spontaneous drainage was determined in 26.5% ($n = 36$) of the PAs, and 73.5% ($n = 100$) of PAs were drained surgically with simple incision and drainage.

Pus cultures were available in 108 of the patients. Twenty of the cultures yielded no growth. Of the pus cultures yielded to growth; 48 were single enteric flora bacteria (the most common *Escherichia coli*, and *Klebsiella*, enterococcus, *proteus*, respectively), 29 were mixed enteric flora bacteria, and 11 were skin flora bacteria (commonly *Staphylococcus aureus* and streptococcus strains). Abscess recurrence was detected in 37.9% ($n = 11$) of the mix enteric flora bacteria, 31.3% ($n = 15$) of the single enteric flora bacteria, and 9% ($n = 1$) of the skin flora bacteria cultures, but the difference was not significant ($p > 0.05$). While the enteric flora bacteria were common in males (56.6%), skin flora bacteria were common in females (60%), and the difference was significant ($p = 0.021$). Although fistula-in-ano development was most common in mixed enteric flora bacteria (24.1%; $n = 7$), there was no statistically significant difference between the other microorganisms in development of FIA ($p > 0.05$) (Fig. 1).

Antibiotic usage in infants and children were 85.7% ($n = 84$) and 75% ($n = 45$), respectively. The most commonly used antibiotics were amoxicillin clavulanate ($n = 44$), sulbactam ampicillin ($n = 41$), cephalosporins ($n = 17$), ampicillin ($n = 13$), and trimethoprim-sulfamethoxazole ($n = 8$), respectively. There was no

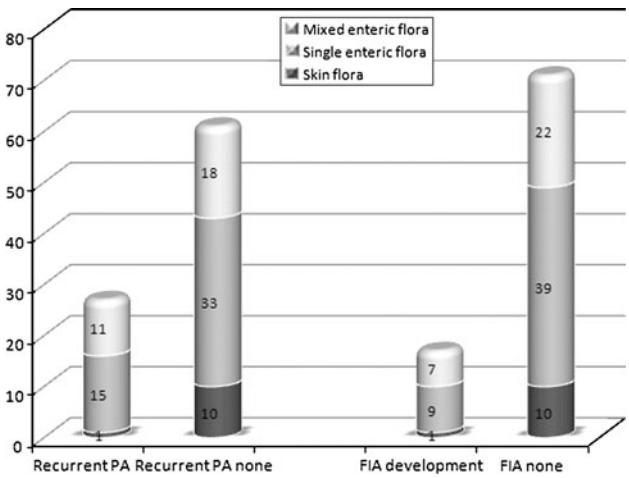

Fig. 1 PA recurrence and FIA development rates of the PAs, in terms of pus cultures

significant difference in antibiotic usage between the infants and children ($p > 0.05$).

When perianal region was divided into four groups through the clock wise; the fourth quadrant was the most common site for the PAs both in infants ($n = 45$, 45.9%) and children ($n = 25$, 41.7%), followed by second and first quadrants, and the least common site was the third quadrant. In terms of these localizations, abscess distributions were similar in both the infants and children ($p > 0.05$).

Of the patients with PA, 38 (27.9%) developed recurrent abscess. In terms of abscess recurrence, there was no significant difference between the infants and children ($p > 0.05$). Recurrences of PAs were found to be 30.6% of the spontaneously drained and 27% of the surgically drained abscesses. In addition, FIA development percentages were 27.8 in spontaneous drainages, and 20 in surgical drainages. The type of abscess drainage did not have any statistical significance on the PA recurrence and FIA development ($p > 0.05$) (Fig. 2).

In addition to 22 patients whom had initial diagnosis of FIA, 30 (22%) of the patients with PA developed FIA in the follow-up, and a total of 52 FIAs were encountered. Thirty-two of the FIAs were infants (61.5%) and 20 were children (38.5%). In terms of FIA development, there was no significant difference between the two age groups ($p > 0.05$). Of the patients with FIA, 90.4% were boys and 9.6% were girls. In terms of FIA development, there was no significant difference between the boys and girls ($p > 0.05$).

Although the fourth quadrant was the most common site of the PAs and FIAs; 50.3% of the PAs encountered in the first quadrant and 45.8% of the PAs encountered in the third quadrant developed FIA and this difference was statistically significant ($p = 0.019$) (Fig. 3).

Abscess recurrence of the PAs was encountered 30% ($n = 36$) of the antibiotic used patients, and 12.5% ($n = 2$) of the patients without antibiotic usage. Antibiotic usage did not have any influence on PA recurrences ($p > 0.05$). However, 68.3% ($n = 28$) of the PA recurrences, and 20.5% ($n = 24$) of the patients without PA recurrences developed FIA, thus the PA recurrence was found to be effective on FIA development ($p < 0.001$).

FIA development was encountered 27.1% of the patients with antibiotic usage, and 58.6% of the patients without antibiotic usage (Fig. 4). Development of FIA was significantly less in the patients who used antibiotics ($p = 0.001$). The antibiotics were divided into three groups as follows: penicillins, cephalosporins and others. There was no significant difference between these three antibiotic groups, in abscess recurrence and development of FIA ($p > 0.05$).

The mean follow-up period of the patients was 10.6 ± 8.6 months. In the follow-up period, 9 of the 52 FIAs (17.4%) resolved spontaneously, and all were males. 77.8% ($n = 7$) of the spontaneously resolved FIAs and 65.1% ($n = 28$) of the surgically treated FIAs used antibiotics, and antibiotic usage did not effect the spontaneous resolution of the FIAs ($p > 0.05$). Also, there was no significant difference between the infants ($n = 4$) and children ($n = 5$) in spontaneous resolution of the FIAs ($p > 0.05$). Surgical intervention of FIA was performed to 18 patients (34.6%) with fistulectomy, and 25 patients (48%) with fistulotomy and deroofing. There were three recurrences of FIA in patients who had a history of recurrent PAs for the last 2–3 years at the initial admission. Two of them were

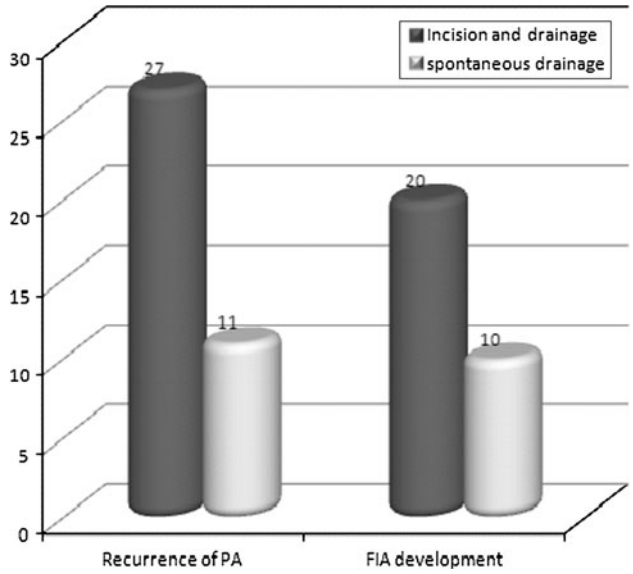

Fig. 2 Effects of drainage types on PA recurrence and FIA development

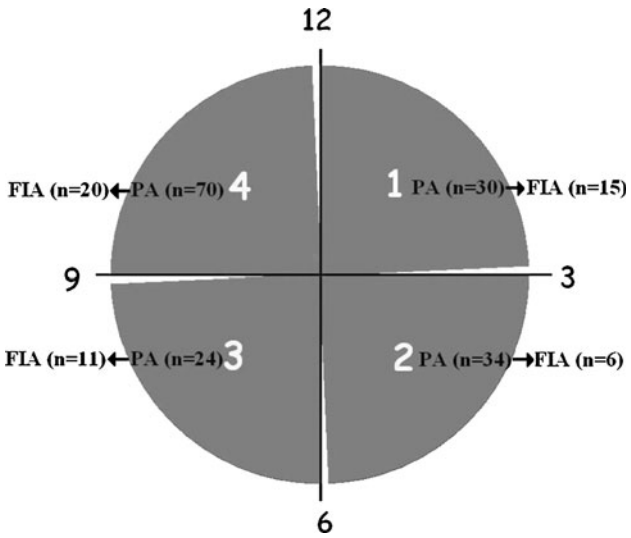

Fig. 3 FIA development from PAs according to 4 quadrants of the perianal region through clock wise

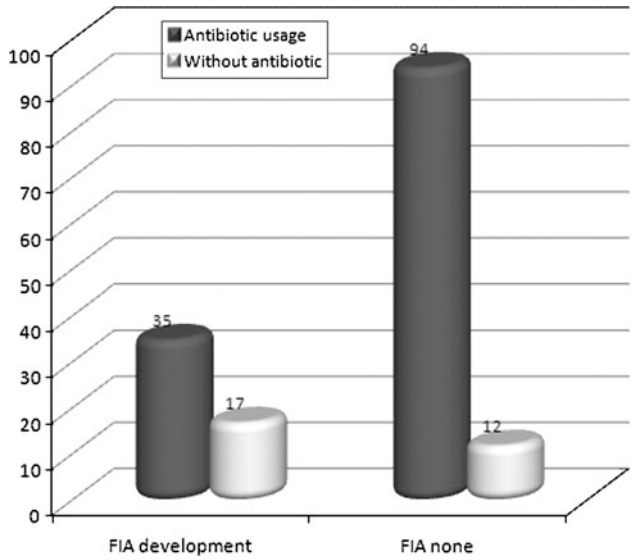

Fig. 4 FIA development rates with or without antibiotics

treated with fistulotomy and deroofing, and one with fistulectomy. There was no significant difference between fistulectomy and fistulotomy in FIA recurrence ($p > 0.05$). We did not encounter any morbidity except FIA recurrence, and none of the patients had mortality.

Discussion

Perianal abscess and fistula-in-ano are common conditions in the childhood. In 1956 Eisenhammer wrote that "the abscess is the parent of Fistula-in-ano" [14], so we did not make a distinction between PAs and FIAs, and reviewed them together. Infants tend to have a relatively higher incidence of PA/FIA than the older children; in accordance with the literature we encountered infants more commonly (62%). Furthermore, previous series reported the remarkable male predominance among PA/FIA as found in our series (94.9% of infants and 88.3% of children) [7]. Fitzgerald et al. [14] have speculated that gender difference may be explained by an androgen excess on androgen–estrogen imbalance or androgen-sensitive glands in utero causes formation of abnormal glands. Since Shafer et al. [2] have showed the thickened dentate line in addition to abnormal deep crypts of Morgagni predisposing to cryptitis, commonly accepted theory for the etiology of PA and FIA is reported to be abnormal crypts of Morgagni. Additionally, infected anal fissures [7], dermal infections [4], and entrapment of migratory cells from the urogenital sinus during development of the perineum [1] are the other suggested theories.

Enteric flora bacteria are more common in PAs [1, 6, 7, 15, 16]. Al-Salem et al. indicated the differences of microorganisms in relation to gender that while E.coli was most common in boys, S aureus was the most common microorganism in girls [1]. In our series we differentiated the microorganisms in pus culture as; enteric flora, mixed enteric flora and skin flora bacteria. Concordant to Al-Salem et al. we found a significant female predominance of skin flora bacteria (*S. aureus*, streptococci), and male predominance of enteric flora commonly including *E.Coli*, *Klebsiella*, Enterococci and *Proteus*, respectively. There is not any established data demonstrating a correlation between kind of microorganism in the pus culture and development of FIA [6, 15, 16]. Although the FIA formation was most common (24.1%) in mixed enteric flora group, we could not establish any significant difference between the other groups.

Although PAs and FIAs may be encountered in any site of the perianal region, the most commonly effected sites involve the 9 o'clock and 3 o'clock directions [4, 7, 9, 17, 18]. In terms of classification of the lesion sites, we divided the perianal region as four quadrants of the clock. We found the most common site of PAs and FIAs in both the infants (45.9%) and children (41.7%) was the fourth quadrant; interestingly first and third quadrants of PAs had highest percentages of FIA development with a significant difference from the second and fourth quadrants. We could not found any study in the literature comparing site of the PA with FIA development similar to our classification. We did not explore the morphology or histopathology of the fistula tracts but these sites may be associated with deeper crypts of Morgagni as Shafer et al. [2] mentioned, and further investigation is needed.

The management procedures of PA within childhood are controversial. The suggested treatment modalities among the different authors have a wide spectrum of conservative treatments to surgical explorations. Some of the authors supported the conservative treatment of PA/FIA [8, 11–13]. Kubota et al. used spray form of basic fibroblast growth factor (bFGF) for the treatment of PAs and FIAs. FGF is a polypeptide, which functions as a multipotent cytokine and regulates angiogenesis, mitogenesis, cellular differentiation, cell migration and tissue injury repair. They treated seven of the nine infants with bFGF initially, and the two patients who developed recurrence were healed with the second administration of bFGF [13]. Although their study group was consisted of a few patients, bFGF may be a challenging agent for the conservative treatment approach.

Incision and drainage is the most common and accepted treatment of PA [1, 2, 4–7, 9, 16]. Our initial treatment choice for patients with PA is performing incision and drainage as an outpatient procedure, and patients are advised for local wound care with warm sitz baths. In addition to incision and drainage, some of the authors suggested a meticulous search for abnormal crypts and

performed the probing of the abscess under general anesthesia with fistulotomy, so they reduced their recurrence and FIA development rates which ranged 0–35% [2, 3, 5, 10]. However, in this approach patients may face to the complications of general anesthesia and some of the authors indicated the risk of iatrogenic tract by probing abscess [6, 19]. Our results demonstrated that 67% of the PAs healed without FIA development and 17.3% of the FIAs resolved spontaneously. As a result, early surgical intervention including probing of the PA is an excessive procedure in ¾ of the all cases.

The overall incidence of FIA development reported in the literature varies 20 to 85% [3–9]. In the literature, antibiotic usage in the treatment of PA and FIA is found to be beneficial by some of the authors [7, 8], as well as some others reported that antibiotic usage was ineffective [4, 5, 12]. While the antibiotic treatment in PA is not clear, we had satisfactory results with the addition of antibiotic treatment which yielded to decreased rates of FIA. Serour et al. also advocated the use of antibiotics; their results were similar to ours although they preferred needle aspiration of the PAs. They reported a FIA percentage of 27.9 with antibiotic usage while the patients who did not use antibiotics had a FIA percentage of 66.7 [7]. We encountered in our series FIA development in 27.1% of the antibiotic received group, and 58.6% of the group without antibiotic usage, thus we consider the usage of antibiotics in the treatment of PA and FIA is beneficial.

Christison-Lagay et al. [8] proposed conservative management of PAs including hygiene, sitz baths, and antibiotics and they encountered FIA more common in the case of incision and drainage of the PAs rather than spontaneous drainage. In our department, incision and drainage is the treatment of choice because this approach decreases the pain caused by the stretching of the abscess, and facilitates the wound healing. Additionally, our results indicated that type of drainage did not affect the FIA development.

FIAs are likely to be a time-limited disorder in infancy hence some of the authors recommended to leave the FIAs for spontaneous healing [4, 12]. Conversely, Niyogi et al. [16] indicated that conservative treatment was associated with longer hospital stay, longer antibiotic use, and longer pain experienced by the patient. In a serial of Oh et al., they recommended surgical intervention to the patients initially however; their parents desired a conservative approach including only local wound care. Consequently, all the patients developed FIAs and underwent fistulotomy [17]. In our study, we encountered the spontaneous healing chance of the FIAs as well as the surgical intervention was required when the FIAs accompanied with recurrent PAs or did not heal in the follow-up period.

Although the PA and FIA are common diseases in infancy and childhood, a few studies have been published in the literature concerning the pediatric patients. There is not any reported consensus about the treatment and follow-up of the patients with PA and FIA. Limit of our study is that data were obtained retrospectively from the patient records. Also, a large study group provided us to demonstrate a new classification of lesion localizations which may yield a new research topic for the etiology of the PA and FIA. Further randomized prospective studies to rule out the appropriate treatment approaches of the PA and FIA are needed.

In conclusion, management of PA is still controversial, we advocate that the antibiotic usage in addition to simple incision and drainage of the PA is the most appropriate treatment; to abbreviate healing period, to achieve the maximal patient comfort, and to decrease the rate of FIA. Fistula-in-ano is thought to be a time-limited disorder in childhood and have a chance of spontaneous resolution thus the immediate surgical intervention should be avoided.

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