

ORIGINAL RESEARCH PAPER		Radiology
MULTIMODAL IMAGING IN CERVICAL CANCER: CASE REPORTS WITH MRI AND PELVIC ULTRASONOGRAPHY		KEY WORDS: Cervical cancer, MRI, Ultrasound, FIGO staging.
Dr. Sayeed Anwar Alam*	Junior Resident, F H Medical College and Hospital*Corresponding Author	
Dr. Sajid Khan	Junior Resident, F H Medical College and Hospital	
Dr. Nausheen Khan	Junior Resident, F H Medical College and Hospital	
Dr. Sandeep Maddheshiya	Junior Resident, F H Medical College and Hospital	
Dr. Hassan Unais	Junior Resident, F H Medical College and Hospital	
ABSTRACT	Cervical cancer remains a major global health issue, especially in developing countries where access to screening and early diagnostic services is limited. Accurate assessment of tumor extent is essential for proper staging, prognosis, and treatment planning. Imaging plays a key role, with magnetic resonance imaging (MRI) considered the gold standard for local staging due to its superior soft tissue resolution. Pelvic ultrasound, particularly transvaginal or transrectal, is a cost-effective, accessible, and non-invasive tool for initial evaluation of suspected cervical lesions. This case series discusses two women who presented with lower abdominal pain, abnormal vaginal discharge, and menstrual irregularities. Ultrasound identified suspicious cervical lesions with heterogeneous echotexture and internal vascularity. MRI further characterized the masses, showing features such as parametrial invasion, pelvic extension, and iliac lymphadenopathy. One case was staged as FIGO Stage IIB, the other as likely Stage IIIB. This series underscores the value of combining ultrasound and MRI for accurate diagnosis, staging, and tailored treatment planning.	
INTRODUCTION	Cervical cancer is the fourth most common cancer in women worldwide, with high morbidity and mortality, particularly in developing countries due to limited access to early screening and diagnosis. Accurate assessment of tumor extent is essential for staging, prognosis, and treatment planning. Imaging plays a crucial role, with magnetic resonance imaging (MRI) and pelvic ultrasonography serving as complementary tools.[1,2] MRI is considered the gold standard for local staging due to its superior soft tissue contrast, enabling detailed evaluation of tumor size, parametrial invasion, pelvic wall involvement, and lymph node status. Pelvic ultrasonography, especially transvaginal and transrectal approaches, offers a cost-effective, non-invasive, and accessible method for detecting cervical masses, evaluating adjacent structures, and guiding biopsies. Although operator-dependent, it is valuable in initial assessment.[3,4] Multimodal imaging—combining MRI and ultrasound—improves diagnostic precision and staging accuracy. This case series highlights clinical scenarios where both modalities played a pivotal role in the diagnosis and management of cervical cancer. significantly, a relatively well-defined heterogeneously hypoechoic mass lesion measuring approximately 5.4 x 4.4 x 4.1 cm was visualized arising from the posterior cervix. This mass demonstrated internal vascularity, raising concern for a neoplastic process such as carcinoma cervix. To further characterize the lesion, a contrast-enhanced MRI of the pelvis was advised. MRI pelvis revealed a bulky cervix with a lobulated infiltrative mass measuring approximately 60 x 42 x 45 mm, extending into the lower uterine body and encroaching upon the endocervical canal. The inferior cervical lip projected into the canal. A fluid-fluid level in the endometrial cavity indicated hemorrhage, suggestive of hematopyometra. The lesion appeared hypointense on T1 and T2 images with cystic necrotic areas and showed restricted diffusion, reflecting aggressive tumor characteristics. The cervical wall was infiltrated with loss of the stromal rim, confirming parametrial invasion, predominantly on the left. The mass extended into the upper vagina with an ill-defined posterior vaginal wall and showed focal loss of fat planes with the anterior rectal wall, raising suspicion for rectal invasion. Anteriorly, the tumor indented the bladder base without bladder wall breach. A 16x15 mm iso- to hypointense lesion near the right pelvic wall was suggestive of a metastatic right iliac lymph node. The right ovary was normal in size, while the left was bulky with multiple follicles. Free fluid in the pelvis indicated ascites, and increased parametrial vascularity was noted. Pelvic bones and soft tissues were unremarkable. Findings suggest cervical carcinoma with local and regional spread, consistent with FIGO Stage IIB. Histopathology was recommended.	
CASE PRESENTATION	Case 1 A 37-year-old female presented to the gynecology outpatient department with complaints of persistent lower abdominal pain for the past two years. She reported profuse white vaginal discharge for the last one and a half years, accompanied by irregular menstruation of similar duration. Additionally, she experienced dyspareunia (painful sexual intercourse) for the past year. These chronic symptoms raised clinical suspicion for an underlying gynecological pathology, prompting further evaluation. An ultrasound of the whole abdomen was performed, which revealed multiple renal calculi in both kidneys, with the largest stones measuring 4.8 mm in the mid-pole of the right kidney and 5.6 mm in the mid-pole of the left kidney. More	

Figure 1. Ultrasound showing a 5.4×4.4×4.1 cm heterogeneously hypoechoic mass from the posterior cervix.



Figure 2. MRI pelvis with DWI and ADC mapping for pelvic mass evaluation.

Case 2

A 40-year-old female, presented to the gynecology outpatient department with complaints of lower abdominal pain persisting for the past one year. The pain was associated with increased menstrual bleeding and dysmenorrhea over the same duration. Additionally, she reported white vaginal discharge for the last nine months, and for the past six months, she had been experiencing low-grade fever along with unintentional weight loss. These chronic and progressively worsening symptoms raised suspicion of an underlying gynecological pathology, potentially neoplastic in nature.

An ultrasound of the whole abdomen conducted on 05-05-2025 revealed a relatively well-defined heterogeneously isoechoic space-occupying lesion measuring approximately 4.0 x 3.8 cm, arising from the posterolateral wall of the cervix. The uterus and both ovaries appeared normal in shape, size, and echotexture, with no evidence of adnexal mass. These findings prompted further imaging, and a contrast-enhanced MRI pelvis was advised for better lesion characterization and assessment of spread.

MRI pelvis with contrast revealed a bulky cervix with a lobulated, infiltrative mass predominantly on the right side. The lesion extended into the cervical canal, effaced the fornix, and mildly involved the lower uterine body, measuring 48.5 × 46.5 × 42.5 mm. It appeared mildly hyperintense on T2-weighted and STIR images, showed restricted diffusion, and demonstrated mild to moderate enhancement post-contrast. The mass infiltrated the cervical wall with an ill-defined stromal rim on the right, indicating right-sided parametrial invasion. There was contiguous extension into the lower uterine segment, particularly the anterior right lateral wall, encroaching upon the endometrial canal without significant hydrometra. The remaining myometrium and junctional zone appeared preserved. The left ovary was bulky with multiple follicles and a focal T2 hypointense area showing restricted diffusion and mild enhancement, possibly hemorrhagic. Free pelvic fluid and prominent parametrial vascularity were noted. Enlarged contrast-enhancing iliac lymph nodes were present bilaterally (right: 14×5 mm; left: 11×7 mm). The urinary bladder, pelvic bones, and soft tissues appeared normal. These findings are suggestive of a mitotic cervical mass with right parametrial invasion and iliac lymphadenopathy, consistent with cervical carcinoma. Histopathological examination was recommended for confirmation and accurate disease staging.



Figure 3. Ultrasound shows 4.0×3.8 cm heterogeneously isoechoic lesion from cervix posterolateral wall.



Figure 4. MRI Pelvis with T2-Weighted, STIR, and DWI Sequences for Evaluation of Pelvic Mass

DISCUSSION

Cervical cancer remains a leading gynecological malignancy, especially in low-resource settings with limited screening. Imaging modalities like MRI and pelvic ultrasound are essential for diagnosis, staging, and treatment planning. These case reports demonstrate the value of multimodal imaging in assessing tumor extent and nodal involvement per FIGO staging guidelines.

MRI is the preferred imaging modality for local staging of cervical cancer due to its excellent soft tissue contrast and multiplanar imaging. In the discussed cases, T2-weighted images effectively depicted cervical masses, parametrial invasion, and surrounding organ involvement. One case suggested Stage IIB with parametrial extension, while the other indicated possible pelvic sidewall involvement consistent with Stage IIIB. These findings are crucial, as staging influences treatment strategy—shifting from surgical intervention to primary chemoradiation in advanced stages for optimal patient management. According to the latest ESUR (European Society of Urogenital Radiology) guidelines, MRI is preferred for accurate local staging and evaluating tumor size, stromal invasion, and parametrial spread.[5] Pelvic ultrasound, though operator-dependent, is a cost-effective and accessible tool for detecting cervical masses, especially in resource-limited settings. It aids in evaluating uterine and adnexal pathology and guiding biopsies. In our cases, ultrasound raised initial suspicion, later confirmed and detailed by MRI, supporting its diagnostic value.[6,7]

In both cases, loss of normal cervical stroma and hypointense cervical mass on T2-weighted MRI, along with irregular margins and parametrial fat infiltration, indicated invasive carcinoma. Furthermore, DWI and apparent diffusion coefficient (ADC) maps provided additional functional information by highlighting areas of restricted diffusion, which correlate with high cellularity and aggressiveness of the tumor. A low ADC value is typically associated with poor prognosis and greater tumor aggressiveness.[8] These findings reinforce the role of functional MRI sequences in the evaluation of cervical cancer, especially when planning fertility-sparing surgeries or radiotherapy.

Moreover, detection of pelvic or para-aortic lymphadenopathy has significant implications for prognosis and treatment. Although MRI can detect enlarged nodes, its ability to distinguish reactive from metastatic nodes is limited. Positron Emission Tomography (PET) and Computed Tomography (CT), which was not performed in these cases, may offer superior sensitivity and specificity in identifying metabolically active nodal metastases, as supported by a meta-analysis by Ruan J et al. (2018),[9] indicating its emerging role in comprehensive cancer staging.

Assessment of adjacent organ invasion, such as bladder or rectum, is crucial in staging cervical cancer. MRI, with 80–95% accuracy, detects fat plane disruption and signal changes, aiding FIGO Stage IVA classification, which significantly

impacts prognosis and treatment planning in advanced disease.[10]

CONCLUSION

In conclusion, multimodal imaging combining ultrasound and MRI enhances the accuracy of diagnosis, staging, and management of cervical carcinoma. While ultrasound offers a valuable initial assessment, especially in low-resource settings, MRI provides a more comprehensive evaluation of tumor extent and local invasion. These imaging findings correlate strongly with histopathological features and clinical stage, guiding appropriate therapeutic decisions. As cervical cancer treatment becomes increasingly individualized, the role of advanced imaging will continue to expand.

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