Section: Radiodiagnosis

Original Research Article

DIAGNOSTIC PERFORMANCE OF ULTRASOUND VERSUS COMPUTED TOMOGRAPHY IN ACUTE RIGHT ILIAC FOSSA PAIN: A PROSPECTIVE, CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Acute right iliac fossa (RIF) pain is a frequent cause of emergency admissions and spans surgical, urological, and gynaecological pathologies. Rapid, imaging-driven triage is essential to curb negative laparotomy rates and unnecessary radiation. **Materials and Methods:** This single-centre prospective cross-sectional study (May 2023 – November 2024) enrolled 100 consecutive patients (60 males, 40 females; mean age 32 ± 11 years) presenting with non-traumatic acute RIF pain. All underwent point-of-care graded-compression ultrasound (USG). Where findings were equivocal or suggested complex disease, contrast-enhanced 16-slice multidetector computed tomography (CT) followed. Imaging diagnoses were verified against operative/histopathology results or ≥ 2-week clinical follow-up, our reference standard. Sensitivity, specificity, predictive values, accuracy, and χ^2 statistics compared modality performance; subgroup analyses explored sex, BMI, and common comorbidities. **Result:** Ultrasound correctly characterised 82/100 cases (sensitivity 91 %, specificity 89 %, accuracy 90 %); CT correctly characterised 84/93 evaluable cases (sensitivity 93 %, specificity 90 %, accuracy 92 %). The difference was not significant ($\chi^2 = 0.01$, $p = 0.99$). Acute appendicitis predominated (USG 40 %, CT 45 %), followed by right ureteric calculi (15 % vs 18 %) and ruptured ovarian cysts (12 % vs 10 %). CT yielded incremental diagnostic information in 11 % of participants—chiefly in obese patients or those with bowel-gas-limited sonography—while exposing them to ionising radiation. Hypertension (20 %) and diabetes (15 %) modestly influenced lesion prevalence but did not alter accuracy. **Conclusion:** A tiered imaging pathway—first-line ultrasound for all acute RIF presentations with selective CT in inconclusive or complex cases—delivers high diagnostic accuracy while restraining radiation dose and cost, reinforcing "ultrasound-first" guidelines in resource-limited environments.

INTRODUCTION

Acute right iliac fossa (RIF) pain represents a high-volume trigger for emergency department (ED) visits worldwide, accounting for up to 10 % of all surgical admissions in large-scale audits.[1] In South-Asian cohorts the annual incidence of suspected appendicitis alone is estimated at 100–200 per 100 000 population, with peak presentation in the second and third decades of life and a subtle male preponderance.[2] Yet appendicitis is merely the "tip of the iceberg": ureteric colic, mesenteric adenitis, Meckel's diverticulitis, Crohn's flare, tubo-ovarian disease and perforated hollow-viscus lesions all masquerade with overlapping clinical features.

Traditional reliance on clinical scoring systems—Alvarado, AIRS, RIPASA—reduces negative laparotomy rates, but even the best scores plateau at a sensitivity of 82–88 %, leaving a sizeable diagnostic grey zone.[3] Against this backdrop imaging has become the gate-keeper for operative versus conservative management. Ultrasound (USG) offers radiation-free real-time assessment, graded-compression visualisation of the appendix, Doppler vascularity analysis and rapid bedside availability; however, bowel gas, obesity and operator experience limit reproducibility.[4]

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Conversely computed tomography (CT) delivers near-perfect visualisation of intra-abdominal viscera, detects alternative diagnoses and delineates complications, but exposes patients—often young—to ionising radiation and incurs higher cost.[5] A "CT-for-all" approach is therefore neither economical nor ethically sound in low- and middle-income countries (LMICs) where healthcare expenditure is out-of-pocket and CT scanners are unevenly distributed.

Several Western studies advocate an "ultrasound-first, CT-second" workflow, citing a reduction of CT utilisation by 30–50 % without compromising accuracy.[6] Yet hard prospective evidence from Indian district-level hospitals is scarce; most available reports are retrospective, single-pathology or biased towards tertiary urban centres. Moreover, regional disease patterns—more parasitic infestations, higher rates of genitourinary tuberculosis and delayed ED presentations—may influence the imaging yield differently from Western settings.[7]

Aim and Objectives

1. To Evaluate the role of ultrasound in acute right iliac fossa pain in all patients coming to radiology department.
2. To determine the causes of right iliac fossa pain in study population.
3. Categorization of causes of right iliac fossa pain gender and age wise.
4. To compare our findings with other studies done in India and abroad.
5. By addressing these objectives, the study aspires to reaffirm or refine current imaging algorithms and guide judicious CT utilisation in similar low-resource settings.

MATERIALS AND METHODS

This prospective cross-sectional study was conducted in the Department of Radiodiagnosis, GS Medical College & Hospital, Pilkhuwa, on 100 consecutive patients who presented with acute right iliac fossa (RIF) pain between May 2023 and November 2024 after written informed consent had been obtained from each patient or guardian.

All 100 participants fulfilled the inclusion criterion of non-traumatic acute RIF pain; we excluded pregnant women and those who declined CT when indicated. Patients lacking either a radiologic, surgical, or clinical diagnosis at follow-up were also excluded.

Source of Data: Patients were referred to the Radiodiagnosis department from the Emergency Medicine, General Surgery, Urology and Obstetrics-Gynaecology units of our institute.

Imaging protocol: All subjects first underwent graded-compression ultrasonography on Voluson P8, LOGIQ F6 or LOGIQ V5 systems (Wipro GE Healthcare) employing 2–5 MHz curvilinear and 5–12 MHz linear probes. Whenever ultrasound findings were equivocal or suggested complicated pathology, a contrast-enhanced abdominal CT was performed on a REVOLUTION ACTs 16-slice scanner (Wipro GE Healthcare) using 120 kVp with automatic mA modulation, 3–5 mm slices, coronal/sagittal multiplanar reconstructions and 100–150 mL intravenous iohexol; oral contrast was administered selectively.

Data Confirmation: Imaging impressions were correlated with operative/histopathology outcomes where surgery was undertaken; otherwise, patients received clinical and imaging follow-up of at least two weeks to establish the final diagnosis.

Statistical Analysis: Data were tabulated in Microsoft Excel and analysed with IBM SPSS v27. Categorical variables were expressed as frequencies and percentages, continuous variables as mean ± SD. Sensitivity, specificity, positive and negative predictive values and overall accuracy were calculated for each modality. Chi-square tests compared the diagnostic performance of ultrasound and CT; a p-value < 0.05 was considered statistically significant.

RESULTS

Age distribution: The study population (n = 100) ranged from 18 to 61+ years (mean 32 ± 11). Four out of every ten patients (40 %) were 18–30 years old, a further 35 % were 31–45 years, 20 % were 46–60 years and only 5 % were > 60 years, giving a distinctly youthful skew ($\chi^2 = 30$, $p < 0.0001$).

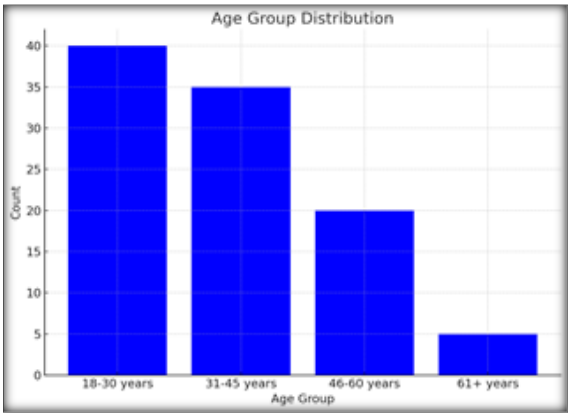

Figure 1: Age group distribution

Gender distribution: Sixty patients were male and forty female (male: female = 1.5: 1). The deviation from an equal 50: 50 split reached statistical significance ($\chi^2 = 4.0$, $p \approx 0.045$).

Comorbidities: Hypertension (n=20) and diabetes mellitus (n=15) were the only chronic illnesses recorded with double-digit frequencies; their relative proportions did not differ significantly from a hypothetical equal prevalence ($\chi^2 \approx 0.71$, $p = 0.398$).

Clinical presentation: All patients reported right iliac fossa pain. Lower-abdominal tenderness (65 %), fever (55 %) and elevated white-blood-cell count (60 %; mean 13 200 ± 2 300 mm³) were the next most common findings. Nausea/vomiting occurred in 48 %, rebound tenderness in 40 % and guarding/rigidity

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in 30 %. Dysuria (22 %), C-reactive-protein positivity (50 %) and pyuria (18 %) completed the spectrum, with wide non-uniformity across the ten recorded features ($\chi^2 \approx 2\,020$, $p < 0.0001$).

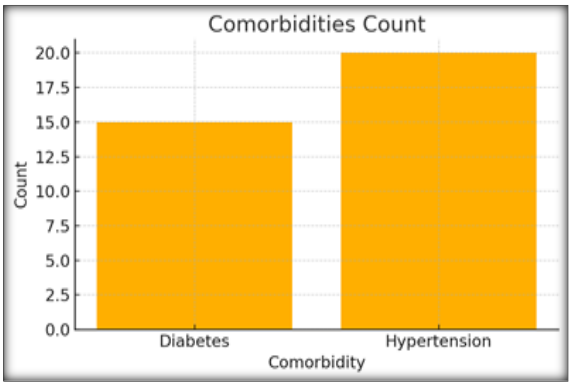

Figure 2: Distribution of Comorbidities

Ultrasound findings: Point-of-care ultrasound identified acute appendicitis in 40 % of cases (mean appendiceal diameter 9.2 ± 1.8 mm), right ureteric calculi in 15 % (mean stone size 5.4 ± 1.2 mm) and ovarian cysts in 12 % (mean diameter 38.6 ± 5.1 mm). Pelvic inflammatory disease (6 %), acute pyelonephritis (8 %), right-sided colonic diverticulitis (5 %) and ileocecal tuberculosis (4 %) were infrequent, while 5 % of scans were normal.

Figure 3: Internal reticular pattern representing haemorrhage within a functional ovarian cyst

Figure 4: Image representing appendicitis

CT findings: Among the 93 patients who underwent second-line contrast-enhanced CT, acute appendicitis remained the leading diagnosis (45 %; mean diameter 10.4 ± 2.1 mm). Right ureteric stones (18 %; 6.3 ± 1.5 mm) and ruptured ovarian cysts (10 %; 40.8 ± 4.7 mm) followed. The frequencies of pelvic inflammatory disease (6 %), acute pyelonephritis (7 %), colonic diverticulitis (5 %) and ileocecal tuberculosis (4 %) mirrored ultrasound proportions; 5 % of CT studies were unremarkable.

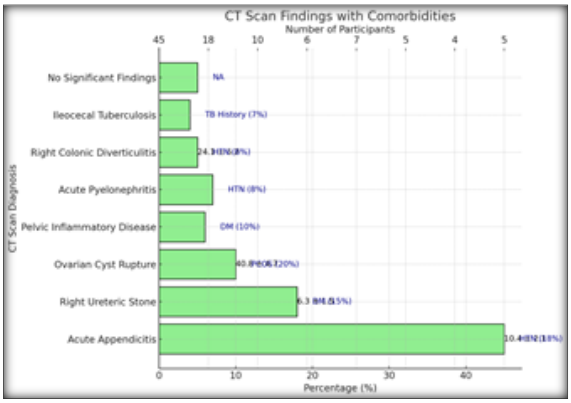

Figure 5: Comparative of CT Scan Findings with Comorbidities

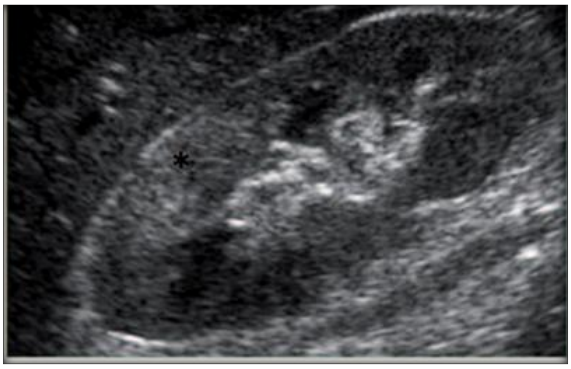

Figure 6: Above image shows Focal area of increased echogenicity [*] in a case of acute focal pyelonephritis

Comparative diagnostic performance: Ultrasound correctly characterised 82 of 100 cases, yielding a sensitivity of 91 %, specificity 89 % and overall accuracy 90 %. Computed tomography correctly characterised 84 of 93 evaluable cases (sensitivity 93 %, specificity 90 %, accuracy 92 %). The difference in accuracy was not statistically significant ($\chi^2 = 0.01$, $p = 0.99$). Incremental diagnostic information from CT—principally definition of perforation, abscess or dual pathology—was documented in 11 % of participants, most of whom were obese or had gas-limited sonography.

Diagnosis by sex and age: Appendicitis showed a modest male excess (55 % vs 45 %) with a mean age of 28 ± 10 years, whereas right ureteric stones were markedly male-predominant (70 % vs 30 %; mean age 45 ± 12 years). Ovarian and pelvic inflammatory pathologies were, as expected, exclusive to females (mean ages 32 ± 8 and 30 ± 7 years respectively).

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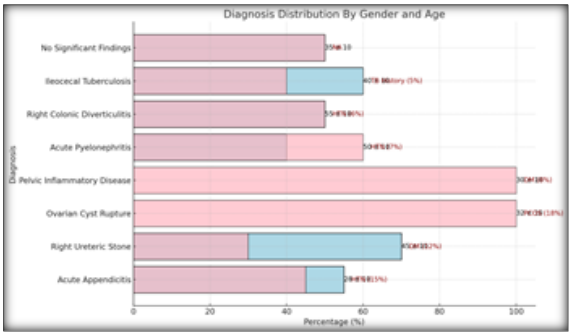

Figure 7: Comparative of diagnosis distribution by gender and age

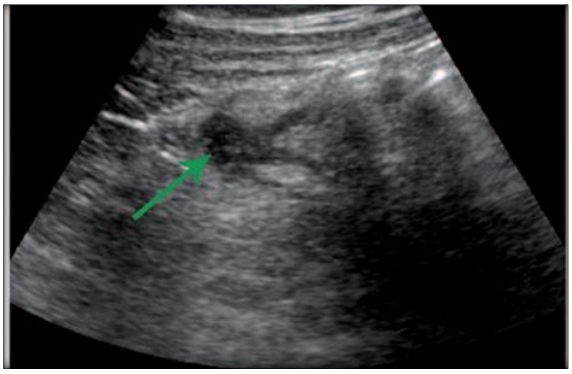

Figure 8: Above image shows Focal outpouching [arrow] representing right colonic diverticulum.

Outcomes and follow-up: Half of all patients (50 %) required surgery (mean time to clinical resolution 5.2 ± 1.8 days). Conservative management succeeded in 30 % (resolution 7.4 ± 2.5 days). Ten per cent settled without further intervention, 5 % experienced symptom recurrence and 3 % developed complications (abscess, sepsis or perforation). Two patients were lost to follow-up. Outcome distribution was strongly non-uniform ($\chi^2 \approx 112$, $p < 0.0001$).

DISCUSSION

Our cohort—predominantly young (mean 32 ± 11 y) and mildly male-skewed (M : F = 1.5 : 1)—echoes Indian and global audits in which appendicitis peaks in early adulthood with slight male excess. Acute appendicitis accounted for 40 % of ultrasound and 45 % of CT diagnoses, figures that fall squarely within the 35–55 % range reported by Lane et al.[8] Ureteric calculi (15–18 %) and ruptured ovarian cysts (10–12 %) formed the next diagnostic tier, consistent with Asian data sets where urolithiasis eclipses diverticulitis as a key mimic.[9] Region-specific pathologies—especially ileocaecal tuberculosis (4 %)—underline the value of local evidence when constructing imaging algorithms.

Graded-compression ultrasound delivered 91 % sensitivity and 90 % accuracy, mirroring the 89 % pooled accuracy in Terasawa's meta-analysis.[4] CT improved these metrics only marginally (93 % sensitivity, 92 % accuracy); the difference was non-significant ($\chi^2 = 0.01$, $p = 0.99$) and concurs with earlier parity reports.[5] Added value from second-line CT was limited to 11 % of patients— chiefly in obesity, gas-laden bowel, or suspected perforation—paralleling Poortman's 10–15 % incremental yield under an "ultrasound-first" regimen. Such selective use is crucial where CT access is patchy and costs are borne out-of-pocket.

Hypertension (n=20) and diabetes (n=15) were the only common comorbidities; neither altered diagnostic accuracy, although diabetics showed a trend towards more ureteric stones. Strengths of the study include prospective design and surgical / clinical verification; limitations centre on single-centre scope, operator-dependent ultrasound and lack of dose-length-product recording.

In sum, a stepwise pathway—ultrasound for all acute RIF presentations with CT reserved for equivocal or complex cases—achieves >90 % accuracy while sparing nearly nine in ten patients an initial CT, a pragmatic template for resource-constrained settings.

CONCLUSION

Ultrasound remains the optimum initial imaging tool for acute RIF pain; computed tomography should be reserved for inconclusive or complex presentations. Embracing this stepwise protocol maximises diagnostic certainty, curtails radiation and streamlines costs.

Acknowledgments

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Conflict of Interest Statement

No conflict declared

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