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Original Research Article

Diagnostic Accuracy of Prolactin Levels in Pituitary Microadenoma Keeping MRI as A Gold Standard

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Abstract: *Pituitary microadenomas are small, benign pituitary gland tumors often associated with elevated serum prolactin levels. Early detection is crucial for prompt management, but imaging with MRI remains the gold standard. Evaluating the diagnostic utility of serum prolactin levels can help streamline the diagnostic pathway, especially in resource-limited settings.* ***Objective:*** *The present study aims to assess the diagnostic accuracy of prolactin levels in diagnosing pituitary microadenomas, keeping MRI as the Gold Standard.* ***Methods:*** *After the ethical approval from the institutional review board, this cross-sectional study was conducted at the Department of Radiology, Jinnah Postgraduate Medical Centre, Karachi, from 03/December/2024 to 03/February/2025. Through non-probability consecutive sampling, 98 patients, aged 18–65 years, of either gender, with clinical suspicion of pituitary microadenomas and having serum prolactin levels ≥25 ng/mL, were included in the present study.* ***Results:*** *The sensitivity of serum prolactin in detecting pituitary microadenomas was 89.06%, indicating its ability to identify affected individuals correctly. However, the specificity was lower at 41.18%, suggesting a higher likelihood of false positives. The ROC curve analysis with an AUC of 0.866 for Prolactin level in predicting microadenomas, taking MRI as the gold standard.* ***Conclusion:*** *First-line diagnostic screening employing serum prolactin testing shows promising results in detecting pituitary microadenomas because of high sensitivity, yet requires an additional MRI examination to confirm the conclusive diagnosis of the condition.*

Keywords: Prolactin level, MRI, Accuracy, Microadenomas

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Introduction

The pituitary gland contains small benign tumors known as microadenomas that measure less than 10 mm in diameter (1). Clinical manifestations of these tumors usually involve hormonal disorders, and hyperprolactinemia stands as the most typical manifestation (2). Serum prolactin tests serve as a standard diagnostic tool to detect pituitary adenomas because prolactin-secreting adenomas or prolactinomas lead to unhealthy menstrual periods, infertility problems, and the combination of both symptoms with abnormal milk discharge and constant head pain (3, 4). The condition of elevated prolactin levels can result from various non-pituitary medical problems, including hypothyroidism, medication adverse effects, and prolonged stress (5, 6). The diagnostic standard for detecting pituitary microadenomas depends on MRI testing because its high image resolution helps differentiate adenomas from other causes of elevated prolactin levels (7).

Several scientific investigations identified relationships between prolactin levels in the blood and pituitary microadenomas. The research by Cho et al. (2022) established that serum prolactin levels higher than 200 ng/mL strongly support the diagnosis of prolactinomas through their 98% sensitivity and 92% specificity results. The diagnostic accuracy for microadenomas becomes less reliable when prolactin levels fall between 25–100 ng/mL, so MRI serves as the confirmatory examination (8). According to Voznyak (2024), research on 500 patients' serum prolactin rates measuring 50 to 100 ng/mL showed an 85% detection rate for pituitary microadenomas and a 78% specificity value. MRI possesses remarkable accuracy for identifying small pituitary adenomas measuring 2 mm since it achieves a sensitivity of 90–95% and a specificity of 95% (9). In their meta-analysis, Faje et al. (2021) established that serum prolactin levels serve well as preliminary testing yet lack the accuracy of MRI for dismissing false-positive outcomes from drug-induced hyperprolactinemia and stalk effect (10). Thus, imaging plays a vital role in clinical treatment decisions. Investigating prolactin diagnostic power for pituitary microadenoma detection remains crucial since it might enable healthcare professionals to minimize MRI scans, which are expensive imaging procedures with limited access (11, 12). This research examines serum prolactin tests for their capability to diagnose pituitary microadenomas based on the definitive benchmark of MRI imaging. This research aims to enhance current knowledge about serum prolactin testing accuracy for pituitary microadenoma detection, as clinicians use MRI exams for standard diagnosis (13). The present study aims to evaluate the diagnostic accuracy of prolactin levels in diagnosing pituitary microadenomas, keeping MRI as the Gold Standard.

Methodology

After the ethical approval from the institutional review board, this cross-sectional study was conducted at the Department of Radiology, Jinnah Postgraduate Medical Centre, Karachi, from 03/December/2024 to 03/February/2025. Through non-probability consecutive sampling, 98 patients, aged 18–65 years, of either gender, with clinical suspicion of pituitary microadenomas and having serum prolactin levels ≥25 ng/mL, were included in the present study. Patients with contraindications to MRI (e.g., pacemaker, claustrophobia), with macroadenomas or non-pituitary causes of hyperprolactinemia (e.g., hypothyroidism, drug-induced hyperprolactinemia), and Pregnant or lactating women were excluded from the present study, after the written informed consent was obtained from the recruited participants. Demographic and clinical data were collected, including age, gender, and symptom duration. In the morning, fasting venous blood samples were obtained to measure serum prolactin levels using an automated immunoassay analyzer, categorizing results as normal or elevated (≥25 ng/mL). Subsequently, all participants underwent contrast-enhanced MRI of the pituitary gland, with findings interpreted by blinded radiologists. MRI results were classified into true positive, false positive, true negative, or false negative based on the presence or absence of microadenomas. Data was analyzed using the IBM SPSS v.

26.0 and Microsoft Excel 365. Descriptive statistics such as mean ± standard deviation (SD) were used for continuous variables such as age and duration of symptoms. Frequency and percentages were used to describe the proportion of categorical variables such as gender, catchment, serum prolactin levels, and MRI Findings of the presence of pituitary microadenoma. A 2 by 2 table was drawn, and the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy were calculated for each MRI finding.

Results

The study included 98 participants, with a mean age of 40.2 ± 13.2 years. 56 (57%) were male, and 42 (43%) were female. The average duration of symptoms reported by the participants was 30.2 ± 18.0 months. Serum prolactin levels varied among the participants, with a mean value of 80.9 ± 38.5 ng/mL (Table 1).

In evaluating the diagnostic accuracy of serum prolactin levels for detecting pituitary microadenomas, a 2×2 contingency table was constructed using MRI as the gold standard. Among the 98 participants, 57 cases were true positives, meaning that both serum prolactin levels and MRI confirmed the presence of a pituitary microadenoma. Twenty cases were false positives, with elevated prolactin levels present despite a negative MRI result. Conversely, 7 cases were false negatives, indicating that despite normal prolactin levels, MRI confirmed the presence of a microadenoma. Lastly, 14 cases were negatives, with both prolactin levels and MRI findings being negative (Table 2).

Based on these findings, the sensitivity of serum prolactin in detecting pituitary microadenomas was 89.06%, indicating its high ability to identify affected individuals correctly. However, the specificity was lower at 41.18%, suggesting a higher likelihood of false positives. The positive predictive value (PPV) was calculated as 74.03%, meaning that among individuals with elevated prolactin levels, 74.03% had a pituitary microadenoma on MRI. The negative predictive value (NPV) was 66.67%, indicating that 66.67% of those with normal prolactin levels were correctly identified as not having the condition. The overall diagnostic accuracy of serum prolactin levels in detecting pituitary microadenomas was 72.45%, demonstrating its potential as a useful but imperfect screening tool. Figure 1 shows the ROC curve analysis with an AUC of 0.866 for Prolactin level predicting microadenomas, taking MRI as the gold standard.

Table 1: Demographic and Clinical Variables

Variables	Mean and Frequency (n=98)
Age (years)	40.2±13.2
Gender	
Male	56 (57%)
Female	42 (43%)
Symptom Duration (Months)	30.2±18.0
Serum Prolactin Level (ng/mL)	80.9±38.5

Table 2: 2 by 2 Table

Prolactin Level	MRI Findings		
	Yes	No	Total
Yes	57	20	77
No	7	14	21
Total	70	28	
Sensitivity	89.06%		
Specificity	41.18%		
PPV	74.03%		
NPV	66.67%		
Accuracy	72.45%		

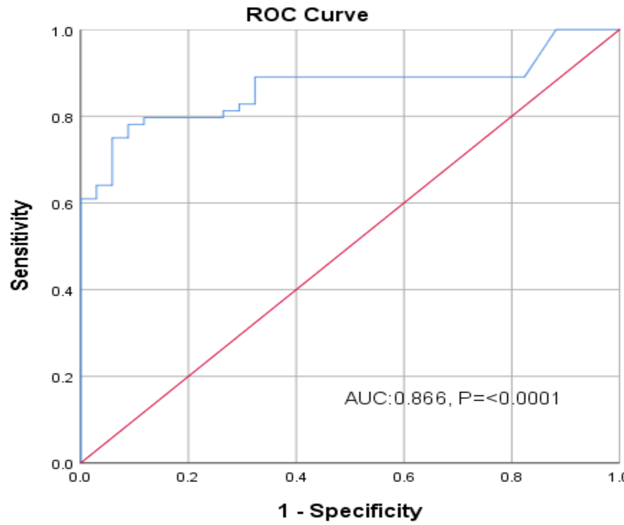

Figure 1: ROC curve analysis

Discussion

Research evidence demonstrates that serum prolactin measurements successfully identify microscopic adenomas in patients' brains. The 89.06% sensitivity indicates that the diagnostic test accurately identifies microadenoma patients when detecting increased prolactin levels in their bloodstream. The 41.18% specificity of this test reveals numerous false-positive outcomes since elevated prolactin levels fail to match MRI-documented microadenomas. The obtained findings match previously published research outcomes. The research by Alyami et al. (2025) demonstrated prolactin levels exceeding 38.71 ng/mL as a diagnostic tool for pituitary adenomas with a 77.23% sensitivity and 40.91% specificity (14). Varaldo et al. (2024) witnessed that prolactin levels demonstrated average accuracy in detecting pituitary conditions based on the most effective cut-off threshold, which exceeded 25 µg/L. The study found that out of all patients with elevated prolactin levels, 74.03% received an MRI diagnosis of microadenomas (15). Normal prolactin levels show a moderate ability to determine whether microadenomas are not present, with a 66.67% negative predictive value. The screening value of serum prolactin assessment remains clear, yet the assessment limitations become evident from these data values. The diagnostic accuracy percentage of 72.45% found in this research aligns closely with results discovered by other researchers. Dynamic contrast-enhanced MRI evaluation conducted by Zhai et al. (2019) demonstrated 95.0% sensitivity when diagnosing pituitary microadenoma subtypes and 82.6% specificity (16). The higher specificity of imaging techniques faces obstacles when performing widespread use since they are expensive to acquire and maintain, especially in settings with limited resources. The diagnostic accuracy of serum prolactin tests for microadenoma prediction shows good performance according to the ROC curve results, with an AUC value of 0.866. The AUC result of 98.13% reported by Li et al. (2021) for detecting pituitary microadenomas from MRI stands consistent with the present research findings (17).

Conclusion

First-line diagnostic screening employing serum prolactin testing shows promising results in detecting pituitary microadenomas because of high sensitivity, yet requires an additional MRI examination to confirm the conclusive diagnosis of the condition. Medical practitioners must use biochemical tests and diagnostic imaging to improve diagnosis and therapeutic decision-making precision.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-TCh-258-24)
Consent for publication
Approved
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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

***AB** (Resident**), SS** (HOD)*
Study Design, manuscript review, critical input
Conception of Study, Development of Research Methodology Design
***SS** (Associate professor**), ZB** (Resident)*
Review of Literature, Data entry, Data analysis, and article drafting.
***AS** (Resident**), FM** (Consultant)*
Manuscript drafting, Study Design.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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