Case Analysis

Microbiological Analysis of Perianal Abscess and its Treatment

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Key Words
Perianal abscess;
Antibiotics;
Anal fistula

Purpose. To identify the species of infectious organisms present in perianal abscesses and to determine their sensitivity to various antibiotics in order to establish the most effective type of oral antibiotics for treatment.
Patients and Methods. Sixteen patients with perianal abscess without skin rupture or identified fistula tract were included in this study. After disinfecting the skin with povidone-iodine and alcohol, exudate was aspirated from the abscess by using a 5-cc needle syringe and sent for common aerobic and anaerobic culture and antibiotic sensitivity tests.
Results. The culture rates of aerobic and anaerobic bacteria were 100% and 87.5%, respectively. The species of aerobic bacteria identified included *Escherichia coli* (13/16), *Streptococcus* spp. (4/16), *Klebsiella pneumoniae* (4/16), *Citrobacter freundii* (2/16), *Salmonella enterica* serogroup D (1/16), and *Staphylococcus aureus* (1/16). The species of anaerobic bacteria included *Bacteroides fragilis* (10 of 14 patients), *Bacteroides vulgatus* (1/14), *Bacteroides stercoris* (1/14), *Bacteroides thetaiotaomicron* (1/14), and *Clostridium* perfringens (1/14). The most common cultured anaerobic and aerobic bacteria were *B. fragilis* and *E.coli,* respectively. Antibiotic sensitivity rates for *E.coli* were determined to be 84.6%, 84.6%, 69.2%, and 30.8% to amoxicillin-clavulamic acid, cefazolin, ciprofloxacin, and piperacillin, respectively. The resistant rate of *E. coli* to gentamycin was 30.8%, but the resistant rate to amikacin was 0%. For anaerobic bacteria, antibiotic sensitivity rates were determined to be 100%, 78.6%, 71.4% and 57.1% to the chemicals metronidazole, ampicillin- sulbactam, piperacillin, and clindamycin, respectively. The rates of fistula development at the 12-month follow-up were 28.6% and 0% in patients who had mixed flora and pure aerobic infection, respectively.
Conclusion. Our findings show that the first choice of oral antibiotics for the treatment of perianal abscess should be metronidazole combined with augamentin or cefazolin. If aminoglycosides are considered necessary in cases of severe infection, it is recommended that amikacin be administered as our results show a high rate of resistance to gentamycin.
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Perianal abscess can arise from local cutaneous infections due to either colonization of obliterated apocrine glands or from caudal tracking of pus originating from an infection of the intersphincteric anal gland. One defining characteristic of perianal abscess over subcutaneous abscess is the possible develop-

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ment of anal fistula subsequent to cryptoglandular infection. The clinical manifestations of perianal abscess include presentation of a painful, swollen subcutaneous nodule which may or may not be associated with the formation of a fistula. Treatment involves prompt surgical drainage or fistulotomy of the associated fistula. The reported incidence of anal fistula in patients with an anorectal abscess vary from 7.6% to 66.2%.[1-7] Patients with perianal abscesses who had undergone surgery still had a propensity to develop anal fistula with an incidence rate of 11%.[8] Previous studies have reported that the development of fistula after perianal abscess formation is related to the bacteriology of the abscess and that accurate microbiological analysis of the abscess was very useful in predicting an underlying anal fistula.[1-4,6] There was, however, little data concerning the prevention of fistula formation in patients with a perianal abscess without identified fistula.

In present study, we have identified the microflora of a perianal abscess in a patient without identified fistula formation. We have also determined the relative antibiotic sensitivity of these microbes to evaluate the relationships between bacteriology and fistula formation and to predict the most appropriate antibiotic treatment.

Patients and Methods

This study only included patients who had the first attack of perianal abscess in the absence of an identified fistula. In total, 16 patients were recruited from our outpatient clinic department between March 2006 and July 2007. None of the patients had a past history of anal fistula or perianal infection, and none presented with any kind of skin rupture or fistula after digital anoscopic or rigid sigmoidoscopic examinations. Prior to collecting abscess exudate samples, the perianal skin was sterilized twice using a povidone-iodine and alcohol solution. Exudate was aspirated from the abscess cavity using a 5-cc needle syringe to prevent contamination by local skin microflora. The samples were then sent for routine aerobic and anaerobic culture as well as antibiotic sensitivity tests.

Results

Of the 16 patients, aged between 20 and 45 years of age, 12 were male and 4 were female. The location of each patient's perianal abscess and their follow-up time are described in Table 1. The median follow-up period was 19 months. Anaerobic microorganisms were isolated from the abscesses of 14 of the 16 patients, and aerobic organisms were found in all 16. The culture rates of anaerobic and aerobic bacteria were determined to be 87.5% and 100%, respectively. The identity of the cultured organisms is shown in Table 2. Cultured aerobic bacteria included *Escherichia coli* (13/16), *Streptococcus* spp. (4/16), *Klebsiella pneumoniae* (4/16), *Citrobacter freundii* (2/16), *Salmonella enterica* serogroup D, (1/16) and *Staphylococcus aureus* (1/16). The species of anaerobic bacteria included *Bacteroides fragilis* (10 of 14 patients), *Bacteroides vulgatus* (1/14), *Bacteroides stercoris*

Table 1. Location of perianal abscesses and fistula formation

Location of perianal abscess	Case number	Fistula formation
Anterior	1	0
Left anterior	1	1
Left Lateral	5	1
Left Posterior	2	0
Posterior	3	1
Right posterior	3	0
Right Lateral	0	0
Right Anterior	1	1
Total	16	4

Table 2. Microbiological analyses of perianal abscesses from all 16 patients

Organisms	Case No.	Culture rate (%)
Aerobic	16	100
Escherichia coli	13	81
Klebsiella pneumoniae	4	25
Streptococcus spp.	4	25
Citrobacter freundii	2	12.5
Staphylococcus aureus	1	6.25
Salmonella enterica serogroup D	1	6.25
Anaerobic	14	87.5
Bacteroides fragilis	10	62.5
Bacteroides vulgatus	1	6.25
Bacteroides stercoris	1	6.25
Bacteroides thetaiotaomicron	1	6.25
Clostridium perfringens	1	6.25
Fusobacterium necrophorum	1	6.25

(1/14), *Bacteroides thetaiotaomicron* (1/14), and *Clostridium* perfringens (1/14). The most common infectious anaerobic and aerobic microorganisms found were *B. fragilis* and *E.coli*, respectively. The results of antibiotic sensitivity tests for *E. coli* are shown in Table 3. Cultured *E. coli* displayed sensitivity rates as high as 84.6% in response to amoxicilin-clavulanic acid and cefazolin treatments, whereas ciprofloxacin and piperacillin treatment resulted in sensitivity rates of 69.2% and 30.8%, respectively. *E. coli* sensitivity rates in response to the aminoglycosides amikacin and gentamycin were 100% and 69.2% respectively. One-third of patients were found to be infected by gentamycin-resistant *E. coli*. Other aerobic species had little resistance to the antibiotics examined. The results of antibiotic sensitivity tests for anaerobic microbes isolated from abscesses are shown in Table 4. The sensitivity rates of anaerobic bacteria were found to be 100% in response to metronidazole treatment, 78.6% for ampicillin-sulbactam, 71.4% for piperacillin, and 57.1% for clindamycin, with metronidazole being the most effective.

During the follow-up periods, there was no fistula development in 2 patients found to be infected with aerobes only (*Staphylococcus* and *Streptococcus*); however, among the 14 patients whose bacterial cultures showed mixed aerobic and anaerobe colonization, 4 patients developed fistulas after intervals of 3, 3, 4, and 34 months after incision and drainage. The overall rate of fistula development was 25.0% wherein patients with mixed flora or pure aerobic infection displayed rates of fistula development at 28.6% and 0%, respectively (Table 5).

Table 3. Results of antibiotic sensitivity tests for isolated *E. coli*. Other aerobic species displayed little resistance to all antibiotics tested

Antibiotics	Sensitive/resistant	Sensitivity rate (%)
Amoxicillin-clavulanic acid	11/2	84.6
Cefazolin	11/2	84.6
Ciprofloxacin	9/4	69.2
Piperacillin	4/9	30.8
Amikacin	13/0	100
Gentamycin	9/4	69.2

Table 4. Results of antibiotic sensitivity tests for anaerobic microorganisms

Antibiotics	Sensitive/resistant	Sensitivity rate (%)
Metronidazole	14/0	100
Ampicillin-sulbactam	11/3	78.6
Piperacillin	10/4	71.4
Clindamycin	8/6	57.1

Discussion

Treatment of perianal abscess includes prompt surgical drainage (fistulotomy) of the associated fistula. The guidelines of the American Society of Colon and Rectal Surgeons (ASCRS) in 2005 state that a perianal abscess should be treated in a timely fashion by incision and drainage, and additional antibiotics are unnecessary for uncomplicated perianal abscess.[9] It appears that this suggestion, do not administer antibiotics in uncomplicated cases of perianal abscess, is based on studies on cutaneous abscesses in which it has been reported that additional antibiotic use dose not improve healing times nor reduce abscess recurrences.[11,12] We found this suggestion controversial because we have observed that the bacteriology of cutaneous abscesses and perianal abscesses differs. Associated literature states that perianal abscesses infected with both aerobic and anaerobic bacteria accounts for 72% of cases, while pure aerobic and anaerobic infection only accounted for 9% and 19% of cases, respectively.[7] However, 1 study showed that the incidence of aerobic, anaerobic, and mixed infections are similar, i.e., 38%, 30%, and 32%, respectively.[13] The other reason we do not agree with the suggestion of the ASCRS is because of the subsequent development of fistula after perianal abscess formation. Although the

Table 5. Fistula development during the period before follow-up examination

Aerobes only	0/2
Mixed Aerobes and Anaerobes	4/14 = 28.6%
	Isolated bacteria
Case 1	Klebsiella pneumoniae, Bacteroides fragilis
Case 2	Clostridium. perfringens, Escherichia coli
Case 3	Klebsiella pneumoniae, Escherichia coli, Bacteroides vulgatus
Case 4	Escherichia coli, Bacteroides fragilis

prevention of fistula formation by the administration of additional antibiotics is still unclear, varied types of antibiotics are often used empirically in patients with anorectal sepsis or in those with high-risk conditions including, patients with diabetes, extensive cellulitis, immunosuppression, previous cardiovascular infection, or prosthetic devices. Our data provides an appropriate choice of antibiotics for empirical use before attaining the results of bacterial culture. The first choice of antibiotics includes augamentin and cefazolin for aerobes, metronidazole for anaerobes, and amikacin for severe infection. Gentamycin is not recommended in severe infection in Taiwan as, in our study, one-third of the *E. coli* isolates from perianal abscesses exhibited gentamycin resistance.

In our opinion, bacteriology of anorectal abscesses can play an important role in the prognosis of anal fistula. In previous studies, the presence of gut-derived bacteria such as *E.coli*, *Bacteroides* spp., and *Klebsiella* spp. in a perianal abscess was shown to be a likely indicator of an abscess communicating with anal glands and was significantly associated with fistula formation.[1,3,6] The presence of skin-derived bacteria such as *Staphylococcus* tended to indicate an abscess resulting from the secondary infection of blocked apocrine glands.[2,4,6] Review of the literature shows that the incidence of gut-derived and skin-derived organisms in patients with anorectal abscesses with fistula ranged from 85% to 100% and 0% to 38% percent with fistula, respectively.[10] Our data shows that fistula development occurred predominantly in patients with mixed microflora infection. Fistulas did not develop in patients with pure aerobic bacterial infection.

In principal, the treatment of perianal abscess involves prompt incision and drainage; however it is debatable whether to perform a primary fistulotomy at the time of abscess drainage or whether to wait for a secondary fistulotomy. A randomized study[14] has reported that the recurrence rate of surgical drainage (29%) was higher than when drainage was combined with fistula tract treatment (5%). A considerable problem resulting from surgical drainage combined with fistula treatment is the occurrence of anal incontinence. Anal incontinence occurs in few patients receiving drainage alone or drainage and fistulotomy with proven internal opening;[15] however, drainage alone and delayed fistula tract treatment is recommended for high transsphincteric and suprasphincteric fistulas.[14] A recent retrospective cohort study reported that, after treating the initial perianal abscess, the cumulative incidence of chronic anal fistula or recurrent sepsis was 36.5% and that the patient's age (< 40 years) significantly increased the risk of recurrence.[16] Other treatment modalities, for example, packing of the abscess cavity, did not affect the rate of abscess recurrence, fistula development, and pain score.[17] It has been shown that there is a 13% abscess recurrence rate after incision, curettage, and primary closure of a perianal abscess, despite treatment with the antibiotics ampicillin and metronidazole for 1 or 4 days.[18] In our study, the rate of chronic fistula development after an initial perianal abscess was 25%.

In conclusion, most cases of perianal abscess presented as mixed flora infection, and the most common aerobic and anaerobic organisms were *E coli* and *B. fragilis*, respectively. The incidence of chronic fistula development was 25% in patients diagnosed with initial perianal abscess without fistula tract. The first choice of antibiotics for aerobes and anaerobes was determined to be augamentin/cefazolin and metronidazole, respectively. In cases of severe infection, amikacin is preferred over gentamycin for treatment because of the high rate of resistance to gentamycin observed in our study.

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病例分析

肛門膿瘍的菌種分析與治療

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目的　這項研究主要是尋找肛門膿瘍最常見的感染菌種，以及對抗這些菌種最有效的抗生素。

方法　我們需要的病人是單純肛門膿瘍患者。肛門膿瘍伴隨肛門廔管的病人必須先排除。是否是單純肛門膿瘍患者，由同一位醫師利用相同的檢查來診斷。從 2006 年 3 月至 2007 年 7 月，共 16 位病人加入本研究。

結果　每個病人的肛門膿瘍均可培養出嗜氧菌，而 16 個患者中，有 14 個人可培養出厭氧菌。嗜氧菌當中以 E-coli 最常見，厭氧菌中以 Bacteroides fragilis 最常見。E-coli 對 cefazolin 84.6% 的病人有敏感性，E-coli 對 augemtin 84.6% 的病人有敏感性，而對 amikacin 100% 的病人有敏感性。Bacteroids fragilis 對 metronidazole 100% 的病人敏感性。

結論　對抗肛門膿瘍所培養出細菌的最佳口服抗生素是 Augentin 加 metronidazole 或者是 cefazolin 加 metronidazole。

關鍵詞　肛門膿瘍、廔管。