Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 07, 2022

Endometrial Cancer: Collaboration of Preoperative Imaging with Postoperatal Myometrial Depth of Invasion and Pelvic Lymph Nodal Metastases

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Abstract

Background: To compare preoperative CT/MRI imaging results with the depth of myometrial invasion and the integrity of the pelvic lymph nodes in endometrial cancer patients. To evaluate the postoperative HPE in endometrial cancer with the depth of myometrial invasion seen on preoperative CT/MRI imaging. To study the sensitivity and specificity of CT/MRI preoperative imaging in identifying endometrial cancer pelvic lymph node metastases. To examine pelvic lymph node metastases in endometrial cancer with histopathological criteria including grade and tumour type. **Martial and Methods**: A Single descriptive study was performed from January 2021 to October 2021 at Department of Surgical Oncology, Nizam's institute of medical sciences, Hyderabad, Telangana, India. 40 patients diagnosed with endometrial cancer were taken in study for evaluating preoperative imaging results with the depth of myometrial invasion and pelvic lymph node status after surgery for endometrial cancer. **Results**: CT of myometrial invasion indicated 81.2% patients had thickening of the endometrium and 18.8% had myometrial invasion, while only 6.3% of patients had pelvic lymph node involvement. Only 12.5% of patients experience pelvic lymph node metastases. In postoperative histopathological specimens, majority i.e 72.5% had tumours with myometrial invasion less than half. When contrasted to postoperative histology and MRI results, myometrial depth of invasion was shown to be statistically insignificant (Fischer's exact test, P = 1.0; statistically insignificant). CT offers a 50% sensitivity and 100% specificity for detecting pelvic lymph node metastases. (Fischer's exact test, P -1.0) There was no statistically significant connection between postoperative histology and CT invasion depth. Preoperative and postoperative histology were correlated, and the latter exhibited significance with a p value of 0.0001. **Conclusion**: Findings of our investigation presented strong correlation between lymph nodal metastases and both preoperative and postoperative histology. CT has superior sensitivity for nodal metastases while MRI has marginally better sensitivity than CT for detecting deep myometrial invasion. CT and MRI may guide us in deciding whether to undertake a bilateral pelvic lymph node dissection, but the study's small sample size makes more research necessary. In order to provide the patient with the best oncological treatment with the least amount of morbidity, further procedures

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 07, 2022

such as transvaginal ultrasonography, hysteroscopy, and sentinel lymph node biopsy must be investigated.

Keywords: Magnetic Resonance Imaging, Computed Tomography, Myometrial invasion.

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Introduction

One of most prevalent gynaecological malignancy and the fourth most frequently diagnosed cancer in women in the United States of America is endometrial cancer. The incidence is rising as menopause ages and obesity rates rise. Endometrial cancer is typically diagnosed when a woman is 61 years old.

Endometrial cancer prognosis and risk of lymph node metastases are influenced by a variety of variables, such as tumour stage, myometrial invasion depth, cervical invasion, lymph vascular invasion, histologic grade, histologic type, and many more.[1,2,3] Lymph node metastases are seen in 20% of patients with endometrial cancer that has spread outside of the uterus (stages II & IIIA-B) and 10% of patients with clinical stage I illness. Therefore, excision of the pelvic and para-aortic lymph nodes has been advised as a component of a thorough surgical staging that also includes bilateral salpingo-oophorectomy and total hysterectomy.[4,5] Despite the fact that retrospective studies have demonstrated the therapeutic effectiveness of pelvic lymph node dissection, this procedure remains the only technique to completely stage the disease and identify patients who would probably benefit from adjuvant therapy. Preoperative imaging is beneficial for patients with suspected extrauterine disease because it enables localised disease staging, the detection of questionable lymph nodes, and the detection of distant metastasis. Cross-sectional imaging methods, such contrast-enhanced computed tomography and magnetic resonance imaging, are complementary approaches for the surgical evaluation of endometrial cancer and are crucial for the diagnosis of the condition both before and after therapy. When choosing a course of treatment for endometrial cancer, magnetic resonance imaging is an effective imaging tool. MRI is a better tool for determining the extent of lymph node metastases, cervical extension, and myometrial invasion.[5,6]

MRI should be the preferable imaging modality for treatment planning, when available, according to the American College of Radiology's (ACR) appropriateness criteria, as it allows for the best overall assessment of the disease. Endometrial cancer is classified into low risk, intermediate risk, high risk, advanced, and metastatic cancer based on FIGO staging of endometrial cancer, grade of endometrioid cancer, depth of myometrial invasion, and presence or absence of lymphoma.[6,7] For pre-surgical and loco-regional staging of endometrial cancer, contrast-enhanced magnetic resonance imaging is an excellent imaging technique. A previous meta-analysis revealed that dynamic contrast-enhanced MRI has a higher diagnostic performance for myometrial invasion than CT or trans-vaginal ultrasound, despite reports that contrast enhanced-CT scans are more sensitive than MRIs for the detection of retroperitoneal lymph node involvement.[8,9]

Although CT provides a greater multiplanar spatial resolution, it is still effective for viewing the entire pelvic and abdominal cavity for enlarged nodes, extra uterine dissemination, and patients with high grade histology and deep myometrial invasion. An endometrioid tumour with low grade histology, a small tumour, and no deep myometrial invasion carries a negligibly low risk of lymphatic dissemination. Most endometrial cancer patients today are managed surgically, usually with a straight forward hysterectomy, bilateral salpingo-oophorectomy, peritoneal cytology, and evaluation of the local lymph nodes. The two main

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 07, 2022

predictors of recurrence are lymph vascular invasion and lymph node status. The degree of tumour infiltration is directly correlated with lymph node metastases. Therefore, in order to best design adjuvant therapy and decrease local and distant recurrences, the nodal status of the patient must be determined.[9]

Accurate disease staging at the time of diagnosis preoperatively and starting the appropriate treatment plan without adding to morbidity are two of the most crucial components of successful patient management for endometrial cancer. Recent clinical data collection enables us to categorise patients into low and high-risk groups based on intraoperative results, allowing the clinician to determine which patients require lymphadenectomies.[9,10] It is generally recognised that lymphadenectomy may be linked to an increased risk of sequelae such lymphedema, chylous ascites, deep vein thrombosis, ureteric injuries, visceral injuries, and ureteric injuries. The application of a preoperative strategy for risk assessment could enhance patient staging and lower morbidity associated with lymphadenectomy. Even so, it is very challenging to accurately quantify the depth of a tumour using preoperative imaging.

Material and Methods

A Single institutional observational descriptive study was performed on 40 patients with endometrial cancer as per inclusion and exclusion criteria. Informed consent was taken from the patients. Ethical clearance from institute's ethics board was taken.

Preoperative histologic type and grade, as well as imaging findings of depth of myometrial invasion and pelvic lymph node metastases on contrast enhanced CT or MRI abdomen and pelvis, were taken into consideration after clinical examination of the prospectively recruited patients.

Patients had surgical staging after receiving their diagnosis, which included a total abdominal hysterectomy, bilateral salpingo-oophorectomy, bilateral pelvic lymphadenectomy, omental biopsy, and peritoneal washings for thorough staging.[11,12]

Finally, the final postoperative histopathology reports were compared to the preoperative findings. To provide reliable results, descriptive and inferential statistical analysis was used.

Inclusion Criteria:

1. All patients with resectable Stage I and Stage II Endometrial Cancer listed for surgery.

Exclusion Criteria:

1. Patients who refuse consent.
2. Stage III and Stage IV carcinoma endometrium.
3. Previously treated for endometrial cancer (such as radiotherapy, chemotherapy, or hormonal therapy).
4. Patients with co-morbidities rendering them unfit for general anesthesia and surgery.

Results

Table 1: Examination findings - frequency distribution of patients

S. No	Examination findings	No. of Patient (N=40)	Percentage (100 %)
1	No abnormality	31	77.5
2	Bleeding Per Vagina	2	5.0
3	Bulky cervix	2	5.0
4	OS growth	2	5.0
5	Bulky uterus	1	2.5
6	Cervical stenosis + hematometra	1	2.5
7	Uterus retroverted	1	2.5

Study shows most patients exhibited normal examination findings on per abdomen, per vaginal and per speculum which amounts for 77.5%.

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Table 2: Computed tomography (CT) of myometrial invasion and pelvic lymph node status - frequency distribution

CT	No. of Patients (N=16)	Percentage (100 %)
Myometrial invasion absent	13	81.2
Myometrial invasion present	3	18.8
Lymph nodes absent	15	93.7%
Lymph nodes present	1	6.3%

Out of 40 patients, 16 received CECT for the abdomen and pelvis. The majority of the 16 patients, or 81.2%, only had endometrial thickening, followed by myometrial invasion in 18.8% of the cases, while pelvic lymph node involvement was absent in 93.7% of cases, occurring in just 6.3% of the patients.

Table 3: Magnetic resonance imaging of Myometrial depth of invasion and pelvic lymph node status -frequency distribution

MRI	No of Patient (N=24)	Percentage (100%)
MI <50%	18	75%
MI >50%	6	25%
Lymph nodes absent	23	95.8%
Lymph nodes present	1	4.2%

A total of 24 out of 40 patients had MRIs. The majority of the 24 patients who had MRI, or 75%, exhibited less than a half-inch of myometrium invasion, whereas 25% showed more than a half-inch. MRI revealed that 4.2% of patients had lymph node involvement, while 95.8% did not.

Table 4: Preoperative and postoperative histopathology- frequency distribution

Preoperative HPE	No. of Patients (N=40)	Percentage (100%)
Endometrioid	37	92.5
GRADEI	25	67.6
GRADEII	6	16.2
GRADEII	6	16.2
GRADEIII	6	16.2
Serous carcinoma	2	5.0
Poorly differentiated	1	2.5
Postoperative HPE	**No. of Patients (N=40)**	**Percentage (1 00%)**
TYPE		
Endometrioid	35	87.5
High grade serous	1	2.5
Serous	4	10.0
Grade		
G1	19	47.5
G2	10	25.0
G3	11	27.5
Myometrial Invasion		
<50%	29	72.5

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□ >50%	11	27.5
Lymphovascular Invasion		
□ Absent	35	87.5
□ Present	5	12.5
Lymph nodes		
□ Negative	35	87.5
□ Positive	5	12.5
□ Pelvic,3/22+	1	2.5
□ Pelvic,3/48+	1	2.5
□ Pelvic,5/47+	1	2.5
□ Pelvic,2/20+	1	2.5
□ Pelvic +paraaortic,11/1	1	2.5
STAGE		
□ pT1aN0	26	65.0
□ PT1aN1a	2	5.0
□ PT1aN1b	1	2.5
□ pT1bN0	4	10.0
□ PT1bN1a	1	2.5
□ pT2N0	4	10.0
□ pT3bN0	1	2.5
□ pT3bN1a	1	2.5
Total	40	100.0

On D&C specimens, endometrioid adenocarcinoma was the most prevalent histology in 37 out of 40 patients (92.5%). 67.6% of cancers of the endometrioid type are well differentiated (G1). Serous carcinomas make up 5% of cases. Endometrioid adenocarcinoma is the most prevalent kind of tumour in post-operative histology, occurring in 87.5% of cases. Ten percent of patients develop serous carcinoma. The bulk of postoperative specimens, or 47.5%, is well differentiated (G1) tumours, with G3 tumours making up the remaining 27.5%. In postoperative histopathological specimens, majority i.e 72.5% had tumors with myometrial invasion less than half. Majority i.e 87.5% of the tumors did not show lymphovascular invasion. Lymph nodal metastasis is absent in 87.5% of patients. Pelvic lymph nodal metastasis is seen in only 12.5% of patients. 65% of the patients correspond to final pathological stage of pT1a N0.

Table 5: Correlation of MRI findings with Postoperative HPE – depth of invasion and lymph node

Depth of Invasion	**MRI (N=24)**	**Postoperative HPE (N=24)**
MI>1/2	6	7
MI<1/2	18	17
Lymph Node Status		
Lymph node positive	1	3
Lymph node negative	23	21

Myometrial depth of invasion was determined to be statistically insignificant when compared to postoperative histopathology and MRI findings (Fischer's exact test, P = 1.0; statistically

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insignificant). Deep myometrial invasion can be found on MRI with a sensitivity and specificity of 28.5% and 70%, respectively. By using MRI, pelvic lymph node metastases can be found with sensitivity and specificity of 33.3% and 100%, respectively. In our investigation, the false-positive rate is zero.

Table 6: Depth of myometrial invasion on MRI with postoperative lymph nodal metastases

MRI – Depth of invasion	**Postoperative lymph node involvement (N=24)**	
	Negative	**Positive**
MI<1/2	16	2
MI>1/2	5	1

On correlating depth of invasion on MRI with postoperative lymph nodal status, we found it as statistically insignificant (Fischer's exact,P=1)

Table 7: Depth of invasion on CT with postoperative myometrial invasion and lymph node metastasis

CT- Depth of invasion	**Postoperative HPE (N=16)**	
	STAGE IB	**STAGE IA**
Myometrial invasion present(N=3)	1	2
Myometrial invasion absent (N=13)	3	10
CT – Myometrial invasion	**Postoperative lymph node status (N=16)**	
	Positive	**Negative**
Present	1	2
Absent	1	12

No statistically significant correlation between postoperative histology and CT invasion depth (Fischer's exact test, P -1.0) found. Deep myometrial invasion on CT had a sensitivity and specificity of 25% and 83.3%, respectively.
On applying Fischer's exact test, we found that the relation between depth of myometrial invasion on CT and postoperative lymph node metastasis is statistically insignificant (p=0.35)

Table 8: Lymph node metastasis on CT and postoperative histopathology

Lymph node status	**CT (N=16)**	**Post -operative HPE (N=16)**
Lymph node positive	1	2
Lymph node negative	15	14

For the detection of pelvic lymph node metastases, CT has a 50% sensitivity and 100% specificity. In our investigation, there was no false-positive CT result for pelvic lymph node metastases.

Table 9: Preoperative histopathology - postoperative lymph nodal status

Preoperative HPE	**Lymph node status**		**Total (N=40)**
	Negative (N=35)	**Positive (N=5)**	
Endometrioid	34(97.1%)	3(60.0%)	37(92.5%)
□ GRADE I	25(71.4%)	0(0.0%)	25(62.5%)
□ GRADE II	4(11.4%)	2(40.0%)	6(15.0%)
□ GRADE III	5(14.3%)	1(20.0%)	6(15.0%)
Serous carcinoma	0(0.0%)	2(40.0%)	2(5.0%)
Poorly differentiated	1(2.9%)	0(0.0%)	1(2.5%)

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P<0.001**, significant, Chi-square test

Table 10: Postoperative histopathology– postoperative lymph nodal status

Variables	Lymph node status		Total (N=40)	P Value
	Negative (N=35)	Positive (N=5)		
Postoperative HPE				
□ G1	19(54.3%)	0(0%)	19(47.5%)	0.009**
□ G2	9(25.7%)	1(20%)	10(25%)	
□ G3	7(20%)	4(80%)	11(27.5%)	

*Chi-Square Test/Fisher Exact Test- p value 0.009

Table 11: Correlating preoperative histopathology and postoperative histopathology

	Post-Operative HPE		
Pre-Operative HPE	G1	G2	G3
G1	16	6	1
G2	1	4	1
G3	1	0	6
Others	1	0	3

Preoperative G1 and G2 grades were upgraded to postoperative G3 in 6.4% of patients when we compared preoperative grades from dilatation & curettage with the final postoperative histology and relationship between them is statistically significant using the Wilcoxon signed rank test (p value 0.0001).

Discussion

Most endometrial cancer patients today are managed surgically, usually with a straightforward hysterectomy, bilateral salpingo-oophorectomy, peritoneal cytology, and evaluation of the local lymph nodes.

The two main predictors of recurrence are lymphovascular invasion and lymph node status. The degree of tumour infiltration is directly correlated with lymph node metastases. Therefore, in order to best design adjuvant therapy and decrease local and distant recurrences, the nodal status of the patient must be determined.[12,13]

Accurate disease staging at the time of diagnosis preoperatively and starting the appropriate treatment plan without adding to morbidity are two of the most crucial components of successful patient management for endometrial cancer. The most recent clinical data allow us to categorise patients into low and high-risk groups based on preoperative or intraoperative observations, allowing the clinician to determine which patients require lymphadenectomies. The increased risk of consequences after lymphadenectomy, including lymphedema, vascular, ureteric, visceral injuries, deep vein thrombosis, and chylous ascites, is well documented.[13,14]

In our study, the average age of presentation was 61 years, which is comparable to Kadir Cetinkaya et al., where the median age group of presentation was 59 years.[14,15] The bulk of the patients, or 50% of those who presented with endometrial cancer, were over 60 years old. Additionally, 82.5% of patients' most frequent presenting complaint is postmenopausal haemorrhage. Mehmet C. Salman et al., study in multivariate analysis, showed that women with postmenopausal bleeding who were older than 55 during premenopausal haemorrhage and who had a history of recurrent bleeding episodes were more likely to have endometrial cancer.[15] The number of patients, or 77.5% of them, had normal examination results for the

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abdomen, vagina, and speculum. Only endometrium thickness, myometrial invasion, and pelvic lymph node metastasis were seen in the majority of patients in our study who had CECT abdomen as part of the staging workup. These results are comparable to those of Lara A. Hardesty et al study's which found that 24% of patients had deep myometrial invasion whereas 76% of patients had superficial endometrial and myometrial involvement.[16,17] There is limited value in using abdominal and pelvic CT for preoperative evaluation of endometrial cancer, according to several retrospective investigations. Although it was hypothesised that CT would be useful in high-risk histologic categories such G3 tumours, clear cell and serous malignancies, it showed little preference for determining the depth of myometrial invasion.

The majority of the patients studied, or 75%, showed myometrial invasion less than half while 25% of patients showed myometrial invasion greater than half, according to the MRI study. Lymph node involvement is observed in 4.2% and missing in 95.8% of the individuals who received MRI. Endometrioid carcinoma, which is seen in 92.5% of patients, is the most prevalent kind of histology on D&C specimens. The majority of endometrioid tumours, or 67.6% of them, are well differentiated (G1) tumours. 5% of cases of cancer are serious. Similar findings are found in the preoperative evaluation research by Todo et al., where the majority of tumours are G1 (84%).[17,18]

To fully stage the disease, all of the patients in our research had open total abdominal hysterectomy with bilateral salphingo-oophorectomy and bilateral pelvic lymph node dissection. In patients whose preoperative histology was G3, Serous, and Poorly Differentiated Tumours, we have performed Para-Aortic Lymph Node Dissection

Endometrioid is the most frequent histology seen during the post-operative histological analysis, accounting for 87% of all cases. Serous malignancies are identified in 10% of cases, G1 tumours account for 47%, and lymphovascular invasion is seen in 12% of cases.

In our investigation, lymph node metastasis was detected in 12% fewer cases than Tayfun et al.[18,19] while myometrial invasion was detected in less than half (72.5%) of cases, which is somewhat greater than them. 65% of patients, or the majority, fit the pT1a N0 pathological stage. One of the nine patients who had paraaortic lymph node dissection also had paraaortic nodal metastases, with postoperative histology showing pelvic LN metastasis and endometrioid G3 as well.

We discovered that MRI exhibited a sensitivity of 28.5% and a specificity of 70.5% for the level of myometrial invasion when we compared the findings of preoperative MRI with those of postoperative histology.

Due to the present study's small sample size, the sensitivity of MRI in detecting deep myometrial invasion is substantially lower than in previous research. The test's specificity is equivalent to the findings of previous research.[19]

MRI has 33.3% sensitivity and 100% specificity in predicting postoperative lymph node metastases. It is discovered that there is no statistically significant correlation between postoperative lymph node status and MRI findings. In comparison to studies by Fei Teng et al. and Rockall et al., but higher than that of Cabrita et al., the current study shows slightly reduced sensitivity of MRI in detecting pelvic lymph node status. In comparison to the other three investigations, the current study has a higher specificity for nodal metastasis. We detected no statistically significant correlation between postoperative histology and CT depth of invasion (Fischer's exact test, P -1.0). Deep myometrial invasion can be found on a CT scan with 25% sensitivity and 83.3% specificity. In contrast to Kim et al. and Hardesty et al., research's the specificity of the current study's method for detecting deep myometrial invasion on CT was higher. We discovered that there is no statistically significant correlation between postoperative lymph node metastasis and the depth of myometrial invasion as seen on CT. For the detection of pelvic lymph node metastases, CT has 50% sensitivity and 100% specificity. Comparable to studies by Connor et al. and Kitajima et al., CT has a sensitivity

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 07, 2022

for detecting pelvic lymph node illness that is higher than both of those research' specificities.[19,20]

We found that preoperative G1 and G2 grades were upgraded to postoperative G3 in 6.4% of patients when we compared preoperative grades acquired from D&C with final postoperative HPE. This finding is consistent with research by Yashuhito Tanase et al. The results of our study are comparable to those of Tayfun et al., who found that high grade tumours are positively associated with lymph nodal metastasis on univariate analysis.[20]

Our study discovered a positive relationship among both preoperative and postoperative histology and lymph nodal metastasis, and the values are statistically significant (p 0.001). The majority of endometrioid tumours lacked nodal metastases, and the incidence of nodal metastases was high in serous cancers. These findings are similar to those of Tayfun et al., who found that high grade tumours are significantly linked with lymph nodal metastasis.

Conclusion

Findings of our investigation presented strong correlation between lymph nodal metastases and both preoperative and postoperative histology. CT has superior sensitivity for nodal metastases while MRI has marginally better sensitivity than CT for detecting deep myometrial invasion. CT and MRI may guide us in deciding whether to undertake a bilateral pelvic lymph node dissection, but the study's small sample size makes more research necessary. In order to provide the patient with the best oncological treatment with the least amount of morbidity, further procedures such as transvaginal ultrasonography, hysteroscopy, and sentinel lymph node biopsy must be investigated.

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