



Case Series

HISTOPATHOLOGICAL SPECTRUM OF TISSUE RESPONSE TO FOREIGN MATERIALS: LEARNING FROM DIVERSE CLINICAL SCENARIOS — A NINE-CASE SERIES

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ABSTRACT

Background: Foreign body granulomas represent a chronic inflammatory reaction elicited by persistent foreign material in tissue. This article focuses on the histopathological findings encountered in cutaneous and visceral reactions to exogenous and endogenous agents, with emphasis on the morphological recognition of the inciting substance. The aim is to describe the histopathological spectrum of tissue reactions to foreign materials, ranging from classical granulomatous inflammation to subtle histiocytic or giant cell responses across varied clinical contexts, in an expanded nine-case series. The objective is to document the histopathological features of foreign body granulomas with identifiable inclusions across nine cases and to review the relevant literature.

Materials and Methods: Nine cases of foreign body granuloma diagnosed over a three-month period were included. Specimens underwent formalin fixation, paraffin embedding, H&E staining, and special stains including Ziehl–Neelsen (ZN), periodic acid–Schiff (PAS), and reticulin. Polarisation microscopy was performed in all cases.

Results: All nine cases exhibited granulomatous inflammation with foreign body–type giant cells. Refractile or identifiable inclusions were demonstrated in eight of nine cases. Special stains for acid-fast bacilli and fungi were negative in all cases.

Conclusion: Histopathological examination remains the gold standard for diagnosing foreign body granulomas. Identifying refractile foreign material alongside thorough clinicopathological correlation is essential to exclude infectious and immune-mediated granulomatous conditions. The spectrum spans BCG vaccination reactions, traditional cosmetic preparations, suture and implant materials, periprosthetic implant-related granuloma, titanium wear debris, injected talc, environmental plant matter, and endogenous vegetable cell walls.

Keywords: Foreign body granuloma, histopathology, giant cells, polarisation microscopy, birefringence.

INTRODUCTION

Granulomas are defined as focal areas of chronic inflammation composed predominantly of activated macrophages (epithelioid cells), often fused into multinucleated giant cells, and surrounded by a collar of lymphocytes with occasional plasma cells. Older granulomas may exhibit fibroblastic proliferation and progressive fibrosis. Granulomatous inflammation represents a specialised chronic inflammatory response triggered by infections, autoimmune diseases, or persistent foreign bodies.^[1,3]

A foreign body granuloma results when non-degradable exogenous or endogenous material resists phagocytic degradation and incites a sustained immune reaction, leading to the formation of epithelioid cells and multinucleated giant cells around the offending material. The foreign material is characteristically identified within the centre of the granuloma or within the cytoplasm of giant cells, which display a haphazard arrangement of nuclei — distinguishing them from the peripheral crescent arrangement seen in Langhans-type giant cells of infectious granulomas.^[1,2]

Foreign body granulomas may arise from diverse exogenous materials including surgical sutures, orthopaedic prostheses and bone cements, implanted biomaterials, retained surgical materials, dermal fillers, traditional cosmetics, medicinal preparations, and industrial particles, as well as from endogenous substances such as keratin released from a ruptured epidermal inclusion cyst or hair follicle, and engulfed vegetable matter in the gastrointestinal or oral mucosa.^[1,3,5,6,7]

With the increasing global prevalence of surgical procedures employing joint prostheses fixed with bone cement and metallic implant components, and with the widespread use of injected pharmaceutical preparations containing vehicle excipients such as talc, the spectrum of iatrogenic foreign body reactions encountered in surgical pathology is expanding considerably.^[5,8]

The precise global incidence of foreign body granulomas is difficult to determine owing to underreporting and frequent misclassification; however, population-based studies suggest that foreign body reactions account for approximately 10–20% of all granulomatous conditions encountered in surgical pathology practice. With the proliferation of cosmetic procedures worldwide, delayed-onset granulomatous reactions to dermal fillers have been increasingly reported, occurring in an estimated 0.01–1% of all filler procedures.^[6]

In the orthopaedic context, periprosthetic tissue reactions to bone cement and to metallic wear debris represent an important and expanding category of implant-related foreign body granulomas. These are mechanistically and histologically distinct entities: bone cement used to anchor prosthetic components may fragment over time and incite a granulomatous

reaction characterised by foreign body-type giant cells surrounding cement particles, accompanied by fibroblastic proliferation.^[5,8]

Separately, metal-on-metal and metal-on-polyethylene bearing surfaces generate particulate wear debris that induces a characteristic macrophage- and giant cell-dominated inflammatory response in the periprosthetic membrane, contributing to aseptic loosening of joint prostheses.^[5,8]

Adverse granulomatous reactions following BCG (Bacille Calmette–Guérin) vaccination, while rare, are well documented. The incidence of local lymphadenitis following BCG vaccination is estimated at approximately 1 per 1,000 to 1 per 10,000 vaccinated individuals.⁴ In the Indian context, foreign body granulomas carry additional epidemiological significance given the widespread use of traditional cosmetic preparations.

Sindhoor (vermillion), commonly containing mercury sulphide (cinnabar), lead tetroxide, or turmeric with lime, is a recognised cause of granulomatous dermatitis in women from the Indian subcontinent.¹ Similarly, vegetable or plant-derived granulomas (pulse granulomas) are well recognised in oral and gastrointestinal pathology, particularly in populations with a predominantly vegetarian diet.^[7,10,11]

The present series of nine cases encountered over a three-month period at a single tertiary care institution illustrates the breadth of materials capable of triggering the foreign body reaction and underscores the indispensable role of histopathological examination, augmented by polarisation microscopy and special stains, in achieving accurate diagnosis.

MATERIALS AND METHODS

This study was designed as a retrospective case series conducted over a three-month period from June 2025 to August 2025 at the Department of Pathology, Chettinad Hospital and Research Institute, Chennai. All cases in which a diagnosis of foreign body granuloma was established by histopathological examination were eligible for inclusion, provided that the specimen contained histologically identifiable foreign material or demonstrated a clear clinicopathological context for a foreign body reaction. Nine cases meeting the inclusion criteria were identified during the study period.

Case Summaries

Case 1: BCG Vaccination Site Reaction

A one-year-old female child was brought to the outpatient department with a persistent nodular swelling at the site of BCG vaccination on the left arm. The lesion had been present for several weeks following vaccination and was associated with mild local discomfort. There was no prior history of tuberculosis, immunosuppressive therapy, or known

immunodeficiency. A punch biopsy was submitted for histopathological evaluation. BCG vaccination was confirmed from immunisation records.

Case 2: Turmeric-Induced Forehead Granuloma

A 42-year-old female presented with pain and swelling over a scar on the forehead — a residual of a previous skin injury sustained approximately two years prior. Following the injury, the patient had applied turmeric paste as a topical native medicinal preparation directly over the wound on multiple occasions, a practice common in the South Indian cultural context. The swelling had gradually enlarged over six months and had become tender. Clinical examination revealed a firm, slightly erythematous nodule measuring approximately 1.2 cm. Excision biopsy was performed.

Case 3: Suture and Keratin Granuloma, Forehead

A 56-year-old female presented with a progressively enlarging painless swelling over the forehead of one year's duration. A preoperative diagnosis of sebaceous cyst was made. A history of prior trauma requiring suturing at a local clinic approximately three years prior was elicited only on directed inquiry following the histopathological findings. The excised specimen measured approximately 1.5 cm, was firm and whitish on gross examination, and showed a gritty consistency on sectioning.

Case 4: Exogenous Barium Material Deposit

A 54-year-old male presented with intermittent epigastric and periumbilical pain of one year's duration. Upper gastrointestinal endoscopy revealed nodular mucosal thickening at the gastric pylorus, raising concern for a submucosal lesion. A barium swallow study performed prior to endoscopy demonstrated refractile crystalline material within the pyloric region, prompting further evaluation. Multiple punch biopsies were taken from the pyloric region.

Case 5: Implant-Related Granuloma (Post Total Knee Replacement)

A 60-year-old female presented with progressive pain and difficulty walking, five years after total knee replacement using a cemented prosthesis. There was no clinical evidence of wound infection, and inflammatory markers were within normal limits.

Imaging raised concern for component loosening, prompting revision surgery. Periprosthetic tissue was obtained during the revision procedure and submitted for histopathological examination.

Case 6: Titanium Wear Debris Granuloma (Post-ORIF)

A 45-year-old male presented with pain and swelling at the surgical site on the lower limb, two years after open reduction and internal fixation (ORIF) of a tibial fracture with a titanium plate. Inflammatory markers were mildly elevated. Imaging demonstrated periosteal reaction and soft tissue thickening around the tibial plate. Tissue was obtained from the periprosthetic membrane during implant revision surgery.

Case 7: Talc Granuloma

A 40-year-old female presented with a painless, gradually enlarging nodular swelling at a site of prior injections administered over several months for a chronic medical condition.

The swelling had been present for approximately four months and showed no signs of acute inflammation, fluctuation, or overlying skin change. Excision biopsy was performed. The clinical diagnosis at the time of surgery was suspected lipoma or abscess.

Case 8: Thorn Prick Granuloma, Foot

A 28-year-old male farmer presented with a non-healing ulcer and associated swelling of the left foot of three months' duration following a thorn prick injury sustained while working in agricultural fields. Examination revealed a firm, mildly tender swelling at the plantar aspect of the foot with a central area of ulceration and surrounding induration. Biopsy of the wound margin and base was performed.

Case 9: Post-Cholecystectomy Suture Granuloma, Abdominal Wall

A 35-year-old female presented with a painful nodular swelling near the surgical scar on the anterior abdominal wall, eight months after open cholecystectomy. The swelling had first been noticed two months after surgery and had been slowly enlarging. Clinical examination revealed a firm, tender subcutaneous nodule measuring approximately 1.8 cm. Excision biopsy was performed under local anaesthesia.

Histological Examination

All nine specimens were processed by identical histopathological methods. Formalin fixation was carried out in 10% neutral-buffered formalin, followed by standard paraffin embedding and serial sectioning at 3–5 µm thickness. Haematoxylin and eosin (H&E) staining was performed as the primary staining method. A standardised panel of special stains was applied to all cases: Ziehl–Neelsen (ZN) stain to identify acid-fast bacilli, periodic acid–Schiff (PAS) stain for the detection of fungal organisms, and reticulin stain for assessment of stromal architecture. Polarisation microscopy was performed on all H&E-stained sections.

RESULTS

Case 1: BCG Vaccination Site Reaction

The punch biopsy from the left arm showed congested fibro-collagenous tissue and granulation tissue. Focal collections of epithelioid cells were present, admixed with lipid vacuoles — some rimmed by degenerating neutrophils — and karyorrhexis debris. Both multinucleated Langhans giant cells with peripherally arranged nuclei and numerous foreign body-type giant cells with haphazardly arranged nuclei were identified.

Several giant cells contained intracytoplasmic crystalline inclusions. No caseous necrosis was identified. ZN stain was negative for acid-fast bacilli

and PAS stain was negative for fungal organisms. The morphological features, in conjunction with the confirmed clinical history of recent BCG vaccination, were consistent with a granulomatous tissue reaction at the vaccination site.

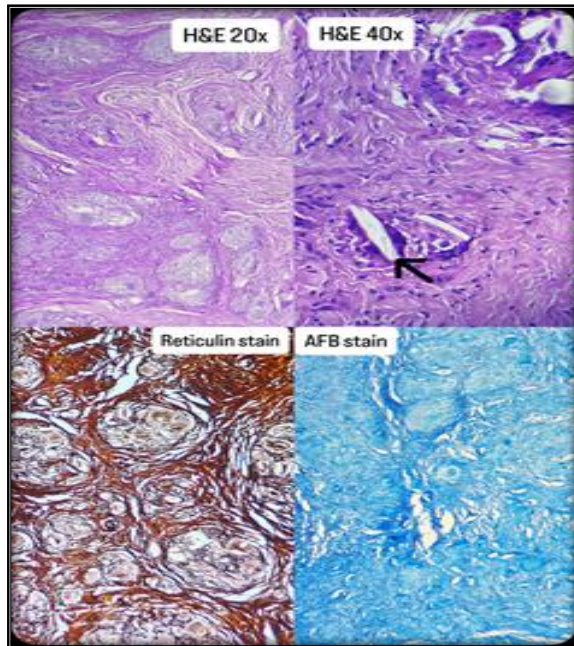


Figure 1: Case 1 (BCG vaccination site reaction) — congested fibro-collagenous and granulation tissue with epithelioid cell collections, lipid vacuoles, karyorrhexis debris, and Langhans-type and foreign body-type giant cells containing crystalline inclusions (H&E).

Case 2: Turmeric-Induced Forehead Granuloma

The excision biopsy of the forehead scar revealed multiple well-defined epithelioid cell granulomas distributed within the mid and deep dermis. Foreign body-type multinucleated giant cells were numerous, many containing intracytoplasmic refractile particulate material appearing as small, irregular, pale yellowish-brown granules on H&E staining. No suppurative change or necrosis was identified. Under polarised light, the intracytoplasmic particles demonstrated clear birefringence consistent with the optical properties of turmeric particles. ZN and PAS stains were negative.

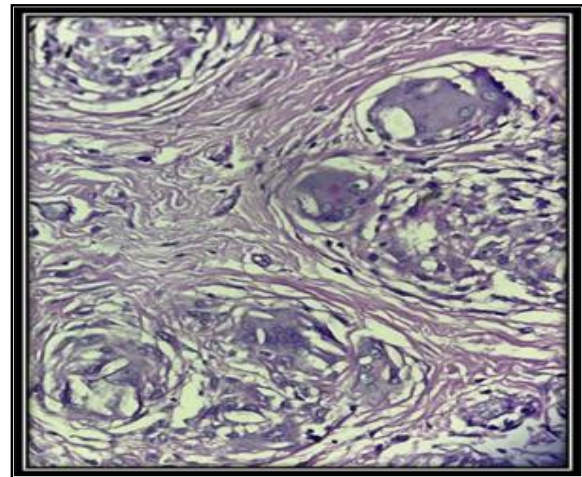


Figure 2: Case 2 (turmeric granuloma) — foreign body-type multinucleated giant cells containing intracytoplasmic refractile pale yellowish-brown granules (H&E).

Case 3: Suture and Keratin Granuloma, Forehead

The excision specimen showed numerous well-formed epithelioid granulomas involving the full thickness of the dermis and extending into the superficial subcutaneous tissue. Many giant cells harboured pale, irregularly shaped thread-like or fragment-like intracytoplasmic material consistent with suture material remnants. A subset of giant cells contained star-shaped, deeply eosinophilic acellular material morphologically consistent with keratin deposits from a ruptured epidermal inclusion cyst. Under polarised light, the thread-like intracytoplasmic material demonstrated birefringence. ZN and PAS stains were negative.

Case 4: Exogenous Barium Material Deposition

A barium swallow study performed prior to endoscopy demonstrated refractile crystalline material within the pyloric region — an imaging correlate infrequently emphasised in the literature but which, when present, should prompt consideration of vegetable granuloma in the differential diagnosis. The gastric pyloric biopsy sections revealed granulomatous inflammation within the lamina propria and submucosa. The granulomas were composed of foreign body-type multinucleated giant cells and epithelioid histiocytes arranged around acellular hyaline ring structures with sharply defined refractile material. ZN and PAS stains were negative.

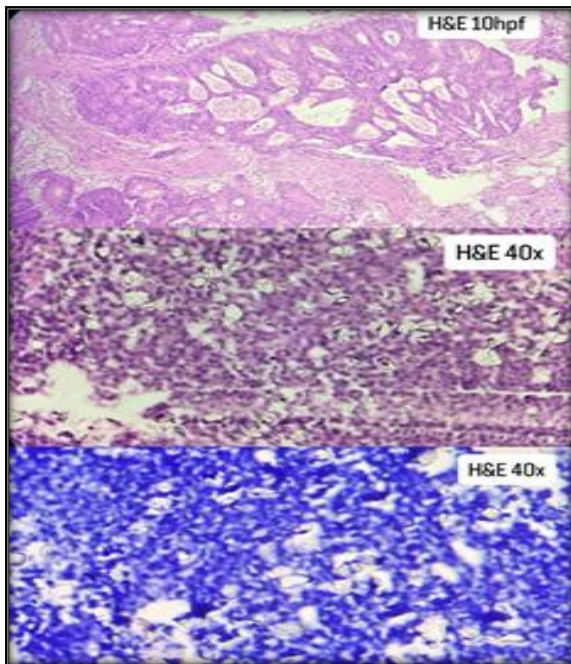


Figure 3: Case 4 (exogenous barium deposition) — mucosa with a dense lymphoplasmacytic infiltrate and fibrinopurulent exudate containing refractile crystalline material (H&E and Giemsa).

Case 5: Implant-Related Granuloma

Histological sections of the periprosthetic tissue obtained during revision of the total knee prosthesis demonstrated a foreign body granulomatous reaction centred on irregular, sharply demarcated, basophilic cement particles. Numerous foreign body-type multinucleated giant cells were seen closely apposed to and surrounding the cement particles, with cytoplasm moulded around the angular contours of the particles. The surrounding stroma showed prominent fibroblastic proliferation with areas of dense fibrosis. No caseous necrosis, microabscesses, or features of septic loosening were identified. Under polarised light, the cement particles demonstrated weak birefringence. ZN and PAS stains were negative, excluding tuberculous and fungal periprosthetic infection. This case illustrates the category of implant-related granuloma, in which the inciting material is a component of the surgical implant construct itself rather than an environmental or pharmaceutical foreign body.

Case 6: Titanium Wear Debris Granuloma

Histological sections of the periprosthetic membrane from the tibial ORIF revision demonstrated extensive sheets of macrophages containing intracytoplasmic and extracellular metallic wear debris particles appearing as dark, angulated, black and grey refractile granules consistent with titanium debris. Numerous foreign body-type multinucleated giant cells were present, many containing engulfed metal particles. The surrounding stroma showed dense fibrosis with a chronic inflammatory infiltrate comprising lymphocytes, plasma cells, and scattered histiocytes. Under polarised light, the metallic debris particles showed variable birefringence

consistent with metallic particulate material. ZN and PAS stains were negative.

Case 7: Talc Granuloma

Histological sections of the excised nodule revealed a well-circumscribed area of granulomatous inflammation within the soft tissue. Numerous foreign body-type giant cells were present, containing intracytoplasmic refractile crystalline particles appearing as transparent plate-like or wedge-shaped crystals on H&E staining. The background showed dense fibrosis and a chronic inflammatory infiltrate of lymphocytes and macrophages. No abscess formation or caseation was identified. Under polarised light, the intracytoplasmic crystals displayed the characteristic Maltese cross-pattern birefringence of talc (hydrated magnesium silicate), confirming the diagnosis of talc granuloma. ZN and PAS stains were negative, excluding infectious aetiology.

Case 8: Thorn Prick Granuloma, Foot

Biopsy sections from the margin and base of the plantar foot ulcer demonstrated granulomatous inflammation within the dermis and subcutaneous tissue. Foreign body-type multinucleated giant cells were present in abundance, arranged around refractile plant material fragments with a fibrous or lamellar internal architecture consistent with plant cell wall material from a thorn or woody plant structure. Surrounding fibrosis was prominent with a dense chronic inflammatory infiltrate. Under polarised light, the plant material fragments showed strong refractile polarisability. ZN and PAS stains were negative, excluding mycobacterial and fungal aetiologies including mycetoma.

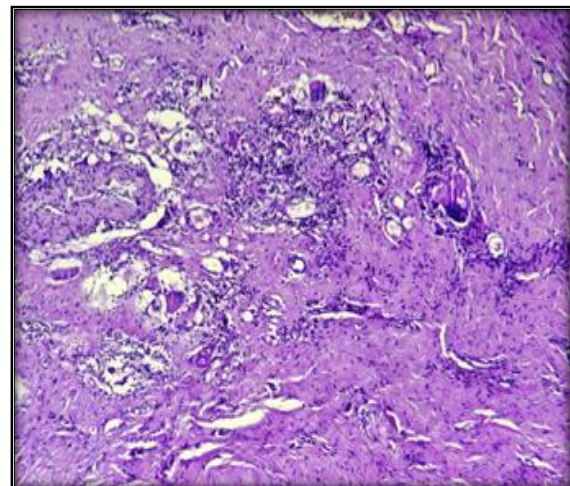


Figure 4: Case 8 (thorn-prick granuloma) — granulomatous inflammation with abundant foreign body-type giant cells surrounding refractile plant material showing a fibrous/lamellar (plant cell wall) architecture (H&E).

Case 9: Post-Cholecystectomy Suture Granuloma, Abdominal Wall

Histological sections of the abdominal wall nodule revealed an area of granulomatous inflammation centred on refractile suture material within the

subcutaneous tissue. Foreign body–type multinucleated giant cells and epithelioid histiocytes were arranged around pale, eosinophilic, thread-like suture strands of variable width. Mild fibrosis was present in the surrounding stroma with a chronic inflammatory infiltrate of lymphocytes and macrophages. Under polarised light, the suture strands demonstrated bright birefringence. ZN and PAS stains were negative.

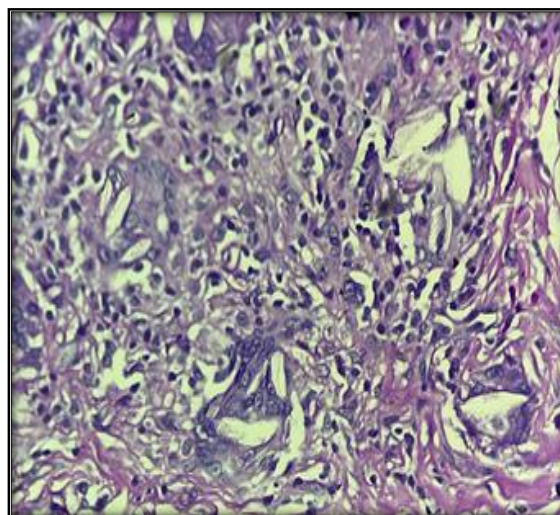


Figure 5: Case 9 (post-cholecystectomy suture granuloma) — foreign body–type multinucleated giant cells surrounding refractile suture material with a chronic inflammatory infiltrate of lymphocytes and macrophages (H&E).

Table 1: Summary of the nine cases of foreign body granuloma

Case	Patient	Foreign Material	Site	Key Histopathology	Polarisation / Special Stains	Actiology
1	1 F (child)	BCG vaccine antigen	Left arm (vaccination site)	Epithelioid granulomas; FBG + Langhans GCs; lipid vacuoles; karyorrhexis; crystalline inclusions; no necrosis	No birefringent material; ZN –ve; PAS –ve	Exogenous (biological)
2	42 F	Turmeric particles (traditional topical)	Forehead scar	FBG with intracytoplasmic yellowish-brown granules	Birefringent particles (polarised); ZN –ve; PAS –ve	Exogenous (cosmetic / medicinal)
3	56 F	Suture remnants + endogenous keratin	Forehead subcutis	FBG around thread-like fragments + star-shaped keratin	Birefringent suture threads; ZN –ve; PAS –ve	Exogenous + endogenous
4	54 M	Exogenous barium deposition	Gastric pylorus	FBG + chronic lamina propria infiltrate; barium swallow showed refractile crystalline material	Mild birefringence; ZN –ve; PAS –ve	Exogenous (iatrogenic / contrast)
5	60 F	Bone cement (implant-related)	Knee (post-TKR, periprosthetic)	FBG surrounding cement particles; fibroblastic proliferation	Occasional birefringent material (polarised); ZN –ve; PAS –ve	Exogenous (surgical implant – cement)
6	45 M	Titanium wear debris	Tibial ORIF site	Sheets of macrophages with metal debris; FBG; fibrosis	Metal particles (polarised); ZN –ve; PAS –ve	Exogenous (surgical implant – metal)
7	40 F	Talc (injection vehicle)	Soft tissue injection site	FBG with intracytoplasmic talc crystals; fibrosis	Birefringent talc crystals (Maltese cross, polarised); ZN –ve; PAS –ve	Exogenous (iatrogenic)
8	28 M	Plant / thorn material	Foot (thorn prick)	FBG around refractile plant fragments; fibrosis	Refractile fragments (polarised); ZN –ve; PAS –ve	Exogenous (environmental)
9	35 F	Silk / synthetic suture	Abdominal scar (post-cholecystectomy)	FBG around refractile suture strands; chronic infiltrate	Birefringent suture material (polarised); ZN –ve; PAS –ve	Exogenous (surgical)

DISCUSSION

The present series of nine cases encapsulates the remarkable breadth of clinical and histopathological presentations that foreign body granulomas can assume, spanning biological antigens, traditional cosmetic preparations, environmental plant matter, endogenous vegetable cell walls, surgical materials, periprosthetic implant-related bone cement

reactions, metallic wear debris, pharmaceutical excipients, and post-traumatic thorn fragments. The foreign body reaction represents the terminal phase of inflammation and wound healing when the inciting material exceeds the degradative capacity of tissue macrophages.

Case 1: BCG Vaccination Site Granuloma

The granulomatous reaction at the BCG vaccination site in this one-year-old child exemplifies the recognised, albeit rare, spectrum of adverse tissue

responses to live-attenuated mycobacterial antigens. The BCG vaccine confers significant protection against severe forms of tuberculosis, with reported efficacy of approximately 78% against disseminated disease and 64% against tuberculous meningitis.^[4] The morphological findings in this case — congested fibro-collagenous tissue, granulation tissue, focal epithelioid cell collections, lipid vacuoles, karyorrhexis debris, and both Langhans-type and foreign body-type giant cells with crystalline inclusions — represent the characteristic histological spectrum of BCG site reactivity. The challenge lies in the coexistence of both giant cell types, a pattern also seen in early mycobacterial infection; the confirmed clinical history and negative ZN stain are therefore indispensable for accurate interpretation and for avoiding misdiagnosis of cutaneous tuberculosis.

Case 2: Turmeric (Sindhoor) Granuloma

Case 2 illustrates the granulomatous potential of topically applied traditional preparations, a phenomenon of particular relevance in the Indian clinical setting. Sindhoor preparations may contain mercury sulphide (cinnabar), lead tetroxide, turmeric, lime, or synthetic azo dyes, each capable of inducing a foreign body granulomatous reaction. Turmeric particles are characteristically birefringent under polarised light, providing a reliable and diagnostically accessible clue. The risk of misclassification as sarcoidosis is real; Marcoval et al. found that exogenous foreign bodies were identifiable in 45% of granulomatous cutaneous lesions initially attributed to sarcoidosis.^[9]

Case 3: Suture and Keratin Granuloma

The suture and keratin granuloma of Case 3 exemplifies two distinct but frequently co-occurring foreign body reactions within the same specimen. Sutures elicit a foreign body-type granulomatous reaction of variable intensity depending on the suture material and host tissue response; the fibres are visible on H&E staining and demonstrate birefringence under polarised light. Concurrently, endogenous keratin released from a ruptured epidermal inclusion cyst is a well-established trigger of foreign body granulomatous inflammation, characterised by amorphous laminated eosinophilic keratin and the pathognomonic star-shaped eosinophilic deposits observed in this case.^[1] The critical history was withheld at initial presentation and recovered only after histopathological findings prompted directed clinical re-inquiry.

Case 4: Exogenous Barium Material Deposit

In Case 4, the refractile crystalline material identified on barium swallow imaging provided an early radiological clue, prompting consideration of vegetable (pulse) granuloma in the differential diagnosis of a pyloric mass. The hallmark histological feature is the presence of acellular hyaline rings representing cellulosic plant cell walls, surrounded by foreign body-type giant cells and a chronic inflammatory infiltrate.^[7,10] This entity may raise clinical concern for malignancy or chronic

infection when endoscopic or imaging features alone are considered.

Case 5: Implant-Related Granuloma

Case 5 represents the implant-related foreign body reaction to bone cement, an increasingly encountered entity in surgical pathology given the global rise in cemented joint arthroplasty procedures. The characteristic histological picture consists of foreign body-type multinucleated giant cells closely surrounding angular cement particles, accompanied by prominent fibroblastic proliferation and a background chronic inflammatory infiltrate — a pattern reflecting material-induced rather than infection-induced inflammation. This distinction from septic implant failure is critical because the two conditions mandate entirely different surgical and antimicrobial management.^[5,8] The fibroblastic proliferation observed around bone cement particles is consistent with the chronic, low-grade nature of cement-induced periprosthetic inflammation, which over years contributes to a fibrous interface membrane and progressive component loosening. Anderson et al. have comprehensively characterised the cellular and molecular basis of the foreign body reaction to biomaterials, emphasising that the macrophage and giant cell phenotype is shaped by the surface chemistry, geometry, and degradation products of the implanted material.^[5]

Case 6: Titanium Wear Debris Granuloma

Case 6 represents a separate and mechanistically distinct category of periprosthetic foreign body reaction induced by metallic wear debris from a titanium implant following internal fixation. The characteristic histological picture consists of sheets of macrophages laden with particulate metallic debris, numerous foreign body-type giant cells, dense stromal fibrosis, and a background chronic inflammatory infiltrate. As in Case 5, this pattern reflects a material-induced rather than infection-induced inflammatory process, and its distinction from septic implant failure is critical.^[5,8] In cases where metallic debris is non-birefringent or its composition is uncertain, energy-dispersive X-ray (EDX) spectroscopy or scanning electron microscopy with elemental analysis can provide definitive particle characterisation.^[5]

Case 7: Talc Granuloma

Talc (hydrated magnesium silicate) granulomas represent a category of iatrogenic foreign body reaction attributable to talc used as a pharmaceutical carrier, glidant, or lubricant. In the present case, the characteristic Maltese cross-pattern birefringence of talc crystals under polarised light provided an unambiguous microscopic diagnosis. This birefringence pattern, reflecting the optical anisotropy of the platy talc crystal structure, is the single most reliable light microscopic feature distinguishing talc from other foreign material.⁵ Talc granulomas may also be encountered in intravenous drug users who inject crushed oral tablets, where the pulmonary vasculature and interstitium are the most commonly affected sites. The fibrosis that develops

around such granulomas may, in chronic cases, contribute to contracture or functional limitation. Recognition of the aetiology is essential to prevent recurrence and to counsel the patient on avoiding further administration of the implicated preparation.^[5]

Case 8: Thorn Prick Granuloma

Environmental thorn prick injuries are a recognised but frequently underappreciated cause of chronic non-healing soft tissue wounds in agricultural workers. Plant thorns introduce cellulose, lignin, and hemicellulose into deep soft tissue compartments where they resist macrophage degradation and elicit a persistent granulomatous reaction.^[1,5] Clinically, thorn prick granulomas may mimic mycetoma, deep fungal infection, or cutaneous tuberculosis. In the present case, the absence of sulphur granules, the negative ZN and PAS stains, and the histological demonstration of refractile plant material under polarised light confirmed the foreign body aetiology and excluded these infectious alternatives. Complete surgical excision with retrieval of foreign body fragments is the definitive treatment; failure to achieve complete excision results in relapse.^[1,5]

Case 9: Post-Cholecystectomy Suture Granuloma

Post-surgical suture granulomas are among the most commonly encountered foreign body granulomas in surgical pathology practice. The onset of the palpable nodule approximately two months after open cholecystectomy, with progressive enlargement over the subsequent six months, typifies the natural history of suture granuloma: a latent period during which the macrophage response intensifies, followed by gradual granuloma maturation and fibrosis.^[1,3] Both absorbable and non-absorbable sutures are capable of eliciting granulomatous reactions; silk sutures elicit particularly florid reactions owing to their proteinaceous composition and susceptibility to fragmentation, while synthetic monofilament sutures typically elicit milder reactions.^[1,5] Recognition of refractile suture strands under H&E and their confirmation by polarisation microscopy, together with the characteristic histological pattern of foreign body-type giant cells surrounding thread-like structures in a fibrotic background, is sufficient for diagnosis in most cases.

General Pathological Principles and Differential Diagnosis

A fundamental requirement in the evaluation of any granulomatous tissue reaction is the systematic exclusion of infectious aetiologies before a foreign body aetiology is accepted. ZN and PAS staining were negative in all nine cases of the present series, satisfying this mandatory step. Beyond infectious exclusion, the distinction from sarcoidosis warrants particular attention, as both conditions produce non-necrotising epithelioid granulomas. In three of the nine cases in the present series, the relevant history was elicited only on directed review after histopathological or radiological findings prompted specific clinical inquiry: the suture history in Case 3,

the turmeric application in Case 2, and the thorn prick injury in Case 8. This underscores the critical role of the pathologist in actively prompting clinical re-evaluation and highlights why a foreign body aetiology should be included in the differential diagnosis of any unexplained granulomatous lesion.^[1,2,5]

CONCLUSION

This expanded nine-case series demonstrates that foreign body granulomas encompass a clinically and aetiologically diverse spectrum, spanning BCG vaccination reactions, turmeric-induced dermal granulomas, combined suture and keratin granulomas, gastrointestinal pulse granulomas, implant-related periprosthetic bone cement granulomas, titanium wear debris granulomas, pharmaceutical talc granulomas, environmental thorn prick granulomas, and post-surgical suture granulomas. Histopathological identification of the inciting foreign material, supported by systematic special staining and polarisation microscopy, is essential for accurate diagnosis and appropriate clinical management. Thorough clinicopathological correlation — with specific inquiry into prior trauma, surgical procedures, injections, orthopaedic implants, and the use of cosmetic or traditional preparations — remains fundamental to distinguish foreign body granulomas from sarcoidosis, infectious granulomatous conditions, and neoplasia. An exogenous or endogenous foreign body should be included in the differential diagnosis of any unexplained granulomatous lesion, regardless of anatomical site, to prevent diagnostic delay and inappropriate management.

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