

CASE REPORT

***Aspergillus* Wound Infection following Laparostomy**

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Accepted for publication 13 March 1996

Wound infections with Aspergillus are surprisingly rare given the quantity of spores in hospital air. We report the first case of infection of abdominal viscera due to Aspergillus in a patient with a laparostomy for Crohn's disease. Amphotericin B effected a cure. Sampling of air from the patient's environment yielded one isolate of Aspergillus fumigatus that matched the patient's isolates. Other examples of surgical wounds being contaminated by Aspergillus are reviewed.

Introduction

Despite significant advances in antibiotic, fluid and nutritional therapy, the prognosis for patients with intra-abdominal sepsis remains depressingly poor. The value of leaving the abdomen open, laparostomy, in cases of diffuse suppurative peritonitis has been expounded by several authors.^{1,2} Laparostomy is recognized to allow greater control of intra-abdominal sepsis, because this technique allows more efficient drainage of the peritoneal cavity when compared with forms of treatment in which the abdomen is closed.¹ However, it is not without complications such as fluid loss,³ secondary haemorrhage⁴ and small bowel fistulae.

Patients with primary immune dysfunction, or immunodeficiency arising from chemotherapy or therapeutic immunosuppression are recognized to be at risk of invasive aspergillosis.⁵ We report on a patient with intra-abdominal sepsis treated by laparostomy, complicated by invasive aspergillosis of the peritoneal cavity and viscera.

Case Report

A 37-year-old woman presented with right iliac fossa pain and was found to have Crohn's disease affecting the terminal ileum and caecum at laparotomy. The affected bowel was resected and her initial postoperative course was uneventful but she then developed generalized peritonitis. Laparotomy revealed complete dehiscence of the

anastomosis and a terminal ileostomy and colonic mucus fistula were created. She then had several episodes of gastrointestinal haemorrhage from a duodenal ulcer. This was treated initially by underrunning and vagotomy and pyloroplasty but continued bleeding necessitated further surgery, at which the duodenum was excluded and a gastroenterostomy was performed. Haemodynamic instability suggested continuing intra-abdominal sepsis and at a subsequent laparotomy 6 days later, both the pyloroplasty and the gastroenterostomy were found to have dehiscence. A laparostomy was created and the abdomen left open and packed with saline-soaked gauze rolls. Over the next 20 days the septic state of the patient slowly improved although blood cultures grew coliforms, Gram-positive cocci and *Candida albicans*. The patient was treated with intravenous cephradine, metronidazole and fluconazole, continued to improve and was transferred to Hope Hospital for further management.

On the 20th day after the creation of the laparostomy, 48 h after transfer, dark patches were noted on the surface of the liver, colon and exposed peritoneal surfaces. These were biopsied and typical hyphae of *Aspergillus* were seen to be invading the subserosal tissues. *Aspergillus fumigatus* was cultured from five intra-abdominal sites and one specimen of drainage fluid over a 48 h period. *Aspergillus* antigen was detected in blood at a titre of 1:8. Treatment with deoxycholate amphotericin B (1 mg/kg/day) was commenced, and the obvious areas of infection were surgically debrided. Amphotericin B was continued with supplemental saline infusions for 4 weeks to minimize renal impairment. The lesions improved within the first 2 weeks and then disappeared. Six months after the initial presentation, a polya gastrectomy was

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performed and the intestinal fistulae and abdomen were closed. The patient made an uneventful recovery and was subsequently discharged from hospital.

Epidemiological Investigation

The intensive therapy unit (ITU) at Hope Hospital where this patient was cared for was 8-years-old and purpose built. There are three side rooms and eight beds on both sides of the main ward. Air is supplied to the ITU from a large ventilation system which supplies the whole of the new four-floor building. The air intake is above the building and the air passes through roll filters for particles $\geq 5 \mu\text{m}$ and then is forced through bag filters for particles $\geq 1 \mu\text{m}$ before entering the ITU along the length of the ward at head height behind the patients' beds. Inspection of the filters at the time of this patient's infection revealed no defect and that they had been changed recently. Ten settle plates of Sabouraud's media were placed in several locations in the ITU for 30 min 1 day after the diagnosis of invasive aspergillosis was made, subsequently incubated and yielded one isolate of *A. fumigatus*. No other patients in the new building developed aspergillosis or grew *A. fumigatus* in samples in the month before or after this patient's illness.

The six isolates from the patient and the ICU isolate were DNA typed by restriction fragment length polymorphism and random amplification of polymorphic DNA as previously described.^{6,7} All were identical. This, and other molecular typing work, is reported separately.⁷

Discussion

It is likely that this patient acquired her infection from air in the intensive care unit. This situation has been reported in burn patients^{8,9} but is uncommon. Primary *Aspergillus* infection of a wound after surgery is rare. Myers and Dunn¹⁰ appear to have been the first to report infection of a skin wound with *Aspergillus* following accident injury in a farmer, and this report was followed by a report of postoperative abdominal wound infection with *Aspergillus niger*.¹¹ Langlois *et al.*¹² reported *Aspergillus* infection of a haematoma associated with the formation of an arteriovenous fistula in a renal transplant recipient that led to dissemination and death. Three cases of invasive aspergillosis of traumatic wounds have been reported, requiring amputation to control infection.¹³ Fatal *Aspergillus* infection of an extensively debrided abdominal wound following necrotising fasciitis has recently been described,¹⁴ as have two liver transplant patients¹⁵ infected postoperatively. In addition, a number of *Aspergillus* infections presumptively acquired during a

Table I. Instances of *Aspergillus* infection during or after surgery or trauma.

During surgery	Reference
Vascular grafts	16-18
Prosthetic valve endocarditis	19-21
Renal infection following pyelolithotomy	22
Hickman line infections	23
Aortitis	24, 25
Sternotomy infections after cardiac surgery	26-28
Bronchial stump infections after pneumonectomy	29
Vertebral body aspergillosis following laminectomy	30
Infection of silicone breast implants	31
Postoperative	
Skin wound following accident injury in a farmer	10
Postoperative abdominal wound infection	11
Arteriovenous fistula related haematoma in a renal transplant recipient	12
Infection of extensively debrided abdominal wound following necrotising fasciitis	12
Liver transplantation recipient with postoperative wound infection	15
Trauma related	
Burn wound infection	8, 9
Extensive soft tissue injury compound by ischaemia	14

surgical procedure have been reported as shown in Table I.

Early diagnosis and initiation of therapy of invasive aspergillosis is regarded as an important component of an early outcome.³² Clearly in this case an aetiological diagnosis was achieved within 48 h of the appearance of the lesions and large doses of amphotericin B were administered. The outcome was much better than in most cases in burns patients,^{8,9} the three trauma victims in whom resection surgery was required¹³ or the two liver transplant patients reported with postoperative wound infections.¹⁵

Cultures from the air (settle plates) in our intensive care unit also yielded one isolate with the same DNA type as the six patient isolates. That only one isolate was obtained suggested that the level of airborne contamination was low. It is therefore likely that there is a particularly high risk of acquisition of *Aspergillus* infection in patients with laparostomies. While laparostomy may improve the management of patients with bacterial infection of the peritoneal cavity, exposing the viscera to the air may result in infection with more esoteric, opportunist organisms.

Acknowledgement

Supported in part (GLC) by a MRC training fellowship. M. Birch was supported by the North West Regional Health Authority and the Fungal Research Trust.

References

- 1 Maetani S, Tobe T. Open peritoneal drainage as effective treatment of advanced peritonitis. *Surgery* 1981; **90**: 804-809.
- 2 Mughal MM, Bancewicz J, Irving MH. "Laparostomy". A technique for the management of intraabdominal sepsis. *Br J Surg* 1986; **73**: 253-259.
- 3 Anderson ED, Mandelbaum DM, Ellison EC, Carey LC, Cooperman M. Open packing of the peritoneal cavity in generalised bacterial peritonitis. *Am J Surg* 1983; **145**: 131-133.
- 4 Duff JH, Moffatt J. Abdominal sepsis managed by leaving abdomen open. *Surgery* 1981; **90**: 774-778.
- 5 Bodey GP, Vartivarian S. Aspergillosis. *Eur J Clin Microbiol Infect Dis* 1989; **8**: 413-437.
- 6 Denning DW, Clemons KV, Hanson LH, Stevens DA. Restriction endonuclease analysis of total cellular DNA of *Aspergillus fumigatus* isolates of geographically and epidemiologically diverse origin. *J Infect Dis* 1990; **162**: 1151-1158.
- 7 Birch M, Nolard N, Shankland G, Denning DW. DNA typing of epidemiologically-linked isolates of *Aspergillus fumigatus*. *Infect Epidemiol* 1995; **114**: 161-168.
- 8 Bruck HM, Nash G, Pruitt BA. Opportunistic fungal infection of the burn wound with phycomycetes and *Aspergillus*. *Arch Surg* 1971; **102**: 476-482.
- 9 Harlan Stone H, Cuzzell JZ, Kolb LD, Moskowitz PLS, McGowan JE. Aspergillus infection of the burn wound. *J Trauma* 1979; **19**: 765-767.
- 10 Myers JT, Dunn AD. Aspergillus infection of the hand. *JAMA* 1930; **95**: 794.
- 11 Frank L, Alton OM. Aspergillosis: A case of postoperative skin infection. *JAMA* 1933; **100**: 2007-2008.
- 12 Langlois RP, Flegel KM, Meakins JL, Morehouse DD, Robson HG, Guttman RD. Cutaneous aspergillosis with fatal dissemination in a renal transplant recipient. *CMA Jour* 1980; **1210**: 673-676.
- 13 Golladay ES, Baker SB. Invasive aspergillosis in children. *J Ped Surg* 1987; **22**: 504-505.
- 14 Falsey AR, Goldsticker D, Ahern MJ. Fatal subcutaneous aspergillosis following necrotizing fasciitis: A case report. *Yale J Biol Med* 1990; **63**: 9-13.
- 15 Plá MP, Berenguer J, Arzuaga JA, Bañares R, Polo JR, Bouza E. Surgical wound infection by *Aspergillus fumigatus* in liver transplant recipients. *Diagn Microbiol Infect Dis* 1992; **15**: 703-706.
- 16 Brandt SJ, Thompson RL, Wenzel RP. Mycotic pseudoaneurysm of an aortic by pass graft and contiguous vertebral osteomyelitis due to *Aspergillus fumigatus*. *Am J Med* 1985; **79**: 259-262.
- 17 Glotzbach RE. *Aspergillus terreus* infection of pseudoaneurysm of aortofemoral vascular graft with contiguous vertebral osteomyelitis. *Am J Clin Pathol* 1982; **77**: 224-227.
- 18 Aguado JM, Valle R, Arjona R, Ferreres JC, Gutierrez JA. Aortic bypass graft infection due to *Aspergillus*: Report of a case and review. *Clin Infect Dis* 1992; **14**: 916-921.
- 19 Rubinstein E, Noriega ER, Simberkoff MS, Holzman R, Rahal JJ. Fungal endocarditis: analysis of 24 cases and review of the literature. *Medicine* 1975; **54**: 331-344.
- 20 Petheram IS, Seal RME. Aspergillus prosthetic valve endocarditis. *Thorax* 1976; **31**: 380-390.
- 21 Gage AA, Dean DC, Schimert G, Minsley N. Aspergillus infection after cardiac surgery. *Arch Surg* 1970; **101**: 384-387.
- 22 Davies SP, Webb WJS, Patou G, Murray WK, Denning DW. Renal aspergilloma—a case illustrating the problems of medical therapy. *Nephrol Dial Transplant* 1987; **2**: 568-572.
- 23 Allo MD, Miller J, Townsend T, Tan C. Primary cutaneous aspergillosis associated with Hickman intravenous catheters. *N Engl J Med* 1987; **317**: 1105-1108.
- 24 Leffert RL, Hackett RL. Aspergillus aortitis following replacement of aortic valve. *J Thor Cardiovasc Surg* 1967; **53**: 866-874.
- 25 Malcolm AD, Bakerspiegel A, Enriquez AA. Aspergillus flavus endocarditis following aortic valvotomy. *Thorax* 1971; **26**: 435.
- 26 Attah CA, Cerruti MM. Aspergillus osteomyelitis of sternum after cardiac surgery. *New Y State J Med* 1979; Aug: 1420-1421.
- 27 Wellens F, Potvliege C, Deuvaert FE, Primo G. Aspergillus osteochondritis after median sternotomy. Combined operative treatment and drug therapy with amphotericin B. *Thorac Cardiovasc Surg* 1982; **30**: 322-324.
- 28 Frank KA, Merz WG, Hutchins GM. Sclerodium formation in an *Aspergillus flavus* wound infection. *Mycopathologia* 1988; **102**: 185-188.
- 29 Sawaski H, Horie K, Yamada M *et al*. Bronchial stump aspergillosis. Experimental and clinical study. *J Thorac Cardiovasc Surg* 1989; **58**: 198-208.
- 30 Tack KJ, Rhame FS, Brown B, Thompson RC Jr. Aspergillus osteomyelitis: report of four cases and review of the literature. *Am J Med* 1982; **73**: 295-300.
- 31 Williams K, Walton RL, Bunkis J. Aspergillus colonization associated with bilatera silicone mammary implants. *Plastic Reconstruct Surg* 1983; **71**: 260-161.
- 32 Denning DW, Stevens DA. Antifungal and surgical treatment of invasive aspergillosis: review of 2121 published cases. *Rev Infect Dis* 1990; **12**: 1147-1201.