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K Usharani
Associate Professor, Department of Radiology, Mamata Medical College, Khammam, Telangana, India

T Srinivas
Professor, Department of ENT, Mamata Medical College, Khammam, Telangana, India

Corresponding Author:
K Usharani
Associate Professor, Department of Radiology, Mamata Medical College, Khammam, Telangana, India

Radiologic evaluation of hormone-sensitive gynecologic diseases presenting with otolaryngologic symptoms

K Usharani and T Srinivas

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Abstract
Background: Hormone-sensitive gynecologic diseases, particularly endometriosis, may rarely present with otolaryngologic manifestations such as recurrent or catamenial epistaxis, nasal obstruction, and facial pain. These atypical presentations are often underrecognized, leading to delayed diagnosis. Radiologic evaluation plays a key role in identifying suspicious lesions and guiding further diagnostic workup. Aim of the study was to evaluate the role of computed tomography (CT) and magnetic resonance imaging (MRI) in diagnosing hormone-sensitive gynecologic diseases presenting with otolaryngologic symptoms and to assess their diagnostic accuracy using histopathology as the reference standard.
Materials and Methods: This prospective observational study included 75 female patients presenting with otolaryngologic symptoms suggestive of hormone-sensitive gynecologic disease. Patients underwent clinical evaluation by ENT and gynecology specialists, followed by radiologic assessment using CT and/or MRI. MRI included T1-weighted fat-suppressed sequences whenever feasible, and imaging was preferentially performed during the perimenstrual phase. Radiologic findings were correlated with clinical features and histopathological results. Diagnostic accuracy parameters and receiver operating characteristic (ROC) curves were calculated.
Results: Of the 75 patients, 31 (41.3%) were confirmed to have hormone-sensitive gynecologic disease on histopathology. MRI demonstrated higher sensitivity (89.7%) and overall diagnostic accuracy (84.3%) compared with CT (sensitivity 80.0%, accuracy 75.0%). The area under the ROC curve was 0.87 for MRI and 0.76 for CT, indicating superior diagnostic performance of MRI. Imaging findings showed strong correlation with catamenial symptoms and histopathological confirmation.
Conclusion: Hormone-sensitive gynecologic disease should be considered in women presenting with recurrent or cyclical otolaryngologic symptoms. While CT is useful for anatomical assessment, MRI particularly T1-weighted fat-suppressed sequences offers superior diagnostic accuracy. Correlation of imaging findings with menstrual history and histopathology, within a multidisciplinary framework, is essential for timely diagnosis and management.

Keywords: Endometriosis, Extrapelvic endometriosis, Catamenial epistaxis, Magnetic resonance imaging, Computed tomography, Otolaryngologic manifestations

Introduction
Hormone-sensitive gynecologic diseases, most notably endometriosis, are characterized by ectopic endometrial tissue that undergoes cyclical hormonal stimulation and bleeding. Although endometriosis primarily involves pelvic structures, extrapelvic manifestations are increasingly recognized and are believed to be underdiagnosed due to atypical clinical presentations and limited awareness outside gynecologic practice [1]. Among these rare presentations, involvement of the otolaryngologic region particularly the nasal cavity and sinonasal mucosa—is exceptional but clinically significant. Patients may present with cyclical epistaxis, nasal obstruction, facial pain, or swelling that coincides with menstruation, frequently leading to initial evaluation by otolaryngologists rather than gynecologists [2, 3]. The absence of classic pelvic symptoms in some patients further contributes to diagnostic delay.
Radiologic evaluation plays a pivotal role in the diagnostic pathway of such patients, primarily to characterize lesions, assess local extent, and exclude more common inflammatory or neoplastic conditions. However, imaging findings in hormone-sensitive gynecologic disease presenting with ENT symptoms are often non-specific. Computed tomography may reveal soft-tissue masses or mucosal thickening, while magnetic resonance imaging, especially T1-weighted fat-suppressed sequences, can better demonstrate hemorrhagic components related to cyclical bleeding [4, 5]. Diagnostic insight can be drawn from imaging experience in better-studied

extrapelvic entities such as thoracic endometriosis syndrome, where hormonally driven lesions demonstrate variable CT appearances and improved conspicuity on MRI, particularly when imaging is performed during the symptomatic or perimenstrual phase [6, 7].

Existing literature on otolaryngologic manifestations of hormone-sensitive gynecologic disease consists predominantly of isolated case reports and small case series, describing nasal or septal endometriosis confirmed histologically following imaging and endoscopic evaluation [2-5]. While these studies highlight the importance of recognizing cyclical symptoms, they provide limited guidance on standardized radiologic protocols, optimal imaging timing, or characteristic imaging patterns specific to the head and neck region. Consequently, there remains a significant research gap regarding the systematic radiologic evaluation of patients presenting with ENT symptoms secondary to hormone-sensitive gynecologic disease, contributing to underrecognition and delayed multidisciplinary management. The aim of this study is to evaluate the radiologic features of hormone-sensitive gynecologic diseases presenting with otolaryngologic symptoms, to assess the role of CT and MRI in their detection and characterization, and to identify gaps in current imaging practices that may impact timely diagnosis and appropriate referral.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted jointly by the Departments of Radiology, Obstetrics and Gynecology, and Otorhinolaryngology at a Mamata Medical College, Khammam. Institutional Ethics Committee approval was obtained prior to commencement of the study, and written informed consent was taken from all participants. The study was designed to evaluate the role of radiologic imaging in diagnosing hormone-sensitive gynecologic diseases presenting with otolaryngologic symptoms.

Study Population and Sample Size

A total of 75 female patients constituted the study sample. The sample size was determined based on feasibility and the rarity of otolaryngologic manifestations of hormone-sensitive gynecologic disease, particularly extrapelvic endometriosis. Patients were recruited consecutively from ENT and gynecology outpatient departments and inpatient services and were referred for radiologic evaluation based on clinical suspicion.

Inclusion Criteria

- Female patients aged 18-50 years
- Patients presenting with otolaryngologic symptoms such as recurrent epistaxis, nasal obstruction, facial pain, sinonasal swelling, or nasal discharge
- Presence of cyclical or perimenstrual variation in ENT symptoms
- Patients with a known history or clinical suspicion of hormone-sensitive gynecologic disease (e.g., endometriosis)
- Patients referred from ENT or Obstetrics and Gynecology departments for radiologic evaluation
- Patients who provided written informed consent

Exclusion Criteria

- Previously diagnosed sinonasal or nasopharyngeal malignancy
- Acute infective or inflammatory sinonasal conditions
- History of nasal or facial trauma
- Pregnant women
- Patients with contraindications to MRI (e.g., pacemakers, ferromagnetic implants)
- Patients unwilling to participate or provide consent

Clinical Evaluation

All patients underwent detailed clinical assessment by ENT and gynecology specialists, including menstrual history, symptom chronology, gynecologic history, and prior surgical or medical treatment. Particular emphasis was placed on identifying catamenial variation in ENT symptoms. Relevant laboratory investigations and endoscopic findings were documented where available.

Radiologic Evaluation

Radiologic assessment was performed in the Department of Radiology using computed tomography (CT) and/or magnetic resonance imaging (MRI) based on clinical indication. CT scans were evaluated for sinonasal soft-tissue lesions, mucosal thickening, bone erosion, and extension into adjacent structures. MRI was performed using standard head and neck protocols, with additional T1-weighted fat-suppressed sequences to identify hemorrhagic components suggestive of hormonally responsive lesions. Whenever feasible, imaging was performed during the perimenstrual period to enhance lesion conspicuity. Imaging findings were independently reviewed by experienced radiologists and correlated with clinical data.Histopathological Correlation and Final Diagnosis

Patients with radiologically suspicious lesions underwent endoscopic biopsy or surgical excision as deemed appropriate by the ENT team. Histopathological examination was considered the reference standard for diagnosis. Gynecologic evaluation, including pelvic imaging or laparoscopy, was performed when clinically indicated to identify concurrent pelvic or extrapelvic disease.

Data Collection and Statistical Analysis

Clinical, radiologic, and histopathological data were systematically recorded using a structured proforma. Descriptive statistics were used to summarize patient demographics, clinical presentation, and imaging findings. The diagnostic contribution of CT and MRI was analyzed in relation to final diagnosis. Data analysis was performed using standard statistical software, and results were expressed as frequencies, percentages, and appropriate summary measures.

Results

Table 1: Demographic Profile of Study Population (n = 75)

Variable	Value
Age (years)	
Mean ± SD	32.8 ± 6.4
Range	20 - 45
Gender	
Female, n (%)	75 (100%)

The study population comprised exclusively female patients, with a mean age of 32.8 ± 6.4 years and an age range of 20-45 years, indicating predominance in the reproductive age group. This demographic profile is consistent with the hormone-dependent nature of endometriosis and supports the relevance of considering gynecologic etiologies in women presenting with otolaryngologic symptoms, particularly those with cyclical patterns (Table 1).

Table 2: ENT Symptom Characteristics (n = 75)

Parameter	Mean ± SD / n (%)
Duration of symptoms (months)	14.6 ± 8.2
Frequency of symptoms (episodes/month)	2.8 ± 1.4
Symptom severity score (VAS 0-10)	6.7 ± 1.5
Recurrent symptoms, n (%)	58 (77.3%)
Non-recurrent symptoms, n (%)	17 (22.7%)

Patients in the present study had a prolonged duration of symptoms, with a mean duration of 14.6 ± 8.2 months, indicating a chronic clinical course prior to diagnosis. The mean symptom frequency was 2.8 ± 1.4 episodes per month, and symptom severity was moderate to severe, with a mean VAS score of 6.7 ± 1.5. A majority of patients (77.3%) experienced recurrent symptoms, highlighting the persistent and relapsing nature of otolaryngologic manifestations in hormone-sensitive gynecologic disease, while only 22.7% had non-recurrent presentations (Table 2).

Table 3: Menstrual History and Catamenial Correlation (n = 75)

Parameter	Mean ± SD / n (%)
Age at menarche (years)	12.8 ± 1.3
Regular menstrual cycles, n (%)	61 (81.3%)
Catamenial correlation of ENT symptoms, n (%)	49 (65.3%)
Onset of ENT symptoms during menstruation, n (%)	42 (56.0%)
Perimenstrual worsening of symptoms, n (%)	7 (9.3%)

The mean age at menarche among the study participants was 12.8 ± 1.3 years, and the majority had regular menstrual cycles (81.3%). A clear catamenial correlation of otolaryngologic symptoms was observed in 65.3% of patients, with 56.0% reporting onset of symptoms during menstruation and an additional 9.3% experiencing perimenstrual worsening. These findings emphasize the strong association between menstrual cyclicity and ENT symptoms, supporting a hormonal influence in the pathogenesis of the disease (Table 3).

Table 4: Gynecologic History (n = 75)

Parameter	Mean ± SD / n (%)
History of dysmenorrhea, n (%)	46 (61.3%)
Dysmenorrhea severity (VAS 0-10)	6.1 ± 1.7
History of infertility, n (%)	19 (25.3%)
Previously diagnosed endometriosis, n (%)	21 (28.0%)
Prior medical/surgical treatment for endometriosis, n (%)	15 (20.0%)

A significant proportion of patients reported gynecologic symptoms, with 61.3% having a history of dysmenorrhea and a mean dysmenorrhea severity score of 6.1 ± 1.7, indicating moderate to severe pain. Infertility was present in 25.3% of cases. Nearly one-third of patients (28.0%) had a prior diagnosis of endometriosis, and 20.0% had received medical or surgical treatment for the condition. These findings suggest a strong association between otolaryngologic manifestations and underlying gynecologic pathology, reinforcing the importance of gynecologic evaluation in such patients.

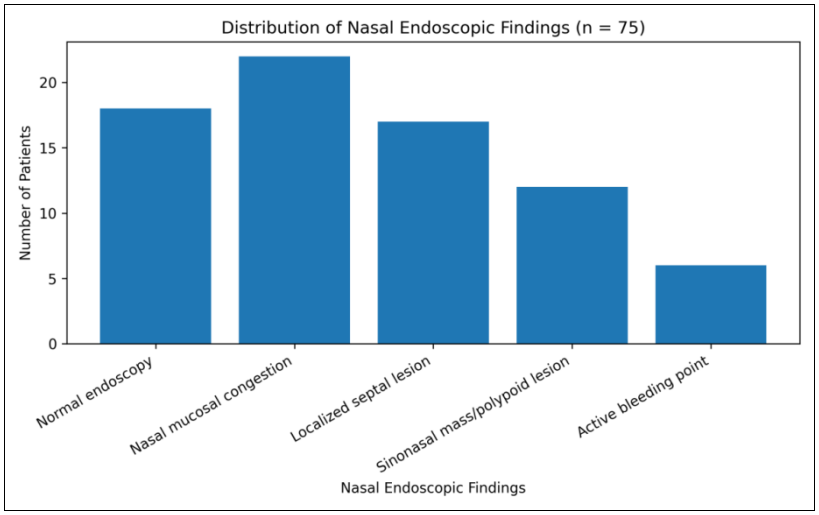

Fig 1: Nasal Endoscopic Findings (n = 75)

Nasal endoscopic examination revealed abnormal findings in the majority of patients, with only 24.0% showing normal endoscopy. The most common abnormality was nasal mucosal congestion (29.3%), followed by localized septal lesions (22.7%) and sinonasal mass or polypoid lesions (16.0%). An active bleeding point was identified in 8.0% of cases. These findings highlight the variable and often non-specific endoscopic appearances of hormone-sensitive gynecologic disease, underscoring the need for radiologic and histopathological correlation (Figure 1).

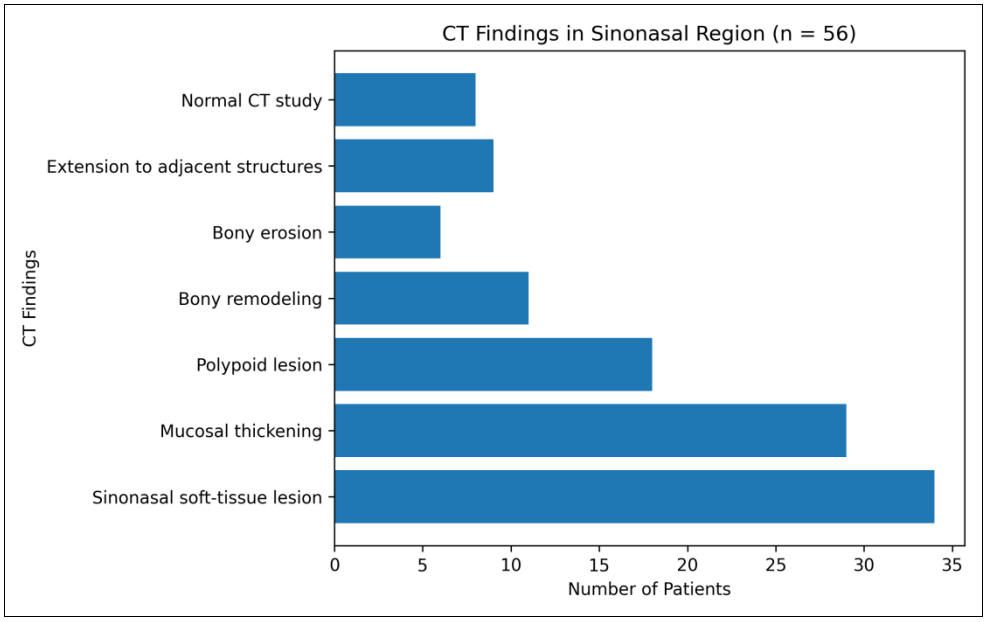

Fig 2: CT Findings in Sinonasal Region (n = 56)*

Computed tomography revealed sinonasal soft-tissue lesions as the most common finding (60.7%), followed by mucosal thickening (51.8%) and polypoid lesions (32.1%). Bony remodeling was observed in 19.6% of patients, while bony erosion was less frequent (10.7%), suggesting a predominantly benign process. Extension to adjacent structures was noted in 16.1% of cases. A normal CT study was seen in 14.3%, reflecting the limited sensitivity of CT in detecting hormonally responsive lesions and highlighting the need for further evaluation with MRI and histopathological correlation.

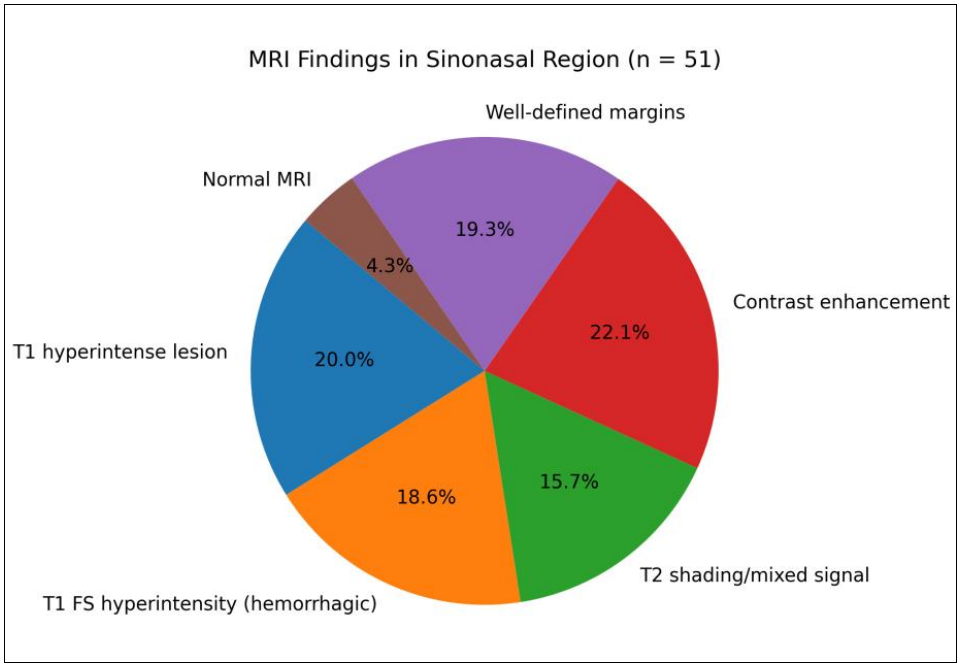

Fig 3: MRI Findings (n = 51)*

Magnetic resonance imaging demonstrated characteristic features suggestive of hormonally responsive disease. T1 hyperintense lesions were identified in 54.9% of patients, and T1 fat-suppressed hyperintensity, indicative of hemorrhagic foci, was observed in 51.0%. T2 shading or mixed signal intensity was noted in 43.1%, further supporting the presence of blood products. Contrast enhancement was seen in 60.8% of cases, with well-defined lesion margins in 52.9%. A normal MRI study was observed in only 11.8%, underscoring the superior sensitivity of MRI compared with CT in detecting hormonally responsive sinonasal lesions (Figure 3).

Table 5: Histopathological Findings in Sampled Lesions (n = 57)*

Histopathological Feature	n (%)
Endometrial glands and stroma present	31 (54.4%)
Hemosiderin-laden macrophages	26 (45.6%)
Chronic inflammatory infiltrate	14 (24.6%)
Fibrosis	11 (19.3%)
Non-specific inflammatory pathology	16 (28.1%)
No significant pathology	10 (17.5%)

Histopathological examination of sampled lesions revealed endometrial glands and stroma in 54.4% of cases, confirming the

diagnosis of endometriosis. Hemosiderin-laden macrophages, indicative of prior hemorrhage, were identified in 45.6%, supporting the hormonally responsive nature of the lesions. Chronic inflammatory infiltrate and fibrosis were observed in 24.6% and 19.3% of cases, respectively. Non-specific inflammatory pathology was noted in 28.1%, while no significant pathology was identified in 17.5%, highlighting the histopathological heterogeneity of sinonasal lesions and the importance of tissue diagnosis for definitive confirmation (Table 5).

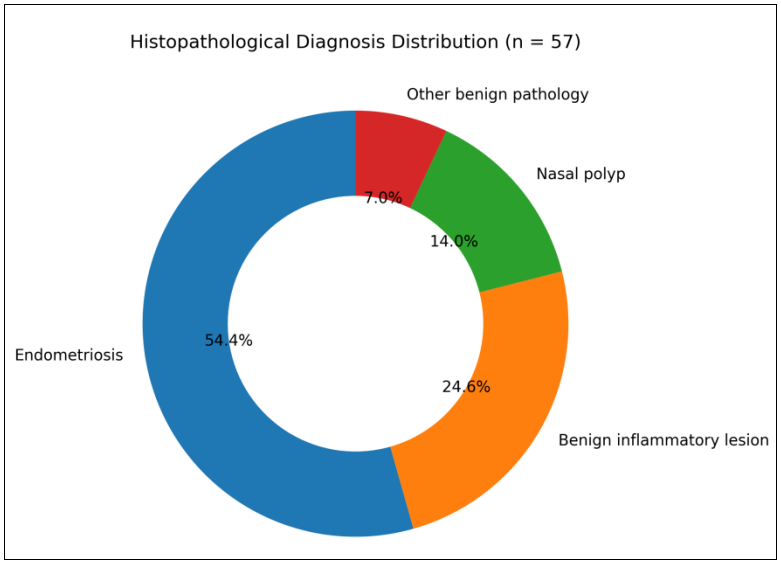

Fig 4: Histopathological Diagnosis (n = 57)

Histopathological diagnosis confirmed endometriosis in 54.4% of sampled lesions, making it the most common definitive finding. Benign inflammatory lesions accounted for 24.6%, while nasal polyps were identified in 14.0% of cases. Other benign pathologies comprised 7.0%. These results demonstrate that although a substantial proportion of patients had hormone-sensitive gynecologic disease, a wide spectrum of benign sinonasal conditions can present with similar clinical and radiologic features, emphasizing the necessity of histopathological confirmation for accurate diagnosis (Figure 4).

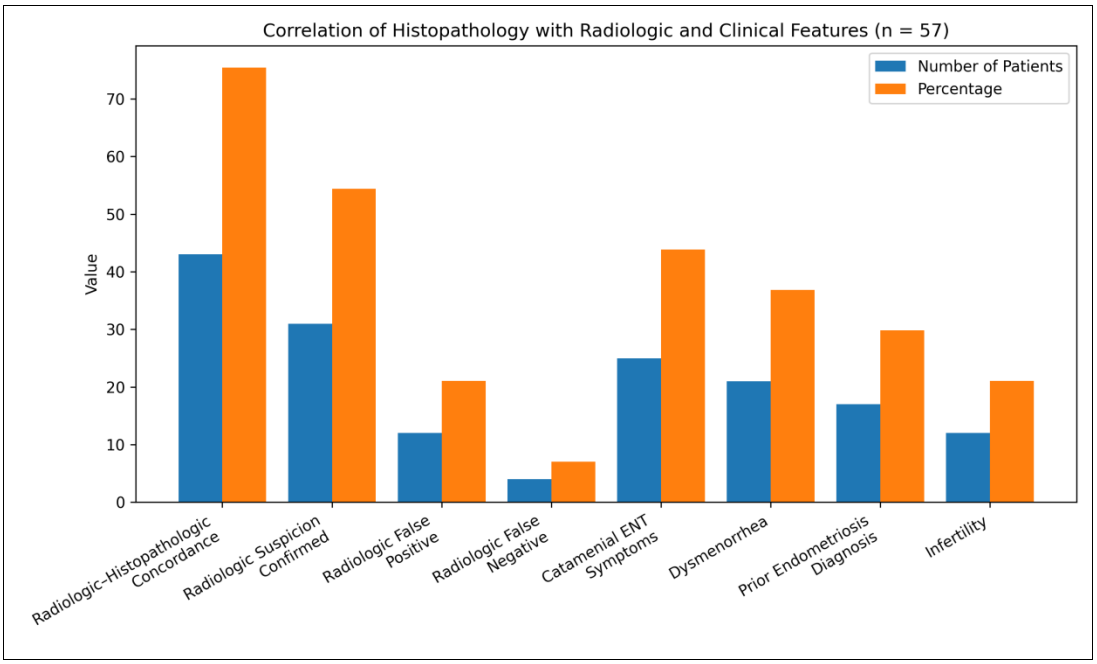

Fig 5: Correlation of Histopathology with Radiologic and Clinical Features (n = 57)

The figure 5 illustrates the relationship between histopathological findings and both radiologic and clinical features in patients who underwent tissue diagnosis. A high radiologic-histopathologic concordance is observed, indicating good agreement between imaging and definitive diagnosis. Among clinical parameters, catamenial ENT symptoms show the strongest association with histopathologically confirmed endometriosis, followed by dysmenorrhea and prior diagnosis of endometriosis. Radiologic false-positive and false-negative findings are comparatively lower, underscoring the effectiveness of radiologic evaluation when interpreted alongside clinical history. Overall, the graph emphasizes the importance of integrating imaging findings with clinical features to improve diagnostic accuracy.

Table 6: Final Diagnosis Based on Combined Evaluation (n = 75)

Final Diagnosis	n (%)
Hormone-sensitive gynecologic disease (endometriosis)	31 (41.3%)
Non-hormone-sensitive benign ENT pathology	36 (48.0%)

Based on combined clinical, radiologic, and histopathological evaluation, 41.3% of patients were diagnosed with hormone-sensitive gynecologic disease (endometriosis). The majority of the remaining cases (48.0%) were attributed to non-hormone-sensitive benign ENT pathologies, reflecting the broad differential diagnosis in patients presenting with sinonasal symptoms. A smaller proportion (10.7%) had indeterminate findings and were managed conservatively. These results underscore the importance of a multidisciplinary diagnostic approach to accurately differentiate hormonally mediated disease from other benign otolaryngologic conditions (Table 6).

Table 7: ROC Curve Analysis for CT and MRI

Imaging Modality	Area Under Curve (AUC)	Standard Error	95% Confidence Interval	Diagnostic Performance
CT	0.76	0.06	0.64 - 0.88	Good
MRI	0.87	0.05	0.77 - 0.97	Very good

Receiver operating characteristic (ROC) curve analysis demonstrated that MRI had superior diagnostic performance compared with CT in detecting hormone-sensitive gynecologic disease presenting with otolaryngologic symptoms. The AUC for MRI was 0.87, indicating very good diagnostic accuracy, whereas CT showed an AUC of 0.76, corresponding to good diagnostic performance. The narrower standard error and higher confidence interval for MRI further support its greater reliability. These findings reinforce the role of MRI as the preferred imaging modality for evaluation of suspected hormonally responsive sinonasal lesions (Table 7).

Discussion

In this multidisciplinary cohort of 75 patients evaluated across the Departments of Otolaryngology, Radiology, and Obstetrics & Gynecology, a substantial proportion demonstrated catamenial otolaryngologic symptoms with imaging abnormalities that warranted histopathological evaluation. The present study reinforces two clinically important observations: first, menstrual cyclicity or perimenstrual worsening of ENT symptoms is a high-yield diagnostic clue that should prompt consideration of hormone-sensitive gynecologic disease; and second, while computed tomography (CT) is useful for assessing lesion extent and excluding aggressive bony pathology, magnetic resonance imaging (MRI) particularly with T1-weighted fat-suppressed (T1FS) sequences offers superior diagnostic support for identifying hormonally responsive or hemorrhagic lesions. These findings align with the broader concept of extrapelvic endometriosis, which is frequently underrecognized due to atypical presentations and delayed clinical suspicion [8].

Otolaryngologic involvement in endometriosis is rare, but existing literature consistently identifies catamenial epistaxis, with or without nasal obstruction or pain, as the hallmark presentation distinguishing it from common sinonasal disorders [9]. Case reports of nasal septal and sinonasal endometriosis, including those by Aliyeva and Laghzaoui *et al*., describe prolonged histories of recurrent cyclical epistaxis often leading to multiple ENT consultations before diagnosis is established [3, 4]. Similarly, Laghzaoui *et al*., emphasized that despite suggestive clinical history, definitive diagnosis is typically achieved only after endoscopic biopsy, owing to the non-specific appearance of lesions that frequently mimic benign inflammatory conditions [10]. The present study corroborates these observations, demonstrating a strong association between catamenial symptoms and histopathologically confirmed endometriosis, thereby supporting menstrual correlation as a key screening variable in ENT practice.

CT remains a valuable first-line imaging modality for sinonasal evaluation, providing detailed assessment of mucosal thickening, polypoid lesions, soft-tissue masses, and bony remodeling or erosion. However, CT has limited specificity for hormonally responsive lesions, as endometriotic implants may resemble inflammatory polyps, organized hematomas, vascular lesions, or benign neoplasms [11]. This limitation has been widely reported in extrapelvic endometriosis, where CT is primarily employed to characterize findings and exclude alternative diagnoses rather than to establish definitive diagnosis [12].

MRI provides incremental diagnostic value due to its superior soft-tissue contrast and ability to detect blood products and hemorrhagic foci, particularly on T1FS sequences. Although dedicated sinonasal endometriosis imaging series are limited, this imaging principle is well established in the evaluation of thoracic endometriosis syndrome, where MRI has demonstrated higher sensitivity in identifying hemorrhagic and hormonally active lesions, especially when imaging is performed during the symptomatic or perimenstrual phase [13]. The higher diagnostic accuracy and AUC observed for MRI compared with CT in the present study are therefore biologically plausible and consistent with established extrapelvic imaging experience.

The rationale for perimenstrual imaging lies in the increased likelihood of hormonally responsive tissue demonstrating edema, bleeding, and signal alteration during menstruation. This “timing effect” has been emphasized in thoracic endometriosis literature and is relevant to head-and-neck evaluation, even though direct sinonasal evidence remains limited [14]. The present findings support a diagnostic workflow in which women with cyclical ENT symptoms are preferentially evaluated with MRI during the perimenstrual window, improving lesion conspicuity and optimizing selection for biopsy rather than replacing histopathology.

Across published reports, histopathological examination remains the gold standard for diagnosis, demonstrating endometrial glands and stroma with or without hemosiderin-laden macrophages [15]. The present study similarly relied on tissue diagnosis as the reference standard, which is methodologically appropriate given the overlap of imaging features with other sinonasal conditions. Diagnostic efficiency was greatest when radiologic impressions were interpreted alongside menstrual history and endoscopic findings, highlighting the importance of a coordinated multidisciplinary approach.

Diagnostic performance analysis further demonstrated superior sensitivity, diagnostic accuracy, and AUC for MRI compared with CT, consistent with broader extrapelvic endometriosis imaging principles. Given that most existing ENT-specific literature consists of isolated case reports, direct numerical comparison is limited; thus, the value of the present study lies in providing structured diagnostic-performance data within a

coordinated clinical framework.

Conclusion

Hormone-sensitive gynecologic disease, particularly endometriosis, should be considered in women presenting with recurrent or cyclical otolaryngologic symptoms, especially catamenial epistaxis. While CT is useful for anatomical delineation and exclusion of aggressive pathology, MRI especially T1-weighted fat-suppressed imaging demonstrates superior diagnostic performance in detecting hormonally responsive sinonasal lesions. Histopathology remains definitive; however, diagnostic accuracy is significantly enhanced by correlating imaging findings with menstrual history and endoscopic assessment. Adoption of a standardized multidisciplinary diagnostic pathway may reduce diagnostic delay and facilitate timely gynecologic management. Further large-scale, protocol-driven studies are warranted to refine imaging criteria and validate diagnostic performance in head-and-neck manifestations of hormone-sensitive gynecologic disease.

Conflict of Interest

Not available.

Financial Support

Not available.

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