Original Article

International Journal of Dental and Health Sciences
Volume 04,Issue 05

THE ROLE OF RADIOLOGICAL IMAGING IN PROSTATIC ADENOCARCINOMA

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ABSTRACT:

Objective: to note the findings on radiological imaging in patients with Prostatic Adenocarcinoma as well as a determination of the advantages and limitations of one imaging modality over the other in the diagnosis of Prostatic Adenocarcinoma.

Methods: a retrospective study was done (n = 56) (MRI: 14, CT: 16, MRI and CT: 26) ranges 46 to 87 years suspected Prostatic Adenocarcinoma based on elevated PSA level and clinical presentation.

Results: The age interval 61-80 years accounted for most of the patients 60.6 %. MRI has found to be having better soft tissue resolution and better in evaluation of lymph node metastasis, bladder wall invasion, seminal vesicle invasion and extracapsular extension as compared to CT, further anatomical imaging of MRI increase accuracy in detection of Prostatic Adenocarcinoma (i.e. prostate zone anatomy), CT found to be lacking in this regard.

Conclusion: Though the CT has less value in demonstrating in extracapsular spread and lymph node metastasis as compared to MRI, it is still significant in evaluating bone metastasis in Prostatic Adenocarcinoma. Both CT and MRI have significance in the evaluation of Prostatic Adenocarcinoma but MRI found to be better and confirmatory for the final diagnosis of Prostatic Adenocarcinoma.

Keywords: Prostatic Adenocarcinoma; computed tomography (CT); magnetic resonance imaging (MRI); radiological imaging.

INTRODUCTION:

Prostatic Adenocarcinoma is the most common non-cutaneous cancer and the second most common cause of cancer death in American men. The American cancer society estimates that in 2003, 220,900 new cases of Prostatic Adenocarcinoma will have been Identified [2]. Prostatic Adenocarcinoma is usually suspected because of an abnormal digital rectal examination or an elevated level of serum prostate-specific antigen (PSA). The American Cancer Society recommendations for the annual cancer prevention check-up include digital rectal examination and serum PSA testing for men older than 50 years or for younger men at increased risk (black race or family history of Prostatic Adenocarcinoma).[1] Imaging for Prostatic Adenocarcinoma can serve several clinical goals. First, it can assist in assessing the primary or recurrent tumor within the prostate gland, as well as tumor size, multimodality, extracapsular extension, seminal vesicle extension, neurovascular bundle involvement, and bladder involvement. second, imaging can be used to assess' metastatic disease such as spread to lymph nodes and bones, Third, imaging is used to guide interventions such as prostate biopsies or CT-guided biopsy of suspicious lymph nodes. Fourth, functional or metabolic Imaging could potentially assess tumor aggressiveness or other parameters that correlate with the outcome.[3]

MATERIALS AND METHODS:

2.1 Standard Protocol, Approval and Consent

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Study was approved and reviewed by the Hubei University of Medicine, Shiyan, Hubei, P. R. China. Before including the patients in our study, primarily purpose was explained to them and a verbal consent was taken, then written consent was taken from each patient. Those agreed to give written consent were included in this study. There was no financial involvement.

2.2 Methods

This is a retrospective study done on cases (n = 56) between 46 to 87 years of age suspected of having Prostatic Adenocarcinoma based on clinical presentation and abnormal elevation PSA level over period of one year. Out of 56 patients, CT alone was done for 16 patients, MRI alone for 14 patients and both CT and MRI for remaining 26 patients was done.

MRI and CT: Patient exclusion criteria were contraindicated in MR imaging (e.g., cardiac pacemaker, intracranial vascular clips). MRI were performed on a General Electric discovery 750 3 Tesla MRI system using body surface coil. initially, T1-weighted (repetition time, 300~600 ms; echo time, 15~100 ms; thickness, 8 mm); T1W1: FSE. T2-weighted (repetition time, 2500~5000 ms; echo time, 100~150 ms; thickness, 5mm). T2W1 :(AXL, SAG, COR). FOV:40 cm; matrix,320 × 256; interval time:2; number of excitation NEX, T1W1:1, T2W1:4 done from level of iliac crest to pubic symphysis. All CT were performed on General Electric optima CT 660. Scan parameters: thickness 3mm; screw-pitch, 1.375:1; interval:3mm; tube voltages:120 KV 350 mA; matrix:512 × 512; FOV:45cm; contrast agent: iohexol,75-90 ml; flow rate 3ml/s.

RESUTS:

The Mean age of patients was 66.9 years with range of 46_87 years. The age interval, 61_80 years accounted for most of patients 60.6 %.

Figure 1: *Patients Age Distribution.*

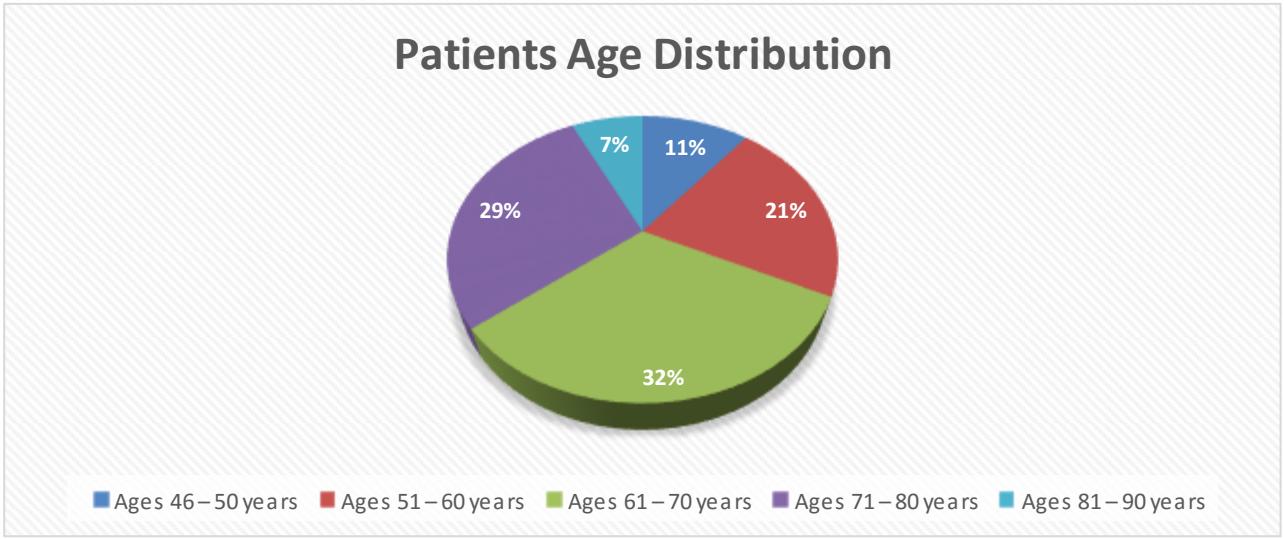
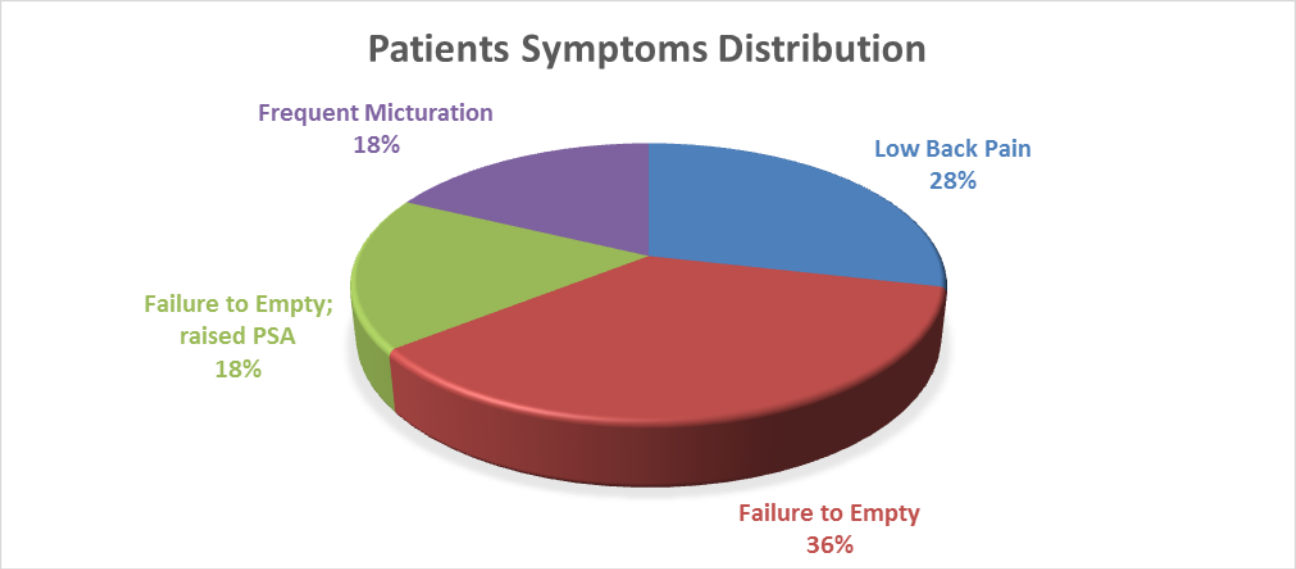


Figure 2: *Patients Symptoms Distribution.*



3.1 CT Findings

Out of 56 patients, CT was performed for 42 patients. The size of the prostate was assessed in 42 cases in whom 26 patients shown increased size and remaining 16 patients had a normal size. Out of 42 patients, the density of tumor was isodense in 30 patients and hyperdense in 12 patients. Contrast enhancement was done in 24 patients out of 42. An extracapsular extension has seen 20 patients, seminal vesicle invasion was seen in 18 patients and bladder wall invasion was seen in only 8 patients. Bone metastasis was seen in 38 patients out of 42 patients and is the most common findings on CT. out of these 38 patients, pelvic bone metastasis was seen in 8 patients, both pelvic bone and sacral bone metastasis was seen in 12 patients, pelvic, sacral and femur bone metastasis together was seen in 8 patients, both femur and ischium bone metastasis was seen 4 patients and both pelvic and femur bone metastasis was seen in 6 patients (see Table 1). Pelvic lymph node metastasis was seen in 18 patients out of 42 CT patients.

Table 1: *CT Findings*

		Number of Patients (%)
Size of prostate	Increased	26 (61.9%)
	Normal	16 (38.1%)
Density of tumor	Hyperdense	12 (28.5%)
	Isodense	30 (71.5%)
Contrast enhancement		24 (57.1%).
Extracapsular extension		20 (47.6%)
Seminal vesicle invasion		18 (42.8%)
Bladder wall invasion		8 (19%)

Bone metastasis		38 (90.4%)
	Pelvic bone	8 (21%)
	Pelvic and sacral bone	12 (31.5%)
	Pelvic, sacral and femur	8 (21%)
	Femur and ischium	4 (10.5%)
	Pelvic and femur	6 (15.7%)
lymph node metastasis	Pelvic lymph nodes	18 (42.8%)

3.2 MRI Findings

Out of 56 patients, MRI was performed for 40 patients. The size of the prostate was assessed in 40 cases in whom 36 patients shown increased size and remaining 4 patients had a normal size. Out 40 patients, the intensity of tumor was isointense in 38 patients and hyperintense in only one patient in T1W1. Out of 40 patients, in 30 patient's tumors was located in peripheral zone and in 10 patients it was located in transition zone seen in T2W1.out of these 30 patients in which tumor is located in the peripheral zone, the intensity of tumor was hypointense in 22 patients, isointense in 6 patients and hyperintense in 2 patients. Out of 10 patients in which tumor was localized in the transition zone, the intensity of tumor was hyperintense in 6 patients and hypointense in 4 patients (see Table 2). The extracapsular extension was seen in 32 patients out of 40 patients, seminal vesicle invasion was seen in 28 patients and bladder wall invasion was seen, 26 patients. Bone metastasis was seen in 28 patients out of 40 patients. out of these 28 patients, pelvic bone metastasis was seen 8 patients, pelvic, sacral and femur bone metastasis together seen in 4 patients, both pelvic and femur bone metastasis seen in 6 patients, ischium bone metastasis seen in 2 patents, iliac bone metastasis seen in 4 patients, both iliac and sacral bone metastasis seen in 4 patients (see Table 2). Pelvic lymph node metastasis was seen in 32 patients out 40 patients.

Table 2: *MRI Findings*

		Number of patients (%)
Size of prostate	Increased	36 (90%)
	Normal	4 (10%)
T1W1	Hyperintense signal	2 (5%)
	Isointense signal	38 (95%)
T2W1		-
Tumor location		-
Peripheral zone (Pz)		30 (75%)
	Hyperintense signal	2 (6.6%)
	Hypointense signal	22 (73.3%)
	Isointense signal	6 (20%)
Transition zone (Tz)		10 (25%)
	Hyperintens signal	6 (60%)

	Hypointense signal	4 (40%)
Extracapsular extension		32 (80%)
Seminal vesicle invasion		28 (70%)
Bladder wall invasion		26 (65%)
Bone metastasis		28 (70%)
	Pelvic bone	8 (28.6%)
	Pelvic, sacral, femur	4 (14.3%)
	Pelvic, femur	6 (21.4%)
	Ischium	2 (7.1%)
	Iliac bone	4 (14.3%)
	Iliac, sacral	4 (14.3%)
Lymph node metastasis	Pelvic lymph node	32 (80%)

DISCUSSION:

Our study includes 56 patients and the mean age was 66.9 years (age range 46 to 87 years) which is comparable to that reported by Rifkin et al which includes 239 patients and the mean age was 60.8 years (age range 40 to 76).[4] The majority of patients were in 61 to 80 years' age group who represented 60.6 % of total patients. The majority of patients 35.7 % are presented with the symptom of the failure to empty bladder.

MRI was done in 40 patients out of 56 patients in our study, prostate size was enlarged in 36 patients (90 %) out of 40 patients which are comparable to that reported by Bryan et al which shown enlargement in 18 out 18 patients (100%).[5] In our study 75% of the tumor was localized in the peripheral zone, 25% in central zone as compared to 70% in the peripheral zone, 20 % in the transition zone and 10% in central zone revealed in the study by Hedvig Hricak et al.[6] Extracapsular extension of a tumor was seen in 80% of patients in our study which was more as compared to only 65 % in the study done by Bezzi et al.[7] Seminal vesicle invasion was seen in 70 % of patients in our study which was much more than only 27.7 % of patients having seminal vesicle invasion noted by Bryan et al.[5] Our study revealed 65% of patients having bladder wall invasion as to compared 33.3% of patients having bladder wall invasion revealed in study by Bryan et al.[5] Lymph node metastasis was seen in 80 % of patients in our study which was more as compared to 55.5 % of patients with lymph metastasis noted by Bryan et al.[5]

CT was done for 42 patients out of 56 patients. Prostate size was enlarged in 61.9% patients. In our study Bladder wall invasion was seen in only 19 % patients, extracapsular extension of a tumor was seen in 47.6 % patients and seminal vesicle invasion was seen in 42.8 % patients. Barchetti F et al revealed in his study that CT is primarily used to assess

for metastatic disease. As CT relies on anatomic changes, such as enlargement or altered morphology, it is insensitive for lymph node metastasis in Prostatic Adenocarcinoma and CT can be useful in evaluation for bone metastases in high-risk patients which is comparable our study which shown enlargement of prostate in 61.9 % patients, lymph metastasis in only 42.8 % patients and bone metastasis in 90.4 % patients.[8] The extracapsular extension was seen in 32 patients out of 40 patients, seminal vesicle invasion was seen in 28 patients and bladder wall invasion was seen, 26 patients. Bone metastasis was seen in 28 patients out of 40 patients. out of these 28 patients, pelvic bone metastasis was seen 8 patients, pelvic, sacral and femur bone metastasis together seen in 4 patients, both pelvic and femur bone metastasis seen in 6 patients, ischium bone metastasis seen in 2 patients, iliac bone metastasis seen in 4 patients, both iliac and sacral bone metastasis seen in 4 patients (see Table 2). Pelvic lymph node metastasis was seen in 32 patients out 40 patients.

CONCLUSION:

MRI has found to be having better soft tissue resolution and better in evaluation of lymph node metastasis, bladder wall invasion, seminal vesicle invasion and extracapsular extension as compared to CT, further anatomical imaging of MRI increase accuracy in detection of Prostatic Adenocarcinoma (e.g prostate zone anatomy), CT found to be lacking in this regard So MRI found to be better and the investigation of choice for diagnosis, evaluation and estimation of severity of Prostatic Adenocarcinoma in comparison of CT. Though the CT has less value in demonstrating in extracapsular spread and lymph node metastasis as compared to MRI, it is still significant in evaluating bone metastasis in Prostatic Adenocarcinoma. So, we can come to this conclusion that, both the CT and MRI have significance in the evaluation of Prostatic Adenocarcinoma but MRI found to better and confirmatory for final diagnosis of Prostatic Adenocarcinoma according to our study that we have done here.

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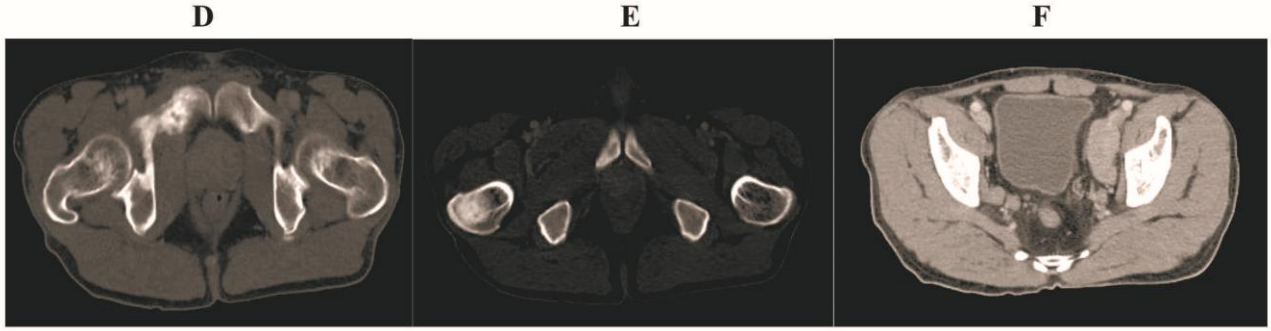
FIGURES:

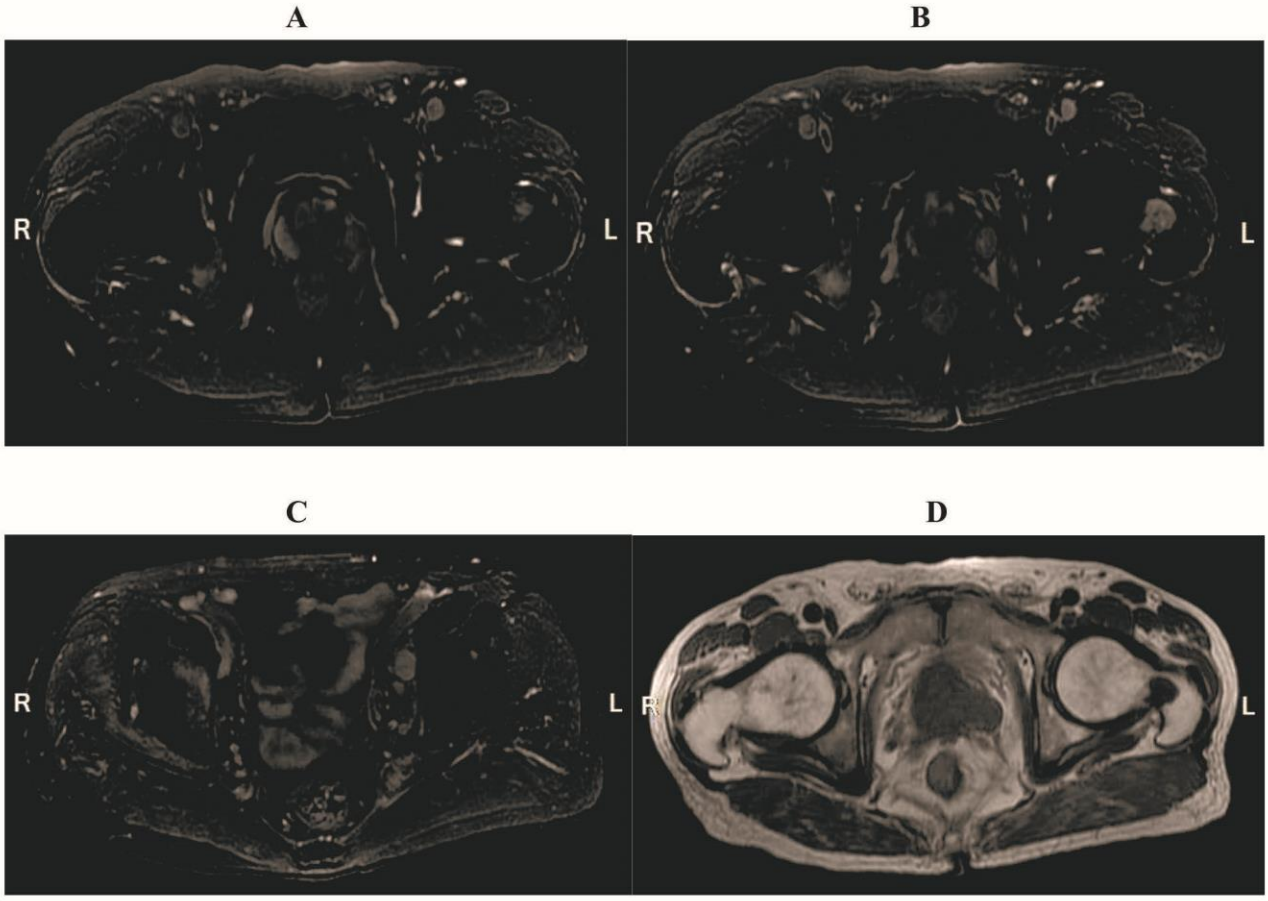
Appendix Figure 1: *CT Images*

Images (A-C): *Size of prostate is increased, isodense and bladder wall invasion.*

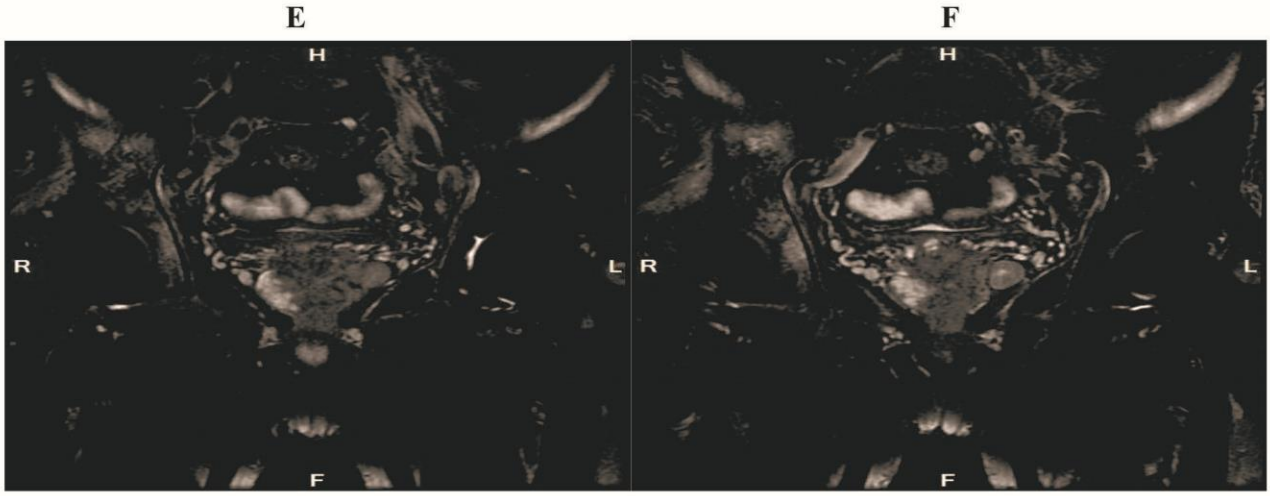
Images (D-E): *Bone metastasis*; ***Image (F):*** *Lymph node metastasis.*



Appendix Figure 2: **MRI Images:**
Images (A-C): *AXL fs T2WI;* ***Image (D):*** *AXL T1WI.*



Images (E-F): *COR fs T2WI.*
Lesion is high signal intensity on T2WI *(see Images E-F)*, bone metastasis was shown *(see Image E)*.



Tumor location: *Left peripheral zone, lesion is high signal intensity on T2WI (see Images A-B) and isointense signal on T1WI (see Image D). Lymph node metastasis were shown (see Image C). Bone metastasis was shown (see Images A-B and D).*