

Experience with fungal infections affecting the heart in necropsies at an Indian hospital

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Abstract

Twenty-one cases of fungal infection of the heart were encountered among 4000 necropsies performed in a South Indian hospital over a period of 20 years. All 5 cases of endocarditis due to infection with *Aspergillus* followed cardiac surgery, while the 4 cases of endocarditis due to *Candida* affected normal heart valves. Cardiac micro-abscesses secondary to fungal infections elsewhere were caused by *Aspergillus* in 5 cases and *Candida* in 4. A fibrosing granulomatous *Aspergillus* infection extended from the lungs to involve the base of the heart in 3 patients.

Introduction

There is no large series of cases of mycosis involving the heart reported from tropical regions. Aspergillosis and candidosis were encountered in necropsies we performed in a South Indian hospital, and were also the commonest fungi reported to involve the heart in patients in Europe and the USA (CHAUDHURI, 1970; RUBINSTEIN *et al.*, 1975; WALSH *et al.*, 1980). We now report our experience with these conditions.

Materials and Methods

All cases of mycosis involving the heart occurring among 4000 consecutive necropsies of patients over one month of age, in whom the heart was examined, at the Christian Medical College Hospital in Vellore were included in our study. Hospital case and necropsy records were reviewed and specimens of the heart preserved in formalin, and histological sections stained with haematoxylin and eosin, periodic acid Schiff or Grocott's methenamine silver stain (BANCROFT & STEVENS, 1975), were studied. Fungi were identified by their morphology in tissue sections (EMMONS *et al.*, 1977); confirmation of species identification by culture was possible in 6 cases.

Results

Thirteen cases of aspergillosis and 8 cases of candidosis affecting the heart were encountered. The age, sex, possible predisposing factors and relevant necropsy findings are given in the Table.

Aspergillus fumigatus was cultured from the valvular vegetation of case 3. The other 12 cases were 'presumed' to be *Aspergillus* infection, based on morphology. *Candida albicans* was grown from blood of cases 14-17 and from pulmonary tissue from case 18. In all the cases both yeast and filamentous forms were present, which is not in keeping with the presence of other *Candida* species.

Aspergillosis

Cases 1-4 showed thrombotic vegetation containing

Aspergillus hyphae in the region of the prosthetic valves and the adjacent endocardium. Vegetation occurred on the aortic aspect of aortic valve prostheses and the atrial aspect of mitral valve prostheses. Case 5 developed endocardial aspergillosis with vegetation along the pulmonary valve cusps and pulmonary outflow tract following corrective surgery for a double outlet right ventricle.

Cases 6-8 had granulomatous inflammation due to *Aspergillus*. In case 6 the pericardial surface of the base of the heart was involved by infection spreading from the adjacent pleura and lungs. In cases 7 and 8 a fibrosing granulomatous inflammation, in which fungal hyphae could be seen, extended from the lungs into the pericardium, myocardium and endocardium of the atria. The valves were spared in these 3 cases.

Cases 9-13 showed micro-abscesses in the myocardium with acute inflammatory cells surrounding *Aspergillus* hyphae.

Infective endocarditis was suspected clinically in the patients who had open-heart surgery. Those with granulomatous aspergillosis presented as a pulmonary neoplasm with or without clinical evidence of cardiac involvement. Cardiac micro-abscesses were clinically unsuspected.

Candidosis

Cases 14-17 showed *Candida* vegetation on the endocardium of otherwise apparently normal valves of the right or left side of the heart. Cases 18-21 had micro-abscesses in the myocardium with neutrophilic leucocytes around yeast and filamentous forms of *Candida*.

Cardiac involvement in these cases was masked by features of septicaemia and was clinically unsuspected.

Discussion

The cardiac involvement was of two types: type 1 in which the endocardium was the primary site of infection and type 2 in which cardiac involvement was secondary to a fungal infection elsewhere, the heart being involved either by contiguous spread from adjacent organs or by emboli from more distant infections.

Type 1 (primary cardiac infection). All 9 cases in this group had valvular endocarditis. The 5 due to *Aspergillus* followed cardiac surgery, with or without implantation of a prosthesis, suggesting an exogenous infection introduced at the time of surgery (CHAURHURI, 1970; DURACK, 1982). The cases of endocarditis due to *Candida* involved normal valves in patients with bacterial septicaemia; intravenous lines were the probable source of infection (RUBINSTEIN *et al.*, 1975; DURACK, 1982).

Type 2 (secondary cardiac involvement). Three of

Table. Findings in 21 cases of fungal infection of the heart

Case no.	Sex & age ^a	Lesion	Extent of cardiac involvement	Other sites	Underlying factors ^b
Aspergillosis					
1	M 27y	Vegetation	Endocardium of aortic valve	-	Aortic valve replacement ^c
2	M 40y	Vegetation	Endocardium of aortic valve, prosthesis and aortic wall	-	Aortic valve replacement ^c , BSA
3	F 16y	Vegetation	Endocardium of aortic valve	-	Aortic and mitral valve ^c replacement
4	M 28y	Vegetation	Endocardium of left atrium	-	Mitral valve replacement ^c
5	M 7y	Vegetation	Endocardium of pulmonary outflow tract	Lungs, kidneys	Double outlet right ventricle correction, BSA
6	M 25y	Granuloma	Pericardium	Lungs, gut	Myelofibrosis
7	M 14y	Granuloma	Left atrial wall	Lungs, brain	Abdominal surgery, BSA
8	M 30y	Granuloma	Both atria	Lungs, kidneys	
9	M 42d	Abscesses	Myocardium	-	Bacterial septicaemia, BSA
10	M 23y	Abscesses	Myocardium	Lungs, brain, gut	Renal transplant, BSA, S, A
11	M 34y	Abscesses	Myocardium	Lungs	Alcoholic hepatitis, bacterial septicaemia, BSA, S
12	M 21y	Abscesses	Myocardium	Lungs, kidneys	Bacterial septicaemia, tropical polyomyositis
Candidosis					
13	M 60y	Abscesses	Epicardium	Kidneys	Sprue, BSA
14	M 12y	Vegetation	Endocardium of pulmonary valve	Lungs	Haemolytic-uraemic syndrome, BSA
15	M 24y	Vegetation	Endocardium of mitral valve	-	Bacterial septicaemia, BSA
16	M 32y	Vegetation	Endocardium of tricuspid valve	Lungs, kidneys	Abdominal surgery, bacterial septicaemia, BSA
17	F 52y	Vegetation	Endocardium of mitral valve	Lungs, gut, kidneys	Retroperitoneal sarcoma, bacterial septicaemia, BSA, radiotherapy
18	F 4m	Abscesses	Myocardium	Lungs, liver, spleen, adrenals, kidneys	Combined immune-deficiency syndrome
19	F 17y	Abscesses	Myocardium	Kidneys	Abdominal surgery, bacterial septicaemia, BSA
20	F 40y	Abscesses	Myocardium	Lungs, liver, kidneys	Bacterial septicaemia, BSA
21	F 47y	Abscesses	Myocardium	Lungs, kidneys	Ulcerative colitis, adenocarcinoma of colon

^aF=female, M=male, d=days, m=months, y=years.

^bAbbreviations: BSA=broad spectrum antibiotics, S=steroids, A=azathioprine.

^cProsthetic valve.

these cases had a fibroblastic granulomatous inflammation simulating a neoplasm. The remainder had micro-abscesses involving the myocardium. In these cases the fungus had apparently been carried in the blood to the heart from other primary sites and spread from the small coronary vessels into perivascular tissue with subsequent abscess formation (WENGER *et al.*, 1982).

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