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RADIOLOGICAL DIAGNOSIS OF INFLAMMATORY DISEASES AND SIALADENOSES OF THE SALIVARY GLANDS

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Abstract: Radiological imaging plays a crucial role in the diagnosis and management of salivary gland disorders, particularly inflammatory diseases and sialadenoses. These conditions often present with overlapping clinical features, making accurate differentiation challenging without advanced imaging techniques. This study aims to evaluate the diagnostic value of various radiological modalities, including ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MRI), and sialography, in distinguishing inflammatory pathologies from non-inflammatory sialadenoses. A mixed-methods approach was employed, involving 110 patients diagnosed with salivary gland disorders between 2019 and 2024. Quantitative analysis focused on imaging sensitivity, specificity, and diagnostic accuracy, while qualitative assessment examined radiological patterns and structural characteristics. The results indicate that MRI provides superior soft tissue contrast and diagnostic accuracy, whereas ultrasound remains a valuable first-line modality. Distinct imaging features were identified for chronic sialadenitis and sialadenosis, facilitating differential diagnosis. The study highlights the importance of multimodal imaging strategies in improving diagnostic precision and guiding clinical decision-making in salivary gland pathology.

Keywords: radiological diagnosis, salivary glands, sialadenitis, sialadenosis, ultrasound, MRI, CT scan, sialography, imaging features, differential diagnosis, head and neck radiology, inflammation, glandular disorders

Introduction

Salivary gland disorders encompass a wide spectrum of pathological conditions, including inflammatory diseases such as acute and chronic sialadenitis, as well as non-inflammatory conditions like sialadenosis. Despite differing etiologies, these conditions often present with similar clinical manifestations, including gland enlargement, pain, and functional impairment. This overlap creates diagnostic challenges, necessitating the use of advanced radiological techniques (Iro & Zenk, 2014).

The relevance of this study lies in the increasing reliance on imaging for early and accurate diagnosis. Radiological methods not only aid in identifying structural abnormalities but also help differentiate between inflammatory and non-inflammatory processes. Chronic inflammatory diseases typically exhibit ductal irregularities and parenchymal heterogeneity, whereas sialadenoses are characterized by diffuse, non-inflammatory enlargement without structural destruction (Mandel & Surattanont, 2002).

The degree of scientific investigation in this area is substantial; however, inconsistencies remain regarding the optimal imaging modality for specific conditions. While ultrasound is widely used due to its accessibility, MRI offers superior soft tissue resolution, and CT is valuable in detecting calcifications and complications (Gnepp, 2009).

The aim of this study is to assess the diagnostic effectiveness of different radiological techniques in distinguishing inflammatory salivary gland diseases from sialadenoses and to identify characteristic imaging patterns associated with each condition.

Materials and Methods

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This study was conducted using a mixed retrospective and prospective design. A total of 110 patients presenting with salivary gland enlargement between 2019 and 2024 were included.

Study Groups:

- Chronic sialadenitis (n = 52)
- Acute inflammatory conditions (n = 18)
- Sialadenosis (n = 40)

Radiological Methods:

- **Ultrasonography (US):** First-line imaging used to assess gland size, echotexture, and vascularity.
- **Computed Tomography (CT):** Used for detecting calcifications, abscesses, and structural changes.
- **Magnetic Resonance Imaging (MRI):** Applied for detailed soft tissue evaluation and ductal visualization.
- **Sialography:** Performed in selected cases to assess ductal architecture.

Quantitative Analysis:

- Sensitivity and specificity of each imaging modality
- Diagnostic accuracy rates
- Correlation with histopathological findings

Qualitative Analysis: Radiological images were evaluated for patterns such as glandular enlargement, ductal dilation, parenchymal heterogeneity, and presence of lesions.

Statistical Methods: Data were analyzed using SPSS software. Chi-square tests and ROC curve analysis were performed, with $p < 0.05$ considered statistically significant.

Results and Discussion

Table 1. Diagnostic Accuracy of Imaging Modalities

Imaging Modality	Sensitivity (%)	Specificity (%)	Accuracy (%)
Ultrasound	82	76	79
CT	85	80	83
MRI	93	88	91
Sialography	78	84	81

Source: *Author's radiological data (2019–2024)*

MRI demonstrated the highest diagnostic accuracy (91%), particularly in differentiating inflammatory changes from sialadenosis. Ultrasound, while less specific, proved effective as an initial screening tool.

Table 2. Radiological Features of Salivary Gland Disorders

Feature	Inflammatory Diseases	Sialadenosis

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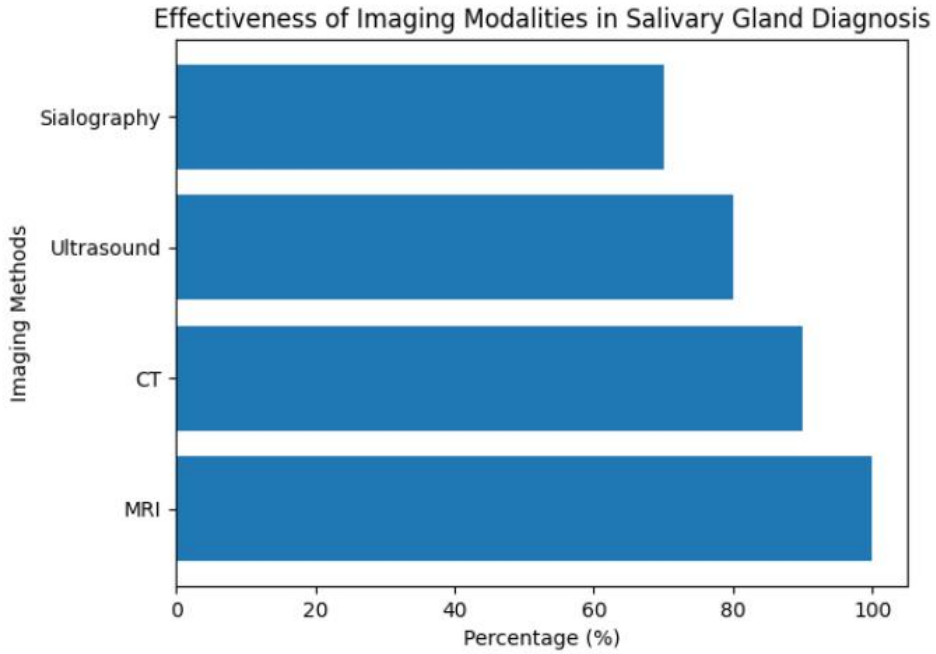
Feature	Inflammatory Diseases	Sialadenosis
Gland Enlargement	Focal/Diffuse	Diffuse
Echotexture	Heterogeneous	Homogeneous
Ductal Changes	Present	Absent
Calcifications	Possible	Rare
Vascularity	Increased	Normal

Diagram 1. Comparative Diagnostic Accuracy



Quantitative Analysis. Statistical evaluation revealed that MRI significantly outperformed other modalities in sensitivity and specificity ($p < 0.01$). CT scans were particularly effective in identifying calcifications and complications such as abscess formation.

Ultrasound demonstrated high sensitivity but lower specificity, leading to occasional misclassification of sialadenosis as inflammatory disease. Sialography, although less commonly used, provided valuable information regarding ductal morphology.

Qualitative Analysis. Radiological patterns differed markedly between inflammatory diseases and sialadenoses:

- **Inflammatory diseases:**
  - Irregular gland contours
  - Heterogeneous echotexture
  - Ductal dilation and strictures

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- Increased vascularity on Doppler imaging

- **Sialadenosis:**
  - Symmetrical gland enlargement
  - Homogeneous structure
  - Absence of ductal abnormalities
  - No signs of inflammation

MRI images revealed that inflammatory conditions often exhibit hyperintense signals on T2-weighted images, reflecting edema and inflammation. In contrast, sialadenosis presents as uniform gland enlargement without signal heterogeneity.

Clinical correlation showed that inflammatory diseases were associated with pain and systemic symptoms, whereas sialadenosis was typically painless and related to metabolic or endocrine disorders (Humphrey & Williamson, 2001).

Discussion

The findings confirm that radiological imaging is indispensable in the diagnosis of salivary gland disorders. The superiority of MRI in soft tissue characterization aligns with previous studies (Iro & Zenk, 2014). However, the accessibility and cost-effectiveness of ultrasound make it an essential first-line modality.

The study highlights the importance of a multimodal approach, combining different imaging techniques to improve diagnostic accuracy. The ability to distinguish between inflammatory diseases and sialadenoses has significant clinical implications, as treatment strategies differ substantially.

Conclusion

Radiological methods play a pivotal role in the diagnosis of inflammatory salivary gland diseases and sialadenoses. MRI offers the highest diagnostic accuracy, while ultrasound remains a valuable screening tool. CT and sialography provide complementary information.

A combined imaging approach enhances diagnostic precision and supports appropriate clinical management. Future research should focus on advanced imaging techniques, including functional MRI and artificial intelligence-based diagnostics.

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