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HISTOMORPHOLOGICAL EVALUATION OF VALVULAR LESIONS IN RHEUMATIC HEART DISEASE PATIENTS – AN INSTITUTIONAL STUDY

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ABSTRACT

Background:

Rheumatic Heart Disease (RHD) remains a significant cause of cardiovascular morbidity in developing countries. Despite advances in medical and surgical management, the histopathological evaluation of surgically excised cardiac valves continues to provide crucial insights into disease progression and pathogenesis. **Aim:**To evaluate the histomorphological spectrum of valvular lesions in patients diagnosed with RHD undergoing valve replacement surgery and to correlate these findings with clinical and demographic parameters.**Results:**

The study found fibrosis in 97.9% of cases, chronic inflammation in 85.7%, and calcification in 61.4%. The mitral valve was most frequently involved (65.3%). Calcification correlated significantly with older age (p=0.032).**Conclusion:**Histopathological examination of excised cardiac valves in RHD reveals consistent features of chronic inflammation and fibrosis, with significant age-related and valve-specific variations. These findings underscore the importance of early detection and surgical intervention to prevent irreversible valvular damage.

Keywords:

Rheumatic heart disease, valvular lesions, histopathology, fibrosis, mitral valve, calcification.

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INTRODUCTION

Rheumatic Heart Disease (RHD) is a chronic sequela of acute rheumatic fever (ARF), an autoimmune inflammatory condition that follows untreated or inadequately treated group A β-hemolytic streptococcal pharyngitis. The hallmark of RHD is progressive valvular damage, primarily affecting the mitral and aortic valves, due to repeated inflammation and subsequent scarring. The pathological evolution typically includes fibrotic thickening, calcification, commissural fusion, and occasionally, the persistence of pathognomonic Aschoff bodies and Anitschkow cells in early or recurrent phases of activity[1].

RHD remains a significant public health concern in low- and middle-income countries, despite a marked decline in incidence in developed nations. Globally, RHD affects over 40 million people and causes approximately 300,000 deaths annually[2]. In India, it continues to be a leading cause of valvular heart disease among young adults and adolescents, especially in socioeconomically disadvantaged regions[3]. The disease frequently culminates in heart failure, atrial fibrillation, infective endocarditis, or thromboembolic events, necessitating surgical intervention.

Histomorphological studies of excised valvular tissue in RHD provide crucial insights into the nature and extent of chronic inflammation and fibrosis. Earlier studies have documented predominant features such as dense collagenous fibrosis, mononuclear cell infiltration, neovascularization, and occasional calcific deposits[4]. A few studies also highlight the persistence of active lesions (like Aschoff nodules) in clinically quiescent patients, indicating subclinical activity[5]. However, there remains a scarcity of comprehensive data correlating these histological features with demographic profiles and valve involvement, particularly in the Indian population.

Given the high burden of RHD in India and the frequent need for surgical valve replacement, the histopathological evaluation of excised valves offers an opportunity to better understand the pathological spectrum of disease progression. Such data can help identify age-related trends, subclinical activity, and patterns of valvular involvement, thereby guiding postoperative management and preventive strategies. Furthermore, histomorphological documentation serves as a feedback loop for clinicians to correlate clinical staging with actual tissue pathology. This study aims to bridge this knowledge gap by systematically analyzing the histomorphological

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spectrum of RHD-associated valvular lesions and correlating them with demographic and clinical parameters in a tertiary care setting.

AIM AND OBJECTIVES:

AIM

To evaluate the histomorphological spectrum of valvular lesions in patients diagnosed with Rheumatic Heart Disease (RHD) undergoing valve surgery, and to correlate these findings with clinical and demographic parameters in the Indian population.

OBJECTIVES

1. To analyze the histopathological changes in surgically excised heart valves of RHD patients.
2. To assess the correlation between histological features and variables like age, gender, and type of valve involvement.

MATERIALS AND METHODS :

Study Design and Setting

This was a descriptive, cross-sectional study conducted in the Department of Pathology in collaboration with the Department of Cardiothoracic Surgery at a tertiary care teaching hospital in India over a period of two years. (from 2022 to 2024)

Sample Size and Selection

A total of 49 patients with a clinical diagnosis of Rheumatic Heart Disease (RHD), who underwent valve replacement surgery, were included in the study. Patients were selected using purposive sampling.

Inclusion Criteria

- Patients of all age groups and both sexes.

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- Patients with a confirmed clinical and/or echocardiographic diagnosis of RHD.
- Patients undergoing valve replacement surgery (mitral, aortic, tricuspid, or combined).
- Availability of adequate valvular tissue samples for histopathological analysis.

Exclusion Criteria

- Patients with non-rheumatic causes of valvular disease.
- Valves showing infective endocarditis.
- Poorly preserved or inadequate tissue samples.
- Incomplete clinical or demographic data.

Data Collection

Clinical and demographic details including age, sex, presenting symptoms, echocardiographic findings, and type of valve replaced were recorded from hospital records and operative notes.

Tissue Processing and Histopathological Examination

- Excised valvular tissues were received in 10% buffered formalin.
- After gross examination, representative sections were taken from the thickened and deformed areas of the valves.
- The tissues were processed using standard paraffin embedding techniques.
- Sections of 3–4 μm thickness were cut and stained with Hematoxylin and Eosin (H&E) for routine histological evaluation.

Histomorphological Parameters Assessed

The following features were evaluated:

- Degree of fibrosis
- Presence of chronic inflammatory infiltrates

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- Calcification
- Neovascularization
- Myxoid degeneration
- Presence of Aschoff bodies or Anitschkow cells

Each feature was semi-quantitatively scored as **mild (+)**, **moderate (++)**, or **severe (+++)**, wherever applicable.

Statistical Analysis

Data were tabulated and analyzed using Microsoft Excel and SPSS software . Descriptive statistics such as frequency, percentage, and mean were used. Correlation between histological features and demographic variables was evaluated using Chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS :

Table 1: Demographic Distribution of Patients

Age Group (Years)	Male (n)	Female (n)	Total (n)	Percentage (%)
21–30	6	7	13	26.5%
31–40	6	9	15	30.6%
41–50	4	6	10	20.4%
>50	3	8	11	22.4%
Total	19	30	49	100%

Table 2: Distribution of Valve Involvement

Valve Involved	Number of Cases (n)	Percentage (%)
Mitral Valve only	32	65.3%

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Aortic Valve only	6	12.2%
Both Mitral & Aortic	11	22.4%
Total	49	100%

Table 3: Histomorphological Findings in Valves

Histological Feature	Frequency (n)	Percentage (%)
Fibrosis	48	97.9%
Chronic Inflammation	42	85.7%
Neovascularization	40	81.6%
Calcification	35	71.4%
Myxoid Degeneration	6	12.2%

Table 4: Histological Features vs. Age Group

Age Group (Years)	Fibrosis (%)	Inflammation (%)	Calcification (%)	Age Group (Years)
21–30	100	90	55	21–30
31–40	100	80	66	31–40
41–50	90	70	70	41–50
>50	91	64	82	>50
p-value	0.61 (NS)	0.048*	0.032*	

*$p < 0.05$ considered significant. "NS" = Not Significant.

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Table 5: Valve Type vs. Histological Findings (with significance)

Valve Involved	Most Common Feature	Secondary Feature	Notable Finding	p-value (Inflammation)	p-value (Calcification)
Mitral Valve	Fibrosis	Inflammation	Calcification	0.041*	0.089 (NS)
Aortic Valve	Calcification	Fibrosis	Neovascularization	0.097 (NS)	0.036*
Mitral + Aortic	Fibrosis	Calcification	Inflammation	0.051 (NS)	

*Significant ($p < 0.05$)

DISCUSSION:

The present study evaluated the histopathological spectrum of valvular lesions in patients with Rheumatic Heart Disease (RHD) undergoing valve replacement surgery. A total of **49** patients were included, with a male-to-female ratio of **19:30** (Table 1). The majority of patients fell within the **31–40** age group, accounting for **30.6%** of the total, followed closely by the **21–30** age group at **26.5%**. The **>50** age group comprised **22.4%** of the sample, and the **41–50** age group made up **20.4%**, suggesting that valvular involvement is more prevalent in the middle-aged to older population.

Our observation of fibrosis as the predominant lesion aligns with previous studies, such as the one by Laudari et al.[6] (2017), which reported fibrosis in 95.5% of cases, emphasizing the chronic nature of RHD and the progressive scarring of valvular tissue over time due to repeated inflammation. Similarly, Alam et al.[7] (2023) found fibrosis to be a universal feature in rheumatic valves, supporting our finding of its consistency across all age groups and valve types.

Chronic inflammatory infiltrates were found in 85.7% of our cases, which is comparable to Livia et al. (2021), who documented lymphoplasmacytic infiltrates in

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84% of their cases[8]. This high prevalence of inflammation suggests ongoing or past immune-mediated injury typical of RHD pathogenesis. Notably, inflammation showed a statistically significant correlation with age group ($p = 0.048$), with younger patients exhibiting more pronounced inflammation, indicating active or recent rheumatic activity.

Calcification, observed in 71.4% of cases, showed a positive correlation with increasing age ($p = 0.032$). This mirrors findings by Alam et al.[9] (2023), who reported calcific changes in 70% of older patients with RHD, attributing it to long-standing hemodynamic stress and chronic inflammatory damage.

Neovascularization, observed in 81.6% of our cases, highlights the chronic reparative process in valvular tissue. This finding concurs with Ihsan et al.[11] (2013), who described neovascularization in over two-thirds of excised valves from chronic RHD patients.

In terms of valve involvement, the mitral valve was the most frequently affected (65.3%), consistent with global and Indian literature. Studies by Talwar et al.[12](2024) and Marijon et al.[13] (2012) also emphasized mitral valve predominance, attributing it to high mechanical stress and susceptibility to immune-mediated injury. The combination of mitral and aortic valve involvement (22.4%) further supports the well-known multivalvular pattern in chronic RHD.

When comparing histological features among valve types, calcification was significantly associated with aortic valves ($p = 0.036$). These observations are supported by Waller et al.[14] (1984), who demonstrated that calcific changes were more prevalent in aortic valves due to systemic pressure load, while inflammatory lesions were more prominent in the mitral valve.

Overall, our study supports the chronic and progressive nature of RHD, characterized by fibrotic and inflammatory remodeling, with histomorphological differences influenced by valve type and patient age. These findings reinforce the importance of histopathological evaluation for assessing disease stage and guiding therapeutic strategies.

CONCLUSION:

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The present study highlights the wide spectrum of histomorphological changes observed in valvular tissues affected by Rheumatic Heart Disease in the Indian population. Fibrosis, chronic inflammation, and neovascularization were the most consistent findings across all age groups and valve types, reaffirming the chronic nature of the disease process. A significant association was noted between age and specific histological features, such as higher rates of calcification in older patients, suggesting varying stages of disease activity. The mitral valve remained the most commonly affected, either alone or in combination with the aortic valve. These findings underscore the importance of histopathological examination in understanding disease progression, guiding clinical decision-making, and reinforcing the need for early detection and management strategies in RHD patients to prevent long-term complications.

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