Infective Endocarditis at Autopsy in Northern India

A Study of 120 Cases

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SUMMARY

Pathologic data on 120 autopsied cases of infective endocarditis are presented. They constitute 1.8% of total 6,700 and 6.3% of 1,900 cardiac autopsies over 16 years. Ninety % of patients were below the age of 40 years, 42.5% had no pre-existing heart disease, 33.3% had previous valvular disease, mainly rheumatic, and 24.2% had congenital heart disease. Mitral and aortic valves were each the sites in one third cases, mitral slightly more than aortic. Twenty-six point six % of the cases had lesions on the right side of the heart, 16.6% exclusively so. Cardiac complications were infrequent while systemic infarcts were found in over 80% cases. A route of infection was detected only in 24.1% of the cases, puerperal sepsis being the commonest. Staphylococci were the responsible bacteria in 18 out of 28 cases in which microbiologic data were available. There were only 2 cases with infective lesions on prosthetic valves, both fungal.

The pattern of infective endocarditis in this and other reports from India and Africa differs from that in the West, in many respects including younger age of our patients, significant rheumatic background disease, absence of narcotic addicts and of "degenerative heart disease" and lower incidence of cardiac complications.

INFECTIVE endocarditis is among the significant crippling and lethal diseases of the heart. There has been a very appreciable change in the nature of the disease, both in its clinical manifestations and autopsy findings after the introduction of antibiotics about 40 years ago. The pattern and background of the disease in the Western countries differs in many respects from that found in the developing or underdeveloped countries. There are

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only a handful of reports of sizeable number of cases from India and Africa, while there is massive literatures from the West. This paper records the pathologic pattern of the diseases as seen at autopsy in Northern India and compares that with other reports.

MATERIALS AND METHODS

The 120 cases have been personally studied by the first author (BND) among the autopsies done in this Institute over the last 16 years. Cases with destructive or verrucous lesions on valves and/or endocardium, with microorganisms demonstrated either by antemortem blood culture, or at post-mortem heart blood or vegetation culture or in histologic sections have been included in this study.

RESULTS

Incidence: The 120 cases represent 1.8% of the total of 6,700 (approximate) autopsies done over the 16 years period 1964–1980, and 6.3% of the approximately 1,900 cases with cardiac disease among them.

Age and sex: Ninety % of the cases were below the age of 41 years and 60% below 31 years, the age span was 3 years to 75 years with an average of 28 years. Only 6 out of 120 cases had crossed 51 years. The 77 males and 43 females provided a sex ratio of 1.8 male: 1 female (Table I).

Pre-existing heart disease: The 120 cases included 69 cases (57.5%) that had previously diseased valves/endocardium while in 51 cases (42.5%) there was no previous heart disease. The previous heart diseases included 38 cases with rheumatic and 2 with calcific aortic disease comprising 40 cases of acquired valvular heart disease (VHD 33.3%), and 29 cases with congenital heart disease (CHD 24.2%). The remaining 42.5% had previously normal hearts (NHD group). The lesions in each of the 3 groups will be detailed separately.

Pathologic lesions and their sites: Table I shows the sites of involvement. About 3/4th of the lesions were on the left side, 16.6% on the right side of the heart and 10% involved both sides (Table II). The 120 cases shared between them 171 lesions. The most frequent site was the mitral valve in 1/3rd of the cases, either alone or in association with other valve sites, the aortic valve followed closely, followed by the tricuspid valve (Table I). The mural endocardium was frequently the site of infective lesions, mostly in association with valves but in 3.3% cases alone too. The left atrium was the most frequent site, usually above the posterior mitral leaflet (Table III). Cardiac complica-

Table I.

Previous Heart Disease	None (NHD)	Congenital (CHD)	Valvular (VHD)	Total
No. of cases	51 (42.5%)	29 (24.2%)	40 (33.3%)	120
No. of lesions	65 (38.0%)	42 (24.5%)	64 (37.5%)	171
Age in years				
Range	3-65	12-63	13-75	3-75
Average	26.4	28.4	29	28
Sex ratio M : F	1 : 1	2.6 : 1	3.4 : 1	1.8 : 1
Mitral valve				
Alone*	16 (13.3%)	0 (0%)	21 (17.5%)	37 (30.8%)
Total**	20 (11.6%)	4 (2.3%)	34 (19.8%)	58 (33.9%)
Aortic valve				
Alone	15 (12.5%)	14 (11.6%)	2 (1.6%)	31 (25.8%)
Total	20 (11.6%)	21 (12.2%)	14 (8.1%)	55 (32.1%)
Tricuspid				
Alone	15 (12.5%)	2 (1.6%)	0 (0%)	17 (14.1%)
Total	16 (9.3%)	7 (4.0%)	4 (2.3%)	27 (15.7%)
Pulmonic				
Alone	0 (0%)	3 (2.5%)	0 (0%)	3 (2.5%)
Total	0 (0%)	5 (2.9%)	0 (0%)	5 (2.9%)
Endocardium				
Alone	0 (0%)	1 (0.8%)	3 (2.5%)	4 (3.3%)
Total	9 (5.2%)	5 (2.9%)	12 (7.0%)	26 (15.7%)
Route of infection	18 (15.0%)	4 (3.3%)	7 (5.8%)	29 (24.1%)
Complications :				
Systemic infarcts	83 (70%)	42 (35.0%)	82 (68.3%)	
Pericarditis	3	0	1	4
Chordal rupture	5	0	5	10
Cardiac abscess	8	3	7	18
Ring abscess	2	1	0	3

* Percentages against "Alone" are in 120 cases.

** Percentages against "Total" are in 171 lesions.

Table II. Side of Heart Involved

Previous Heart Disease Side	None (NHD)	Congenital (CHD)	Valvular (VHD)	Total
Left	35	18	36	89
Right	15	5	0	20
Both	1	6	4	11
Total	51	29	40	120

Table III. Involvement of Mural Endocardium (No. of Cases)

Group	Left Atrium	Left Ventricle	Right Ventricle	Total
Previous Heart Disease				
None (NHD)	5	1	3	9
Congenital (CHD)	1*	4	—	5
Valvular (VHD)	8**	4	—	12
Total	14	9	3	26

* Isolated involvement, no valvular lesion.

** 3 out of 8 had isolated lesion, no other valvular lesion.

Table IV. Type of Vegetation

Group	Polypoid	Destructive	Verrucous	Total
Previous Heart Disease				
None (NHD)	26	22	4	52
Congenital (CHD)	6	4	21	31
Valvular (VHD)	5	15	22	42
Total	37	41	47	125

tions like ruptured chordae tendinae, aneurysms of the sinus of Valsalva, pericarditis, ring abscess, myocardial abscesses were not frequent (Table I), while extra cardiac embolic infarcts were seen in over 80% cases (Table I). A possible route of infection was detected in only 29 of the 120 cases (24.1%, Table V), the largest number of which were cases of puerperal sepsis (11/29, 38%). In 10 cases (34%), cardiac surgery had been performed, which included 2 cases of prosthetic valve insertion, 5 of mitral valvotomy and 3 of repairs of congenital defects. Data on microorganism were available in only 28 cases, the commonest organisms were staphylococci, in 18 instances, followed by streptococci in 8 cases. There were 2 cases in which fungus (*aspergillus* in one and *candida* in the other) was identified in the vegetations, both were cases of prosthetic valves. In cases without any previous heart disease (NHD group, 51 cases), the patients were youngest (average age 26.4 years) and there were equal number of male and female patients. Mitral and aortic valves were equally involved, while tricuspid valve and mural endocardium involvement (Table III) was most frequent in this group. The cardiac complications too were most frequent in this group (Table I). The lesions were mostly destructive or polypoidal vegetative (Table IV). By contrast the cases with pre-existing valvular heart disease (VHD) were slightly older, average 29 years and males outnumbered females by 3.4 to 1, and the mitral valve was involved most frequently in this group. In the cases with congenital

Table V. Route of Infection (29 Cases)

Previous Heart Disease	None (NHD)	Congenital (CHD)	Valvular (VHD)	Total
Systemic infection	18	1	0	19
Puerperal sepsis	11			
Osteomyelitis	2			
Post dialysis	2	1		
Enteric fever	1			
Renal (diabetic)	1			
Leukemia	1			
Cardiac Surgery	0	3	7	10
Prosthetic			2	
Others		3	5	
Total	18	4	7	29

heart disease (CHD), the mitral valve was rarely involved. The underlying congenital defects in the 29 cases included bicuspid aortic valve (15 cases), unicuspid valve (1 case), Fallot's tetralogy (3 cases), and others.

DISCUSSION

The perspective on endocarditis as a disease entity has undergone a number of changes during the past 30–40 years. These are summarized below.

Age incidence: The publications from the West indicate a steady increase in the age of patients of infective endocarditis after the antibiotic era. From the average age below 40 years earlier it has gone beyond 50 years.^{1)–3)} One group of patients which, however, falls in the second and third decades is the narcotic drug abusers.^{4), 5), 18)} By contrast, in our material as well as in that reported from Bombay⁶⁾ and Africa^{7)–9)} the age of as many as 90% patients is below 40 years. The factors operating in the West for this disparity in age include the control of the underlying rheumatic heart disease, adequate antibiotic therapy, an increasing proportion of cases with underlying “degenerative heart” diseases of advancing age and the higher age of patients subjected to cardiac surgery. In the earlier reports from UK,²⁾ there was a considerable age difference between patients with the pre-existing heart disease and those of normal valves. The latter were far older. This difference too is not noticeable in the reports from India and Africa^{6)–9)} as well as in our findings. However, patients with mitral valve infection have been found to be younger than those with aortic valve lesions in one report from Africa,⁸⁾ similar to recent Western reports.

Underlying heart disease: has also shown considerable changes in the West-

ern literature. Prior to antibiotic era, 61–72% had a pre-existing heart disease including 40–72% rheumatic and 6.7 to 23.6% congenital lesions.¹⁰⁾ The reports prior to 1950 showed that as much as 90% of cases of infective endocarditis had underlying rheumatic disease,^{6),11)–13)} while lately this figure has come down to around 40%^{1),2),14)} (Table VII). Autopsy data in this Institute have shown that 11% rheumatics get complicated by infective endocarditis.¹⁷⁾ This corresponds to the figure of 10–25% mentioned by Friedberg.¹³⁾ The place of rheumatic disease has partly been taken by congenital heart disease (specially in view of increasing surgical approaches) but mainly by conditions like ischemic heart disease, calcific aortic valves, prosthetic valves and myxomatous degeneration of mitral valves.^{14)–16)} The last named condition has gained considerable importance in recent years in the West and some authors believe¹⁶⁾ that the high incidence of rheumatic disease in the past could have been due to non-recognition of the entity of myxomatous degeneration. All these so-called “degenerative disease” have yet not found any significant place in reports from developing countries. In our material there were only 2 cases with calcific aortic valve disease of possible non-rheumatic etiology. Patients without a previous heart disease have constituted 25 to 40% in almost all reports (Table VI). Another difference seen here is the complete absence of cases of narcotics addiction, which form a significant proportion of cases in the West.

Sites of lesions: There is a considerable variation in the reports, summarized in Table VII. In general in the pre- and early antibiotic periods mitral valve was more commonly involved, in the present context, aortic valve is the commonest site. This is related to the change in the background heart

Table VI. Pre-existing Heart Disease (Percent Cases)

Author and Year		Valvular (VHD)	Congenital (CHD)	None (NHD)	Others
Seabury ¹¹⁾	1947	60	14	17	—
Cates and Christie ¹²⁾	1951	Over 80	13	—	—
Hughes and Gauld ²⁾	1966	56	7	28	7
Vogler ²⁴⁾	1962	48	23	21	8
Somers ⁷⁾	1972	51	8	40	—
Arnett ²⁵⁾	1976				
Mitral		27	—	68	—
Aortic		8	23	50	—
Mehta ⁶⁾	1978	(Both	58)	42	
Mouldsdaie ¹⁴⁾	1980	23	7	30	30
This report	1981	31	24	43	2

The percent figures have omitted decimal points.

Table VII. Involvement of Mitral and Aortic Valves
(Percent Figures, Omitting Decimal)

Author and Year		Mitral	Aortic	
Clawson ²⁰⁾	1924	76	47	
Seabury ¹¹⁾	1947	36	17	
Cates and Christie ¹²⁾	1951	41	13	
Wilson ²⁷⁾	1963	86	62	Preantibiotic
		67	62	Postantibiotic
Lerner and Weinstein ¹⁾	1966	69	37	Preantibiotic
		63	66	Postantibiotic
Hughes and Gauld ²⁾	1966	38	50	
Cherubian ³⁾	1971	44	5	Preantibiotic
		37	41	Postantibiotic
Steiner ⁹⁾	1973	36	53	
Arnett ²⁵⁾	1976	30	70	
Falase ⁸⁾	1976	43	59	
Mehta ⁸⁾	1978	43	27	
Stinson ¹⁶⁾	1980	18	72	
Moulsdale ¹⁴⁾	1980	50	34	
This report	1981	34	32	

disease and to a larger number of older patients going in for aortic valve surgery. However, in our material there is not much difference in the two sites, and all the three reports from Africa⁷⁾⁻⁹⁾ show a higher involvement of aortic valve. Tricuspid valve lesion has considerably increased in the recent years, based mainly on the narcotic addicts in the West.^{4),5),18)} In our material 31 out of 120 cases showed lesions on the right side of the heart, 20 being exclusively so, against 89 cases localised to left heart (Table II). Earlier publications^{1),19),20)} had given the figures for right sided endocarditis as 5-10% and suggested that the frequency of right sided endocarditis represented the ratio of pressure between the left and right sides (6:1).¹⁹⁾ We have also encountered a greater frequency of involvement of the mural endocardium (Table III) usually in association with a valve.²¹⁾

The size and nature of the vegetations is apparently related to the state of the valve. Previously sclerotic valves are likely to be resistant to destruction and on them vegetations are usually small and verrucous (Table IV). Destructive lesions are therefore far commoner on previously normal valves (the "primary" infective endocarditis). Cuspal destruction has been reported to occur in 60 to 92% of such cases.^{16),22)}

Microbiological data with us were available in only 28 of the 120 cases and lends support to an earlier report from this Institute²³⁾ and to publications in the literature that the pathogenic staphylococci are more frequently

the cause of infective endocarditis.¹⁴⁾ Finally, the route of infection in our material is quite different from the Western experience. In general the route is identifiable in a small percentage of cases, but whereas dental route is the commonest portal of entry of the infective organisms in the West,¹⁴⁾ we have a significant contribution from puerperal sepsis (Table V). This has also been the experience in some of the African data.⁹⁾

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