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Diagnostic certainty and outcome reporting in sinus fungus balls with African clinical examples

Mouhamed Sidiya Maham
Université cheikh anta diop de Dakar
Tah Ahmed Mouloud
Tah.ahmed@ucad.edu.sn

Université cheikh anta diop de Dakar
Abdallahi Yargeutt
Université cheikh anta diop de Dakar
Abdoul bast Akram
Université cheikh anta diop de Dakar

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Abstract

Background: Paranasal sinus fungus balls must be distinguished from allergic and invasive fungal rhinosinusitis. Small clinical reports can clarify diagnosis and treatment, but their interpretation depends on pathological confirmation, anatomical location and follow-up. This review examines these issues using selected African publications within the broader clinical literature.

Main body: Targeted searches of indexed records and publisher websites were completed on 29 September 2026. A critical narrative synthesis considered definitions, diagnostic certainty, operative management and outcome reporting. Selected Tunisian reports described surgically treated lesions, including isolated frontal disease; a Moroccan concha bullosa report represented a different anatomical site and a presumptive diagnosis. In a mixed Tunisian noninvasive cohort, fungus-ball labels could not be equated with uniformly documented histological confirmation. CT findings supported suspicion, while pathology and assessment of tissue invasion determined classification. Fungal culture contributed organism information but could not reliably exclude a fungus ball when negative. International surgical evidence supported effective clearance in selected patients, without establishing an Africa-specific success rate. The review proposes explicit reporting of diagnostic evidence, anatomical access, mucosal assessment and time-specific outcomes.

Short conclusion: Interpretation of fungus-ball reports requires separating imaging suspicion, documented fungal material and exclusion of invasion. Regional case reports should not be pooled uncritically with mixed fungal cohorts or used to infer continental prevalence. Standardised reporting would improve both clinical communication and the value of future multicentre research.

Background

The expression fungal sinusitis encompasses conditions with different pathological mechanisms and treatment requirements. A sinus fungus ball is a local accumulation of fungal material within a sinus lumen without tissue invasion. Allergic fungal rhinosinusitis and invasive fungal disease must be distinguished from it. The international definitional consensus favours the term fungus ball over aspergilloma because the organism is not necessarily Aspergillus [1]. Terminology is therefore clinically consequential rather than merely editorial.

Management recommendations and international surgical synthesis already exist [2, 3], and a recent review addresses the global distribution of fungal rhinosinusitis [4]. The remaining challenge considered here is how to interpret small regional publications when their diagnostic evidence, anatomical scope and outcome definitions differ. The presence of an evocative radiological appearance does not necessarily mean that the defining pathological features were demonstrated. A cohort of noninvasive fungal rhinosinusitis can also combine fungus balls with allergic disease, making aggregate findings unsuitable for a fungus-ball-specific conclusion.

This review examines selected African reports as clinical examples within that wider literature. Its aims are to distinguish diagnostic certainty from diagnostic terminology, assess what the reports support about management and outcomes, and propose practical information for future reporting. It is not an estimate of African prevalence or an exhaustive geographical catalogue.

Review approach

Targeted, web-assisted searches were conducted through 29 September 2026 using PubMed-indexed records and publisher websites. Terms included sinus fungus ball, fungal ball, aspergilloma, noninvasive fungal rhinosinusitis, Africa, Tunisia and Morocco, together with the French expressions balle fongique and sinusite aspergillaire. Exact-title searches located primary publications. International consensus statements and clinical series were used to interpret diagnostic and therapeutic claims.

The design is a critical narrative review. Selection was purposive, with emphasis on publications illustrating pathological classification, unusual location or outcome-reporting uncertainty. No registered protocol, exhaustive database export, independent duplicate screening, formal risk-of-bias score or pooled analysis was undertaken. Three Tunisian reports and one Moroccan report form the regional examples. The concha bullosa publication is considered separately because an aerated middle turbinate is not itself a paranasal sinus and because confirmation was limited.

Full text was available for the mixed Tunisian cohort and the international 40-case surgical series. Accessible abstracts or indexed publication material informed other report summaries; access and diagnostic limitations are identified in Table 1. Missing detail was not interpreted as evidence that the corresponding test or clinical step had not occurred. No patients from mixed cohorts were reclassified as definitely having or not having a fungus ball on the basis of an incomplete table.

Diagnostic categories should precede treatment comparisons

The distinction between noninvasive and invasive disease rests on tissue invasion rather than on imaging density or identification of a fungal species alone [1]. Fungal material in a sinus lumen answers a different question from fungi infiltrating mucosa or deeper structures. Pathological sampling should therefore make clear whether the material submitted was the luminal mass, adjacent mucosa or both.

Allergic fungal rhinosinusitis involves an allergic inflammatory context and eosinophilic mucin, and it should not be treated as a synonym for fungus ball [1]. A study that combines these conditions can contribute to a broad description of fungal disease, but treatment exposures and recurrence patterns require subgroup interpretation. In particular, corticosteroid treatment in allergic disease should not be assumed to represent fungus-ball therapy.

Clinical risk also matters. Immunosuppression or concerning orbital, neurological or destructive features warrants careful evaluation for a different disease process. Neither an apparently typical fungus ball on CT nor an organism label should override evidence suggesting invasion. Conversely, unusual location or bony change alone does not establish invasive fungal rhinosinusitis. Diagnostic classification should explain the relevant clinical, operative and pathological findings together.

What the African examples show

The early Sfax report described three immunocompetent patients with noninvasive fungal disease managed surgically [5]. A later Tunisian series separated four author-labelled fungus balls from seven cases of allergic fungal rhinosinusitis [6]. The mixed nature of the latter cohort is essential to interpretation: whole-cohort treatment and follow-up cannot automatically be attributed to its fungus-ball subgroup.

The frontal sinus series adds anatomical information rather than a regional effectiveness estimate. Its three operations included endonasal approaches and an external approach selected for the reported extent and anatomy [7]. The concha bullosa case illustrates an additional distinction: a presumptive radiological diagnosis in an unusual aerated structure should not be counted as a histologically confirmed paranasal sinus fungus ball [8].

Together, these publications show why apparently similar labels do not ensure equivalent observations. Table 1 retains the authors' classifications while making the available basis for those classifications explicit. The evidence is useful for clinical reasoning, but too selected and heterogeneous to establish continental incidence, demographic risk or a pooled recurrence frequency.

Table 1
Selected African examples and diagnostic or follow up limits

Report and access	Clinical contribution	Limit for synthesis
Makni et al [5] Tunisia Abstract	Three immunocompetent patients; fungal material without tissue invasion; surgery without antifungal treatment.	No recurrence was reported, but its observation period was not quantified in the accessible abstract.
Masmoudi et al [6] Tunisia Full text	Eleven noninvasive cases, including four labelled fungus balls. Three of those four have fungal material described in the pathology table.	One labelled case lists inflammatory polyps alone. The table cannot establish uniform confirmation. Median follow-up of three months concerns the whole cohort.
Kharrat et al [7] Tunisia Abstract	Three isolated frontal lesions; two Draf IIb procedures and one external operation.	Reported recurrence-free observations were three, two and twelve months. Anatomical selection precludes comparison of approaches.
Bijou et al [8] Morocco Indexed report	A presumed fungus ball in a concha bullosa; surgery was declined.	Different anatomical compartment and no operative histological confirmation; excluded from any confirmed sinus case count.

A hierarchy of documented evidence

Diagnostic confidence should be described using the information actually available. A practical distinction is between imaging-suspected disease, operative fungal-appearing material, and pathological demonstration of fungal elements with a stated assessment of invasion. These are reporting categories proposed here, not newly validated diagnostic criteria. They help readers understand whether a publication supports a definitive classification or only a plausible working diagnosis.

The pathology table in the Tunisian mixed cohort demonstrates the need for this distinction [6]. The appropriate response to incomplete documentation is neither to accept every label as equivalently confirmed nor to declare an individual diagnosis erroneous. Additional tissue findings may have existed outside the table. A careful synthesis should preserve uncertainty and avoid converting an author-labelled subgroup into a fully verified denominator.

Radiology has a complementary role. CT can raise suspicion, define location and inform operative access, but it does not replace pathological classification. The larger international series by Dufour and

colleagues illustrates the integration of clinical, radiological and pathological information in evaluating sinus fungus balls [9]. Imaging findings should be described as suggestive where confirmation is lacking. This language matters in both clinical communication and evidence synthesis.

Mycology provides another, distinct form of information. In the international 40-case surgical report, fungal cultures were positive in only seven cases; the publication also distinguished 37 confirmed cases from three without histological or cultural confirmation [10]. A negative culture therefore cannot be used alone to exclude a fungus ball. Equally, the operating appearance should not be used to conceal an absent pathological result. Reporting each component separately is more informative than a single unexplained diagnostic label.

Pathology and microbiology requests should answer explicit questions

A specimen pathway can be designed around the questions needed for classification. The operative record should identify the affected compartment and describe the material removed. Where specimens are obtained, the laboratory request should distinguish luminal contents from sampled mucosa, identify the clinical concern and ask whether fungal elements and tissue invasion are present. A report that describes fungal hyphae without identifying the tissue compartment may leave the decisive classification question unanswered.

The international surgical series explicitly describes assessment of surrounding mucosa to exclude invasion [10]. This supports the importance of communicating what was sampled, rather than assuming that examination of a luminal aggregate necessarily evaluated adjacent tissue. Sampling decisions remain clinical and should reflect operative findings and the patient's risk profile; the reporting proposal does not imply that every patient requires an identical biopsy protocol.

Organism identification can be valuable, but species information and invasiveness should remain separate fields. The word aspergilloma should not be inferred solely from a CT appearance. Likewise, an unspecified negative fungal culture should not erase supportive histology. Where pathology and microbiology disagree, the report should state both results and explain the final diagnosis rather than presenting only the test that supports the preferred interpretation.

Treatment should match symptoms anatomy and diagnostic category

The Young-IFOS consensus supports treatment in symptomatic patients and in relevant immunosuppression contexts, while allowing selected observation strategies after assessment and counselling [2]. These recommendations should not be reduced to an automatic operation for every incidental radiological opacity. Symptoms, operative risk, planned immunosuppression and the

confidence of the diagnosis affect the decision. Observation also requires a specified reassessment plan rather than an unexplained absence of treatment.

For surgically managed fungus balls, adequate access and removal are central practical objectives. The operation should permit inspection of the involved cavity and address the relevant drainage pathway. An unusual site may require a different access strategy. The Tunisian frontal series demonstrates that an external approach can remain appropriate in selected anatomy [7]; its small size does not establish the superiority of one route. The criterion for interpreting the operation is whether the chosen route addressed the documented disease, not whether it conformed to a single preferred label.

Systemic antifungal treatment is not routinely required for an uncomplicated, adequately treated noninvasive fungus ball [2, 10]. That conclusion does not extend to invasive fungal rhinosinusitis. Antibiotics for suspected or demonstrated bacterial coinfection answer a separate clinical question. Likewise, topical corticosteroid use in a mixed cohort should be interpreted according to the allergic or inflammatory indication rather than attributed indiscriminately to fungus-ball treatment.

Dental history deserves attention in maxillary disease, but an association should not be converted into a universal causal explanation. A dental procedure may be relevant to an individual case, while its absence does not exclude the diagnosis. The Young-IFOS consensus does not treat all fungus balls as necessarily odontogenic [2]. Future reports should record the actual dental finding or intervention and its timing, rather than using a presumed origin as an undocumented categorical variable.

Surgical success requires a defined endpoint

The international meta-analysis by Fadda and colleagues reported a pooled surgical success proportion of 98.4% with a 95% confidence interval of 97.4–99.3%, based on 14 studies, most retrospective [3]. This is useful context for discussing the effectiveness of surgery in selected published cohorts. It is not an estimate of success in Africa, a guarantee for an individual patient or evidence that every access route is equivalent. The review’s inclusion of studies with at least six months of follow-up also limits comparison with very short case observations.

Symptom improvement, endoscopic appearance, documented removal and absence of recurrence should be stated separately. A patient can feel better without every diagnostic uncertainty having been resolved. Conversely, persistent symptoms may have another inflammatory or dental cause and should not automatically be labelled recurrent fungus ball. Definitions should identify what constituted success or failure and which examination established it.

Follow-up should be reported at the patient or relevant subgroup level. The overall median in a mixed fungal cohort cannot define surveillance for the fungus-ball subgroup [6]. For case reports, individual observation times are more informative than a general statement of favourable evolution. For larger cohorts, the denominator assessed at each interval and the number lost to follow-up should accompany recurrence estimates.

Apparent absence of recurrence after two or three months should therefore be presented as an early observation rather than a durable-control conclusion. More complete surveillance may detect more events, and comparisons should account for that possibility. A report can be clinically valuable even when follow-up is short, provided that the wording does not promise more certainty than the observation supports.

A reporting framework for future regional work

Table 2 proposes a concise reporting framework. It separates the diagnosis assigned by the clinician from the evidence supporting it and separates removal from subsequent outcome. The framework is intended for descriptive cohorts and clinical case reports; it has not undergone formal validation or a regional consensus process.

Prospective collection of these fields would make multicentre collaboration more useful. The first task would be to agree on case definitions and specimen reporting before calculating pooled frequencies. Suspected cases could still be recorded, but should remain distinguishable from confirmed cases. Mixed allergic and invasive cohorts should provide separate subgroup data.

Geographical interpretation also requires restraint. Sparse published examples may reflect publication practices, terminology, access to pathology or retrieval limitations. They do not establish that the condition is rare in an entire region. Historical French terms and English terms may identify overlapping but differently classified material. Future systematic work should plan multilingual searches and resolve these classification differences explicitly.

Table 2
Proposed reporting framework for sinus fungus balls

Domain	Minimum information
Patient and presentation	Age; symptoms or incidental detection; relevant immune status; prior sinus and dental procedures with dates where available.
Location and imaging	Specific sinus and laterality; single or multiple sites; CT findings; adjacent structures; reason for additional imaging.
Diagnostic evidence	Clinical label; operative findings; luminal histology; mucosal sampling and invasion assessment; culture result; unresolved discordance.
Treatment	Observation or surgery with rationale; access route; extent of removal; drainage procedure; indication for any antifungal, antibiotic or corticosteroid.
Outcome	Separate symptom, endoscopic and disease-control outcomes; assessment method; complications; recurrence definition and detection date.
Surveillance and analysis	Individual or subgroup follow-up duration; denominator assessed; losses; separation from allergic or invasive disease; suspected versus confirmed cases.

Limitations

This review is purposive and partially dependent on abstracts and indexed material. It cannot determine whether additional African cases were missed, and it does not provide a prevalence estimate or an exhaustive map of affected countries. The regional examples are concentrated in North Africa and should not be taken as representative of sub-Saharan services. Historical terminology further limits direct comparison.

The diagnostic reporting categories and minimum dataset are interpretive proposals. They require prospective assessment and should not be mistaken for a new consensus definition. The distinction between absent documentation and absent testing is particularly important in short reports. These constraints favour cautious, source-specific conclusions rather than pooled counts or comparative treatment claims.

Conclusions

The clinical value of published sinus fungus-ball reports depends on the clarity of their diagnosis and outcomes. Imaging suspicion, fungal material, assessment of invasion and anatomical location should be reported separately. Surgery can achieve favourable results in appropriately selected patients, but international pooled results cannot substitute for regional follow-up data. Consistent pathological documentation and subgroup-specific surveillance would strengthen future African clinical evidence without requiring diagnostic uncertainty to be hidden.

Abbreviations

CT
computed tomography
IFOS
International Federation of Otorhinolaryngological Societies.

Declarations

Author Contribution

All authors have reviewed and corrected the article

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