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Spectrum of Chronic Granulomatous Lesions of Skin: A 10-Year Study from a Tertiary Referral Centre of South India

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ABSTRACT

Chronic granulomatous lesions of the skin represent a diagnostic challenge due to their varied etiologies and overlapping histopathological features. These lesions can result from infectious, immunogenic, or foreign body reactions, necessitating careful clinical and histopathological evaluation. This study aims to analyze the spectrum of chronic granulomatous skin lesions encountered over a 10-year period at a tertiary referral center in South India. This retrospective study was conducted at the Department of Pathology and Dermatology. A total of 938 skin biopsies from 2005 to 2015 were reviewed, out of which 167 cases (17.8%) were identified as chronic granulomatous inflammation. The biopsies were categorized into infectious and non-infectious granulomas based on histopathological examination and the use of special stains such as Ziehl-Neelsen, Periodic Acid-Schiff (PAS) and Fite-Faraco. Clinical data including patient demographics and anatomical distribution were analyzed. The study found that 75% of the granulomatous lesions were infectious in origin, with tuberculosis being the most common etiology (51.3%), followed by leprosy (21.8%) and sarcoidosis (11%). The lesions predominantly affected males (59.9%) and were most common in the 21-30 year age group. The face was the most frequently involved anatomical site (29.9%), followed by the upper and lower extremities. Infectious granulomatous lesions, particularly tuberculosis and leprosy, constitute the majority of cases in this South Indian population, reflecting the endemic nature of these diseases. The study highlights the importance of considering these infections in the differential diagnosis of granulomatous skin lesions and underscores the role of histopathology, supported by special stains, in accurate diagnosis. Future studies should focus on regional variations in granulomatous diseases and the long-term outcomes of these lesions.

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Key Words

Chronic granulomatous lesions, skin biopsy, leprosy, sarcoidosis, infectious and non-infectious granulomas

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INTRODUCTION

Chronic granulomatous lesions of the skin represent a complex and heterogeneous group of disorders that present significant challenges in both clinical and pathological diagnosis. These lesions are characterized by granulomatous inflammation, a distinctive immune response that occurs when the body attempts to isolate and contain substances it perceives as foreign but cannot eliminate[1]. These substances may include non-degradable foreign materials, persistent microorganisms, or autoantigens associated with immune-mediated diseases. The granulomatous response is marked by the formation of granulomas organized aggregates of immune cells, including macrophages, epithelioid cells and multinucleated giant cells within affected tissues[2].

Granulomatous inflammation is a hallmark of numerous dermatological conditions, ranging from infections like tuberculosis and leprosy to non-infectious causes such as sarcoidosis, granuloma annulare and foreign body reactions[3]. The diversity in the etiology of these lesions shows the importance of a precise and accurate diagnosis, as the underlying cause directly influences the management and prognosis of the patient[4]. Clinicians and dermatopathologists must carefully differentiate between infectious and non-infectious granulomatous lesions, which often present with overlapping clinical and histopathological features. This differentiation typically requires a combination of clinical evaluation, histopathological examination, and the use of special stains to identify specific microorganisms or other causative agents[5].

The challenge in diagnosing granulomatous skin lesions is further compounded by the broad spectrum of diseases that can present with similar histological features. For example, granulomas in tuberculosis may closely resemble those seen in sarcoidosis, yet the clinical implications and treatment strategies for these conditions are vastly different[6]. Similarly, distinguishing between infectious granulomas caused by mycobacteria and those resulting from fungal infections or foreign body reactions requires a high degree of expertise and often the application of advanced diagnostic techniques[7].

Despite the extensive body of literature on granulomatous skin diseases, there remains a notable gap in comprehensive data on the relative frequency and distribution of these conditions in different populations, particularly in the South Indian demographic. Much of the existing research has focused on specific types of granulomatous conditions, such as those associated with tuberculosis, leprosy, or sarcoidosis, which are of significant public health concern in endemic regions[8]. However, few studies have examined the full spectrum of chronic granulomatous skin lesions across a large, diverse patient population over an extended period. Such data are crucial for understanding the epidemiology of these conditions, identifying emerging trends and refining diagnostic and therapeutic approaches.

In South India, where infectious diseases like tuberculosis and leprosy are endemic, there is a pressing need for research that provides a comprehensive overview of the types and frequencies of granulomatous skin lesions encountered in clinical practice. Understanding the distribution of these lesions within the population can help dermatologists and pathologists prioritize diagnostic tests, anticipate potential complications, and tailor treatments more effectively.

The primary aim of this study was to systematically examine and categorize the various types of granulomatous skin diseases observed over a 10-year period at a tertiary referral center in South India.

MATERIALS AND METHODS

This retrospective study was conducted at the Department of Pathology and Dermatology, over a period of 10 years, from 2005-2015. The study included all skin biopsies reported as chronic granulomatous inflammation during this period. A total of 938 skin biopsies were reviewed, out of which 167 cases (17.8%) were identified as having chronic granulomatous inflammation.

Inclusion Criteria:

- Skin biopsies showing histopathological features consistent with chronic granulomatous inflammation.
- Cases spanning from 2005-2015.

Exclusion Criteria:

- Cases with incomplete clinical data or inadequate biopsy samples.
- Biopsies showing granulomas associated with acute inflammation.

Histopathological Examination: Each biopsy specimen was processed and stained using routine Hematoxylin and Eosin (H and E) staining. Special stains, including Ziehl-Neelsen (for acid-fast bacilli), Periodic Acid-Schiff (PAS, for fungi) and Fite-Faraco (for lepra bacilli), were employed as needed to identify specific microorganisms or confirm the presence of infectious agents.

Data Collection: Clinical data, including patient demographics, clinical presentation and relevant medical history, were obtained from medical records. The histopathological findings were meticulously reviewed, and the granulomatous lesions were

classified into infectious and non-infectious categories based on the presence of microorganisms and the associated clinical data.

Statistical Analysis: The frequency of each type of granulomatous lesion was calculated as a percentage of the total number of chronic granulomatous cases. The data were then tabulated to show the distribution of different granulomatous skin diseases over the study period. Descriptive statistics were used to summarize the data.

RESULTS AND DISCUSSIONS

Over the 10-year study period from 2005-2015, a total of 938 skin biopsies were reviewed at the Department of Pathology and Dermatology, Himalayan Institute of Medical Sciences, Jolly Grant, Dehradun. Out of these, 167 cases (17.8%) were identified as chronic granulomatous inflammation of the skin.

Table 1: Age and Gender Distribution of Granulomatous Skin Lesions

Age Group (Years)	Male (n=100)	Female (n=67)	Total Cases (n=167)
0-10	5	3	8
11-20	15	10	25
21-30	20	15	35
31-40	18	13	31
41-50	22	12	34
51-60	12	8	20
61-70	6	4	10
71-80	2	2	4
Total	100	67	167

Table 1 shows that younger adults, particularly those in the 21-30 year age group, are most prone to granulomatous skin lesions, with this group showing the highest number of cases (35 cases). Males were more commonly affected than females, with 100 cases in males compared to 67 cases in females, indicating a possible gender predisposition. Additionally, the 41-50 year age group also exhibited a significant number of cases, particularly among males, totaling 34 cases. In contrast, the lowest incidence was observed among children (0-10 years) and the elderly (71-80 years), with 8 and 4 cases, respectively, suggesting that these age groups are less frequently affected by granulomatous skin lesions.

Table 2: Anatomical Distribution of Granulomatous Skin Lesions

Anatomical Site	Number of Cases (n=167)	Percentage
Face	50	29.9%
Upper Extremities (Arms, Hands)	35	21.0%
Lower Extremities (Legs, Feet)	30	18.0%
Trunk (Chest, Abdomen, Back)	28	16.8%
Neck	12	7.2%
Scalp	7	4.2%
Genital Region	5	3.0%
Total	167	100%

Table 2 presents the analysis of anatomical distribution reveals that the face is the most common site for granulomatous lesions, with 50 cases (29.9%), suggesting a tendency for these lesions to appear in visible areas, which may significantly impact patients' quality of life and psychological well-being. The upper and lower extremities, including the arms, hands, legs, and feet, are also frequently affected, comprising 65 cases (39%), indicating that these areas are common sites for granulomatous inflammation, likely due to increased exposure to environmental factors. The trunk, encompassing the chest, abdomen and back, accounts for 28 cases (16.8%), demonstrating that while lesions can be distributed across the body, they are less common in these regions compared to the face and extremities. The neck and scalp are less frequently involved, with 12 cases (7.2%) and 7 cases (4.2%), respectively. The genital region is the least affected site, with only 5 cases (3%), reflecting a lower propensity for granulomatous lesions in this area.

Table 3: Frequency of Chronic Granulomatous Skin Lesions

Type of Lesion	Number of Cases (n=167)	Percentage
Infectious Granulomas	125	75%
Non-Infectious Granulomas	42	25%
Total	167	100%

Table 3 summarizes the distribution of chronic granulomatous skin lesions observed over a 10-year period, showing that the majority (75%) of the 167 cases were caused by infectious agents, such as bacteria or fungi. Non-infectious granulomas, which arise from immune-mediated reactions or other non-infectious stimuli, accounted for 25% of the cases. This highlights that infectious causes are the predominant source of granulomatous skin lesions in the studied population.

Table 4: Distribution of Specific Granulomatous Skin Diseases

Disease/Condition	Number of Cases (n=167)	Percentage
Tuberculosis	86	51.3%
Leprosy	36	21.8%
Sarcoidosis	18	11%
Foreign Body Granulomas	10	6.1%
Fungal Infections	4	2.6%
Granuloma Annulare	4	2.4%
Granulomatous Vasculitis	4	2.4%
Fat Necrosis	4	2.4%

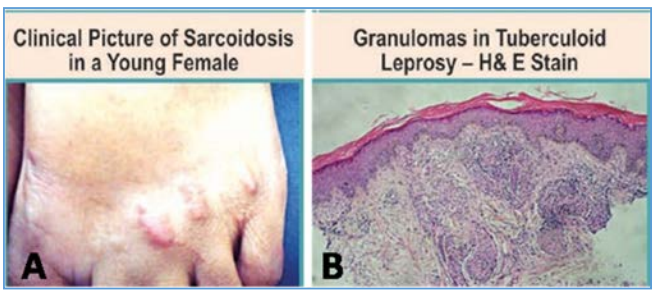

Fig. 1: A) The image depicts the clinical presentation of sarcoidosis on the hand, B) Image shows a histopathological section of skin tissue stained with Hematoxylin and Eosin (H and E), highlighting granulomas in a case of tuberculoid leprosy.

The results in table 4 indicate that tuberculosis is the most prevalent cause of chronic granulomatous skin lesions, accounting for 51.3% of the 167 cases. Leprosy follows, contributing 21.8% of the cases. Sarcoidosis is the third most common condition, responsible for 11% of the cases. Other causes include foreign body granulomas (6.1%), fungal infections (2.6%), granuloma annulare (2.4%), granulomatous vasculitis (2.4%), and fat necrosis (2.4%). These findings highlight the dominance of infectious diseases, particularly tuberculosis and leprosy, in the etiology of granulomatous skin lesions in this study population.

This study provides an in-depth analysis of chronic granulomatous skin lesions observed over a decade at a tertiary care center in South India. The findings of the present study explains the predominance of infectious etiologies, particularly tuberculosis and leprosy, which together account for a significant majority of the cases. The high incidence of tuberculosis (51.3%) reflects the endemic nature of this disease in India, where it remains a major public health concern. Similarly, the notable presence of leprosy (21.8%) highlights its ongoing burden in certain regions, despite extensive eradication efforts.

The study revealed that the 21-30 year age group had the highest prevalence of granulomatous skin lesions, followed by the 41-50 year age group. This trend suggests that younger and middle-aged adults are more susceptible, possibly due to greater exposure to environmental and occupational risk factors. The male predominance observed in this study is consistent with previous reports from similar settings. Studies by Grover *et al.* (2016) noted a higher incidence of granulomatous skin lesions among males, which may be attributed to differences in occupational exposures and social behaviors between genders in these populations[9].

The anatomical distribution of lesions in this study revealed that the face was the most commonly affected site, followed by the upper and lower extremities. This distribution pattern is similar to findings reported by Sharma and Verma (2023), where facial involvement was also prominent[10]. The visibility of facial lesions may lead to earlier presentation and diagnosis, which could partially explain the high frequency observed in this region. The involvement of the extremities, accounting for 39% of cases, could be linked to increased exposure to trauma and infectious agents in these areas.

When comparing these results with earlier studies, the dominance of tuberculosis as the leading cause of granulomatous skin lesions aligns with findings from studies conducted in similar regions, such as those by Gautham[11]. However, the lower prevalence of leprosy in the current study compared to earlier reports from other parts of India might reflect regional variations in disease prevalence or differences in healthcare access and diagnostic practices. Additionally, the presence of non-infectious granulomas, though less common, is consistent with global trends, where conditions like sarcoidosis and foreign body reactions constitute a smaller, yet significant, proportion of granulomatous lesions.

The role of histopathological examination, supplemented by special stains, was critical in distinguishing between infectious and non-infectious granulomas. The use of Ziehl-Neelsen staining for detecting acid-fast bacilli in tuberculosis and Fite-Faraco staining for lepra bacilli in leprosy was essential for confirming the diagnosis. These findings are consistent with the diagnostic approaches recommended in the literature[12], emphasizing the importance of meticulous histopathological assessment in managing granulomatous skin lesions.

To conclude the present study that, the significant burden of infectious granulomatous skin lesions, particularly tuberculosis and leprosy, in the South Indian population. The findings explain the importance of maintaining a high index of suspicion for these diseases in endemic regions.

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