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GRANULOMATOUS EPIDIDYMO-ORCHITIS: AN ORCHIDECTOMY-BASED CLINICOPATHOLOGICAL STUDY HIGHLIGHTING THE NEED FOR TESTIS-SPARING WORKUP

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ABSTRACT

Background: The objective is to study the clinicopathological features of Granulomatous Epididymo-Orchitis (GEO) in orchidectomy specimens and to highlight the importance of testis-sparing diagnostic workup, particularly Fine Needle Aspiration Cytology (FNAC).

Materials and Methods: A retrospective cross-sectional study was conducted on all orchidectomy specimens received in the Department of Pathology at a tertiary teaching hospital in northern India, over a three-year period (January 2021–December 2023). Archival cases reported as GEO were retrieved; gross features and histopathological slides were re-examined by a team of four pathologists in conjunction with clinical details. Special stains — Ziehl-Neelsen (ZN) for Acid-Fast Bacilli (AFB) and Periodic Acid-Schiff (PAS) for fungal elements — were applied where indicated.

Results: Of 35 orchidectomy specimens received, 18 (51.4%) were diagnosed as Acute/Chronic Epididymo-Orchitis and 17 (48.6%) as testicular torsion. GEO accounted for 8 of the 18 epididymo-orchitis cases (44.4%). Mean patient age was 42 years (range: 17–72 years). Infective causes predominated: tuberculosis in 6 cases (75%) and filariasis in 1 case (12.5%). One case (12.5%) was diagnosed as Xanthogranulomatous/Idiopathic GEO (X/IGEO). Three of eight GEO cases (37.5%) were clinically or radiologically suspected as malignancy. No FNAC was requested in any case prior to orchidectomy.

Conclusion: GEO is a diagnostically challenging entity that can closely mimic testicular malignancy. The majority of cases were caused by treatable infections (tuberculosis, filariasis). FNAC — a minimally invasive, cost-effective tool — was not utilised in any case, including those with clinical suspicion of malignancy. Wider adoption of FNAC as a first-line diagnostic step could prevent unnecessary orchidectomies, preserve testicular function, and reduce patient morbidity, particularly in younger men and in resource-limited settings.

Keywords: Granulomatous epididymo-orchitis; testicular mass; fine needle aspiration cytology; tubercular orchitis; filarial orchitis; xanthogranulomatous orchitis; orchidectomy; testis-sparing surgery.

INTRODUCTION

Granulomatous epididymo-orchitis (GEO) is a rare and diagnostically challenging condition characterised by granulomatous inflammation of the testis and/or epididymis. It presents a diverse aetiological spectrum broadly classified into infectious and non-infectious causes.[1] Infectious agents include Mycobacterium tuberculosis (the most prevalent cause in low- and middle-income countries), Brucella spp., Treponema pallidum,

Actinomyces spp., Mycobacterium leprae, and certain fungi.[1] Non-infectious causes encompass sarcoidosis, post-traumatic granulomas, sperm granulomas, and idiopathic granulomatous orchitis — a rare entity of unknown aetiology.[2,3]Tuberculosis is the leading infectious cause of GEO globally. Genitourinary tuberculosis accounts for nearly 18% of extrapulmonary TB cases in India, the highest reported proportion worldwide.[4-7] Despite this, diagnosis is frequently delayed because GEO can closely mimic testicular malignancy on clinical examination and imaging.[8-10]

Orchidectomy, historically the gold standard for managing indeterminate testicular masses, carries significant consequences: loss of the testis, potential fertility impairment, hormonal disturbance, and substantial psychological impact, especially in younger men. The advent of Fine Needle Aspiration Cytology (FNAC) offers a minimally invasive means to establish tissue diagnosis before committing to surgery.[11-18]

This study examines the clinicopathological characteristics of GEO in orchidectomy specimens from a tertiary teaching hospital in northern India and advocates for the routine inclusion of FNAC in the diagnostic workup of testicular masses.

MATERIALS AND METHODS

A retrospective cross-sectional study was conducted on all orchidectomy specimens received in the Department of Pathology at a tertiary government hospital and medical college in northern India, from January 2021 to December 2023. The study was approved by the Institutional Ethics Committee (IEC) and conducted in accordance with the Declaration of Helsinki. Patient consent was waived by the IEC given the retrospective and anonymised nature of the study.

Patient demographic and clinical data were retrieved from pathology requisition forms and the medical records department. Archived haematoxylin and eosin (H&E)-stained slides were retrieved and re-examined by a team of four qualified pathologists. All cases previously reported as GEO were included. Special stains were performed where clinically warranted: Ziehl-Neelsen (ZN) stain for AFB and Periodic Acid-Schiff (PAS) stain for fungal elements. Gross findings, histomorphological patterns, special stain results, and relevant clinical and radiological data were recorded systematically.

Cases of orchidectomy performed exclusively for torsion were excluded. All GEO cases were classified into infective (tubercular, filarial) and non-infective (xanthogranulomatous/idiopathic) categories based on histomorphological criteria and special stain results.

RESULTS

Over the three-year study period, 35 orchidectomy specimens were received. Of these, 18 (51.4%) were diagnosed as Acute/Chronic Epididymo-Orchitis and 17 (48.6%) as testicular torsion. GEO was identified in 8 of the 18 epididymo-orchitis cases (44.4% within this group).

The clinicopathological details of all eight GEO cases are summarised in [Table 1].

Table 1: Clinicopathological Summary of Granulomatous Epididymo-Orchitis Cases (n = 8)

Case No.	Age (yrs)	Laterality	Clinical Presentation	Gross Findings	Histopathology	Special Stains	Diagnosis
1	29	Left	Painful scrotal swelling	Lobulated, grey-white + haemorrhage	EG + LGC + N	AFB (+)	Tubercular GEO
2	34	Right	Painful scrotal swelling	Lobulated, grey-white + haemorrhage	EG + LGC + N	AFB (+)	Tubercular GEO
3	51	Right	Painful scrotal swelling	Lobulated, grey-white + haemorrhage	EG + LGC + N	AFB (−)	GEO likely Tubercular
4	39	Left	Painful scrotal swelling	Lobulated, grey-white + haemorrhage	EG + LGC + N	AFB (−)	GEO likely Tubercular
5	45	Right	Painful scrotal swelling	Lobulated, grey-white + haemorrhage	EG + LGC + N	AFB (−)	GEO likely Tubercular
6	72	Bilateral	Painless testicular mass (suspected malignancy)	Lobulated, grey-white areas	EG + LGC + N	AFB (−)	GEO likely Tubercular
7	17	Right	Testicular mass (suspected germ cell neoplasia)	Lobulated, grey-white + haemorrhage	EG + LGC + N	AFB (+)	Tubercular GEO
8	31	Right	Hard testicular lump (suspected malignancy)	Solid pale yellowish (3.5×2×2 cm)	XG + vague GC + eosinophils	AFB (−), PAS (−)	Xanthogranulomatous/ Idiopathic GEO
9*	42	Right	Scrotal swelling	Grey-white + haemorrhage	GC surrounding adult filarial worms in dilated sacs	N/A	Filarial GEO

EG – Epithelioid cell granulomas; LGC – Langhans giant cells; N – caseous necrosis; GC – giant cells; XG – xanthogranulomas; AFB – Acid-Fast Bacilli; PAS – Periodic Acid-Schiff. *Case 9: filarial GEO (42-year-old male) included separately in Results text.

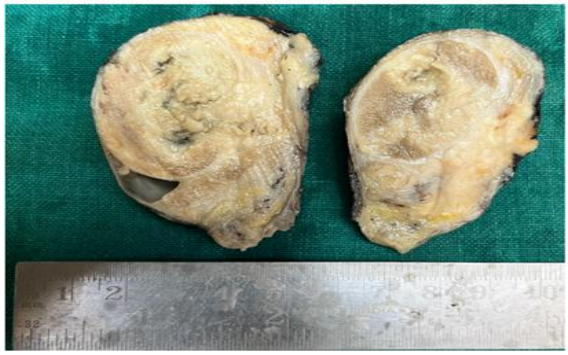

Figure 1: Cut section of the orchidectomy specimen showing multiple firm greyish-white nodules involving the testis and epididymis, consistent with tuberculous orchiepididymitis.

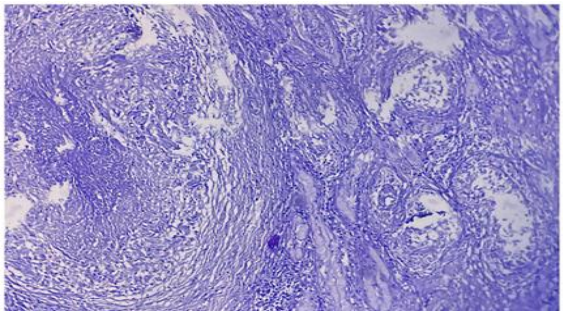

Figure 2: Haematoxylin and eosin stain showing Seminiferous tubules (right) distorted by epithelioid cell granulomas (EG) with Langhans giant cells (LGC) and caseous necrosis (N) — Tubercular GEO (×400).

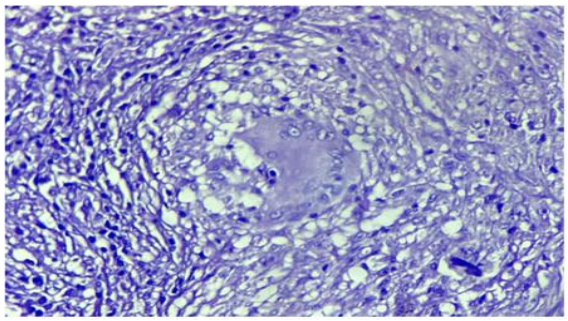

Figure 3: Higher magnification of epithelioid cell granulomas with Langhans giant cells — Tubercular GEO (×400).

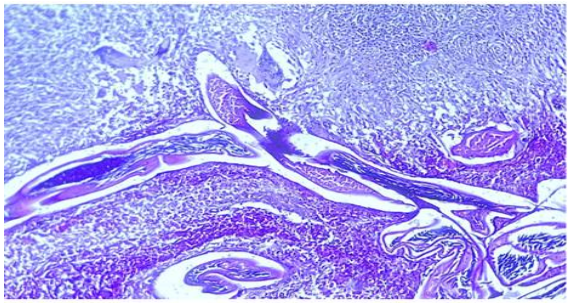

Figure 4: Giant cell reaction (GC) surrounding adult filarial worms (F) in dilated sacs — Filarial GEO (×100).

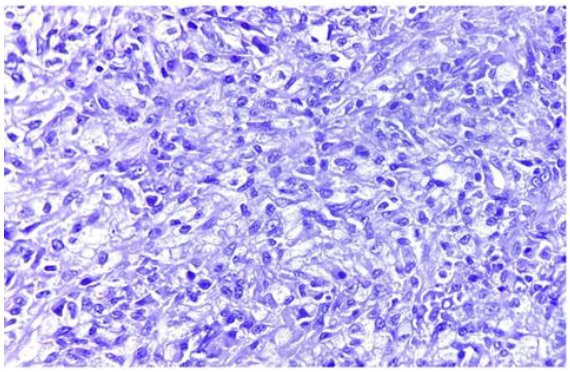

Figure 5: Xanthogranulomatous inflammation with vague giant cells and foamy histiocytes — X/IGEO (×100).

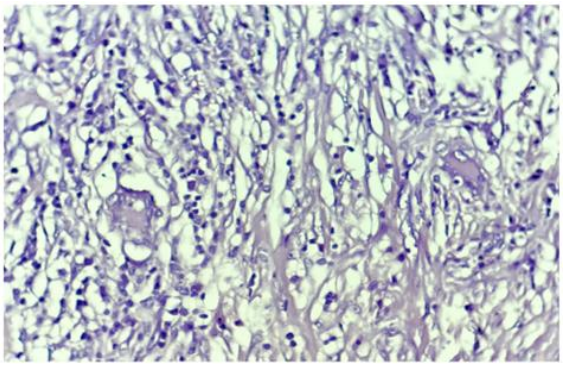

Figure 6: Dense fibrotic stroma with scattered eosinophils and chronic inflammatory cells — X/IGEO (×400).

The mean age of patients with GEO was 42 years (range: 17–72 years). Infective aetiologies accounted for 87.5% (7/8) of cases.

Tubercular GEO was the most common diagnosis, identified in 6 cases (75%). AFB positivity on ZN stain was confirmed in Cases 1, 2, and 7. The remaining four AFB-negative cases were designated as "GEO – likely tubercular" on the basis of characteristic histomorphology (epithelioid cell granulomas with Langhans giant cells and caseous necrosis); all responded to Anti-Tubercular Treatment (ATT) at follow-up.

Case 6: A 72-year-old male with painless bilateral testicular masses. Ultrasound showed well-defined hypoechoic lesions (3.5×2.5×2 cm) in the lower pole of both testes; CT revealed heterogeneously peripherally enhancing bilateral lesions. Histopathology: GEO – likely tubercular (AFB negative).

Case 7: A 17-year-old male with right testicular mass (2.7×2×1.8 cm), clinically suspected germ cell neoplasia; serum tumour markers not significantly elevated. Histopathology: Tubercular GEO (AFB positive).

Case 8: A 31-year-old male with right-sided hard testicular lump. Ultrasound: well-defined

hypoechoic mass (3×2×2 cm), upper pole. Serum LDH mildly elevated; other markers normal. Histopathology: Xanthogranulomatous/Idiopathic GEO — solid pale yellowish tissue (3.5×2×2 cm) with xanthogranulomatous inflammation, vague giant cells, chronic inflammatory infiltrate, dense fibrosis, scattered eosinophils. No epithelioid cells, necrosis, parasites, fungal elements, or malignant cells. AFB and PAS negative.

Filarial GEO (Case 9): A 42-year-old male with right scrotal swelling. Gross: grey-white areas with haemorrhage. Histopathology: destruction of testicular parenchyma by granulomatous giant cell reaction surrounding adult filarial worms in dilated sacs, with dense chronic inflammatory infiltrate.

None of the patients displayed clinical signs of complicated tuberculosis (scrotal fistulae, sinus tracts, cord bead formation). Importantly, FNAC or intraoperative frozen section was not requested in any of the eight cases, including the three with clinical or radiological suspicion of malignancy. [Figures 1–6 illustrate representative histopathological findings].

DISCUSSION

This study underscores the diagnostic complexity of testicular masses and the disproportionate reliance on orchidectomy as the default diagnostic and therapeutic intervention. In our series, GEO constituted 44.4% of all epididymo-orchitis cases, with infective aetiologies – predominantly tuberculosis – accounting for 87.5%. This is consistent with published data from South Asian institutions and reflects the high endemicity of genitourinary tuberculosis in India.[6,7,13]

A defining feature of this cohort was the frequency with which GEO mimicked malignancy: three of eight cases (37.5%) were clinically and radiologically suspected to represent testicular neoplasia. Multiple published case reports corroborate that tubercular, filarial, and idiopathic granulomatous orchitis can closely resemble malignancy on examination, ultrasonography, and CT imaging.[8-11]

The role of FNAC in the evaluation of testicular masses remains debated. Huang et al. caution against FNAC in tubercular GEO due to theoretical risks of fistula formation and haematogenous spread, advocating instead for a pre-operative anti-TB trial followed by radical surgery.[6] Conversely, Sah et al. and Handa et al. have demonstrated FNAC to be a sensitive and reliable diagnostic method for granulomatous epididymo-orchitis, including tubercular aetiology.[14,15] Sharma et al. conducted an extensive review advocating FNAC as first-line assessment in endemic regions, noting its accuracy, safety, and cost-effectiveness.[18] Kerkar et al. similarly demonstrated the utility of cytological assessment across the spectrum of testicular pathology.[19]

In our study, no FNAC was performed in any case, including the three where malignancy was clinically documented. FNAC could have enabled pre-operative diagnosis, potentially obviating orchidectomy. This is particularly consequential for the 17-year-old patient, in whom testicular preservation is critical for fertility and hormonal function, and for the 72-year-old patient with bilateral disease, in whom bilateral orchidectomy carries profound endocrine implications.

The case of X/IGEO (Case 8) merits separate consideration. Its presentation – an enlarging testicular mass with mildly elevated LDH – closely mirrored a malignant process. Nativ et al. reported successful testicular preservation in X/IGEO using open biopsy with intraoperative frozen section, with complete lesion regression at 10-month follow-up.[16] Their experience suggests frozen section should be considered before orchidectomy in young men with indeterminate masses and a non-classic malignancy workup.

Testicular filariasis presenting as GEO is rare and poses a similar diagnostic dilemma.[11,12] FNAC can identify microfilariae or adult worm fragments in scrotal aspirates, serving as a rapid non-surgical means of diagnosis.

This study is limited by its retrospective single-centre design and small sample size. The absence of microbiological confirmation (culture, nucleic acid amplification) in AFB-negative cases is a significant diagnostic limitation. Follow-up data were available only for a subset of patients, precluding full assessment of long-term outcomes.

Notwithstanding, the data support a paradigm shift: FNAC should be the first-line diagnostic step when the clinical picture is not unequivocally malignant. When malignancy remains probable despite FNAC, or when FNAC is non-diagnostic, intraoperative frozen section provides an additional opportunity to preserve the testis. Orchidectomy, while definitive for confirmed malignancy or complicated disease (abscess, torsion), should not be the default approach in the absence of pre-operative tissue diagnosis.[20]

CONCLUSION

GEO is a clinically significant entity that can closely mimic testicular malignancy, leading to unnecessary orchidectomies with substantial physical, hormonal, and psychological consequences. In this series, infective GEO (predominantly tubercular) accounted for the majority of cases, yet no pre-operative cytological evaluation was performed in any patient. Early and accurate diagnosis via FNAC — a safe, rapid, and cost-effective procedure — can prevent unnecessary orchidectomy, preserve testicular function, and facilitate prompt initiation of appropriate medical therapy. We advocate for the

routine inclusion of FNAC in the diagnostic algorithm for testicular masses, particularly in resource-limited, infection-endemic settings.

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