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# "Is It A Stricture Or A Parapelvic Cyst? Differentiating Renal Sinus Lesions On Imaging"

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***Abstract***
***Introduction:***
*Renal sinus lesions are a diagnostic challenge due to overlapping imaging features of renal pelvis strictures and parapelvic cysts. Differentiating them is important, as they have various clinical implications and management. Strictures cause obstructive uropathy. Parapelvic cysts are usually benign, non-communicating fluid collections that can mimic obstruction on imaging.*
***Aim:*** *To evaluate and differentiate renal pelvis strictures from parapelvic cysts using ultrasound, computed tomography (CT), and magnetic resonance urography.*
***Methodology:*** *This prospective observational study was done on 50 patients with renal sinus lesions detected on ultrasound. Detailed imaging evaluation using ultrasound, CT urography, and MRU was done, assessing lesion morphology, communication with the collecting system, and enhancement patterns. Final diagnosis was confirmed by clinical correlation, surgical/endoscopic findings, and histopathology when needed and available.*
***Results:*** *Among 50 patients (54% male, 46% female) included, 60% were diagnosed with parapelvic cysts and 36% with pelviureteric junction (PUJ) strictures. Flank pain was main symptom (58%). Parapelvic cysts are seen as well-defined, non-enhancing, anechoic lesions without vascularity, PUJ strictures showed irregular, enhancing lesions with signs of obstruction.*
***Conclusion:*** *Combining clinical presentation with advanced imaging modalities effectively differentiates parapelvic cysts from renal pelvis strictures. Early, accurate diagnosis prevents unnecessary interventions and guides appropriate management.*
***Keywords:*** *Parapelvic cyst, Renal Pelvis, Pelviureteric junction, Obstruction, Imaging features, Strictures*

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## I. Introduction

Renal sinus lesions pose significant diagnostic challenge in urological and radiological practice due to multiple etiologies and overlapping imaging characteristics. Differentiating between a renal pelvis stricture and a parapelvic cyst is important, as management and clinical implications varies significantly. Strictures of the renal pelvis are associated with obstructive uropathy, recurrent infections, or previous surgical interventions, causing hydronephrosis and impaired renal function if not promptly addressed. In contrast, parapelvic cysts are non-communicating fluid-filled structures arising in the renal sinus, asymptomatic but mimicking obstruction on imaging studies[1,2]

Modern imaging techniques, especially ultrasound (US), computed tomography (CT), and magnetic resonance urography (MRU), are important in evaluating renal sinus lesions. But, each modality presents specific strengths and limitations. For instance, on conventional ultrasound, both parapelvic cysts and hydronephrosis appear anechoic, necessitating further imaging for clarification. Contrast-enhanced CT and MRU are superior in delineating anatomical detail and functional information, allowing radiologists to assess communication with the collecting system and determine the exact nature of the lesion.[3,4]

CT urography, with its high spatial resolution, shows parapelvic cysts as non-enhancing, water-density lesions adjacent to the renal pelvis, clearly distinct from dilated calyces which enhance with contrast. MR urography provides advantage of functional assessment without ionizing radiation, especially useful in younger patients or those requiring serial imaging. Advanced techniques like T2-weighted MR sequences can highlight differences in fluid content and help differentiate between true obstructions and cystic lesions, thus guiding accurate diagnosis and avoiding unnecessary interventions.[5,6]

In spite these advances, diagnostic confusion still persists, particularly in cases of large cysts compressing the collecting system or atypical presentations of strictures. So, a structured imaging approach, incorporating clinical history, careful assessment of lesion morphology, and use of multiplanar reconstructions, is essential. Emerging imaging techniques and artificial intelligence-based tools also hold promise in enhancing diagnostic accuracy in complex renal sinus pathology.[7,8]

## II. Aim And Objectives

**Aim:**
To evaluate and differentiate renal pelvis strictures from parapelvic cysts using various imaging modalities

**Objectives:**
1. To analyze the imaging characteristics of renal sinus lesions on ultrasound, computed tomography (CT), and magnetic resonance urography (MRU).
2. To identify main radiological features that distinguish between renal pelvis strictures and parapelvic cysts.
3. To assess the diagnostic accuracy and utility of different imaging modalities in evaluating renal sinus pathology.
4. To correlate imaging findings with clinical presentation and, where applicable, surgical or histopathological outcomes.

## III. Methodology

**Study Design:**
Observational study.

**Study Setting:**
Department of Radiodiagnosis, Dr Pinnamaneni Insititute of Medical Sciences, a tertiary care teaching hospital.

**Study Duration:**
August 2024 to January 2025- 6 months

**Sample Size:**
**50 patients** with renal sinus lesions detected on preliminary ultrasound were included in the study.

**Study Population:**
Patients referred for imaging evaluation of renal sinus lesions suspected to be either parapelvic cysts or renal pelvis strictures.

**Inclusion Criteria:**
- Patients aged 18 years and above.
- Patients with renal sinus lesions identified on ultrasound.
- Patients undergoing further evaluation with CT urography and/or MR urography.
- Patients who provided written informed consent.

**Exclusion Criteria:**
- Patients with known renal malignancies or complex cysts (Bosniak III or IV).
- Patients with contraindications to contrast agents (e.g., renal insufficiency, allergy).
- Pregnant women.
- Uncooperative patients or those lost to follow-up.

**Data Collection and Analysis:**
- Data recorded on a structured proforma including demographics, clinical symptoms, and imaging findings.
- Lesions were classified as either parapelvic cyst or renal pelvis stricture based on final imaging diagnosis corroborated by surgical/endoscopic findings where available.
- Statistical analysis performed using SPSS software:
- Descriptive statistics for demographic and lesion characteristics.
- Sensitivity, specificity, and diagnostic accuracy calculated for CT and MRU.
- Chi-square test and independent t-test used where applicable; **p**-value < 0.05 considered statistically significant

Ethical aspects:
Informed consent was taken from every participant.

## IV. Results

**GENDER:** 54% were male.

| GENDER | Number of Patients | Percentage (%) |
|---|---|---|
| Male | 27 | 54 |
| Female | 23 | 46 |
| TOTAL | 50 | 100 |

**Table 1: Gender of patients**

**SYMPTOMS:** Most common symptom was flank pain.

| Symptom | Number of Patients | Percentage (%) |
|---|---|---|
| Flank pain | 29 | 58 |
| Hematuria | 12 | 24 |
| Recurrent UTI | 9 | 18 |
| TOTAL | 50 | 100 |

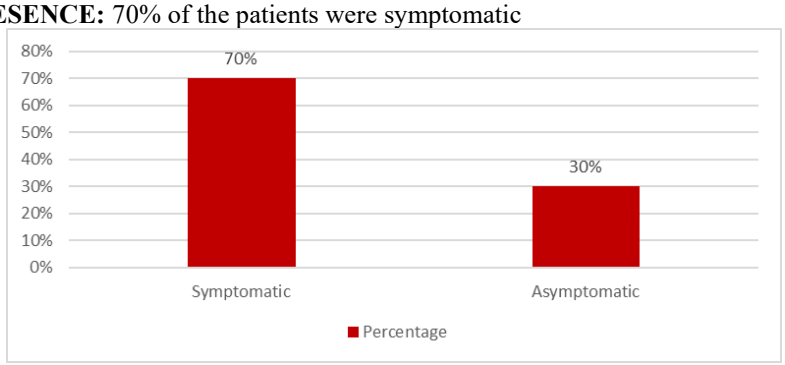
**Table 2: Symptoms among patients**

**SIZE OF LESION:** Most commonly, lesions are of size 2 to 4 cm

| SIZE OF LESION | Number of Patients | Percentage (%) |
|---|---|---|
| < 2 cm | 15 | 30 |
| 2 – 4 cm | 25 | 50 |
| > 4 cm | 10 | 20 |
| TOTAL | 50 | 100 |

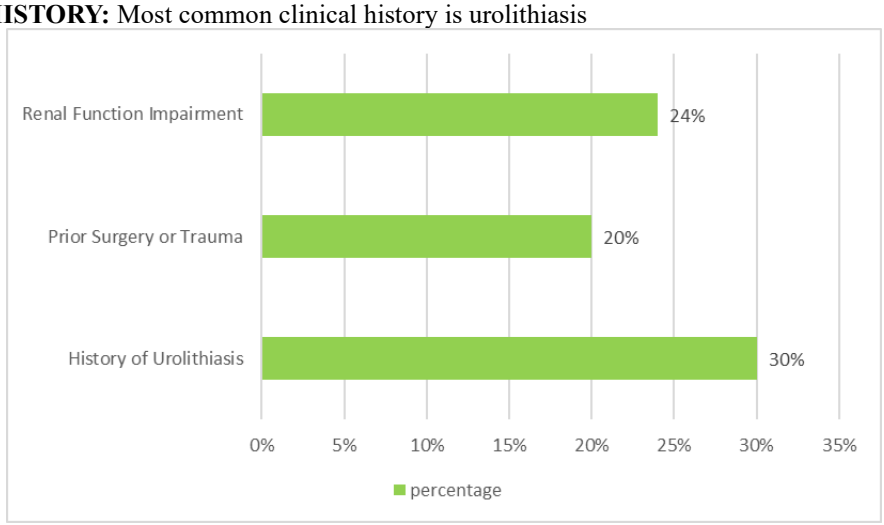
**Table 3: Size of lesions among patients**

**SYMPTOMS PRESENCE:** 70% of the patients were symptomatic



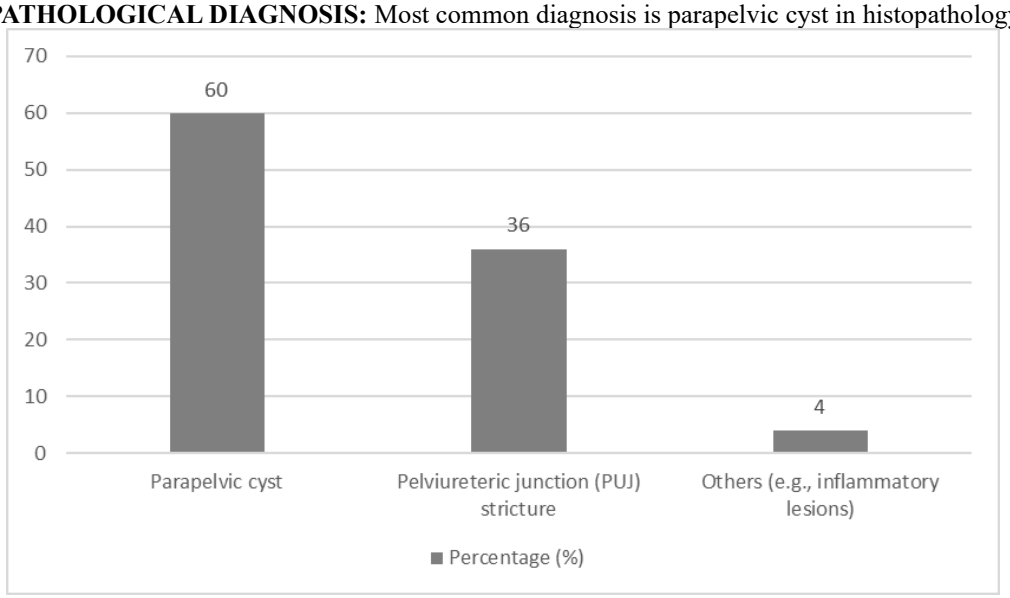

**Graph 1: Symptoms presence**

**CLINICAL HISTORY:** Most common clinical history is urolithiasis




**Graph 2: Clinical history**

**HISTOPATHOLOGICAL DIAGNOSIS:** Most common diagnosis is parapelvic cyst in histopathology.




**Graph 3: Histopathological diagnosis**

## V. Discussion

In this study of 50 patients presenting with renal sinus lesions, parapelvic cysts were most common diagnosis (64%), followed by pelviureteric junction (PUJ) strictures (36%). This distribution is consistent with previous research where parapelvic cysts were frequently identified in imaging studies of renal sinus abnormalities. Differentiating between renal sinus lesions such as parapelvic cysts and hydronephrosis remains a diagnostic challenge due to overlapping imaging features. Recent studies have explored advanced imaging modalities to improve diagnostic accuracy.

A study by **Han et al.**[9] utilized pre-contrast dual-energy spectral CT imaging to distinguish between parapelvic cysts and hydronephrosis without calculi. They found significant differences in CT numbers, effective atomic number (Z_eff), and iodine concentration between the two conditions, suggesting that quantitative parameters from dual-energy CT can aid in differentiation

Similarly, a case reported by Ma and Neild highlighted the potential for misdiagnosis when relying solely on ultrasonography. In their case, a parapelvic cyst was initially misinterpreted as hydronephrosis on ultrasound, but further evaluation with contrast-enhanced CT clarified the diagnosis.[10]

The anatomical origin of these lesions also plays a role in their imaging characteristics.[11] Peripelvic cysts, thought to be of lymphatic origin, are typically bilateral and do not communicate with the collecting system, whereas parapelvic cysts arise from the renal parenchyma and can cause extrinsic compression of the collecting system, potentially leading to hydronephrosis, while ultrasonography is a valuable initial imaging modality, it may not always provide definitive differentiation between parapelvic cysts and hydronephrosis. Advanced imaging techniques, such as dual-energy spectral CT and contrast-enhanced CT, offer quantitative and anatomical insights that enhance diagnostic accuracy. Understanding the distinct origins and imaging features of these lesions is crucial for appropriate management.

**Koratala A et al.**[12] study scenario where parapelvic cysts were initially misdiagnosed as hydronephrosis on ultrasonography. The authors emphasize the importance of contrast-enhanced CT scans in accurately distinguishing between these two conditions, as parapelvic cysts can mimic the appearance of hydronephrosis on ultrasound due to their location and anechoic nature.

**Tarzamni MK** et al.[13] study with bilateral parapelvic cysts that were initially interpreted as hydronephrosis on both ultrasonography and non-enhanced CT scans. The correct diagnosis was established using contrast-enhanced CT imaging, underscoring the potential for misdiagnosis and the value of advanced imaging techniques in differentiating these conditions.

## VI. Conclusion

Accurate differentiation between parapelvic cysts and pelviureteric junction strictures is essential for appropriate patient management and prognosis. Our study proved that a combination of clinical presentation and advanced imaging modalities, including ultrasound and contrast-enhanced CT, distinguishes these renal sinus lesions. Parapelvic cysts present as well-defined, non-enhancing cystic lesions, and PUJ strictures show irregular, enhancing features with associated obstruction. Histopathological confirmation supports imaging findings and aids in excluding other pathologies. Early and precise diagnosis facilitates

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