



Different imaging techniques to detect pelvic lymph nodes affection in patients with gynecological cancers. A comparative study

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Abstract

Objectives: Pelvic lymph nodes affection is a common finding in patients with gynecological cancers and it has an important effect on prognosis and survival of the patients. The ultimate goal was to compare different radiological techniques used for detection of pelvic lymph nodes in patients with gynecological cancers, comparison between ultrasound, computerized tomography and magnetic resonance imaging in relation to operative and histopathological findings.

Patients and Methods: The study included 300 patients with gynecological cancers treated surgically. Assessment of pelvic lymph nodes metastasis using ultrasound, CT, MRI and clinical intra-operative examinations. Correlations between the results of pelvic lymph nodes affection techniques and the final histopathological examination were done.

Results: The study included 300 cases with operable gynecological cancers; 162 of them were with endometrial cancer, 129 of them were with ovarian cancer and 9 of them were with cervical cancer. Sensitivity of Ultrasound examination for malignant pelvic lymph nodes detection was 61.5 %, specificity of CT was 92.2%, accuracy of MRI was 63.3% and sensitivity, specificity and accuracy of clinical intra-operative assessment was 83%, 77% & 81 % respectively.

Conclusion: Clinical intra-operative pelvic lymph nodes assessment is the most sensitive tool to detect pathologically enlarged lymph nodes in comparison to ultrasound, CT and MRI, while MRI is the most specific tool.

Keywords: pelvic lymph nodes; cancer; ultrasound; CT; MRI

Introduction

The lymphatic system, including Lymph nodes, is very important in body protection; lymph nodes may be affected by many diseases like inflammatory and malignant diseases ^[1].

Lymph nodes are usually affected by cancers earlier than other organs, so early detection is very important in management of these cancers ^[2].

The extent of its affection is a crucial step in diagnosis of the stage of the cancer, plan of management and prognosis ^[3].

Many techniques are used to diagnose this affection in women with gynecological malignancy; ultrasound, CT, MRI and PET CT are commonly used to achieve this mission ^[4].

Sometimes different imaging techniques cannot detect lymph nodes affection properly, so we may miss affected lesions and sometimes may misdiagnose other pathological lesions as if malignant affection ^[5].

So a surgical assessment during surgical procedure increases the accuracy of malignant lymph nodes detection ^[6].

That is why the surgical staging is mandatory in management of different gynecological cancers, but sometimes the imaging techniques could be helpful to avoid extensive surgical procedures, like patients with early endometrial cancer type 1 with negative pelvic lymph nodes as proved by MRI ^[7].

The National Comprehensive Cancer Network (NCCN) recommends pelvic lymph nodes dissection in different types of gynecological cancers to achieve a better diagnosis and prognosis ^[8].

Also, the presence of pelvic lymph nodes affection may change the plan of treatment or to avoid surgery in certain situations, for example cervical cancer ^[9].

The aim of surgery in patients with gynecological cancer is to resect all resectable lesions, so any suspicious lesion including suspicious lymph nodes should be removed to obtain complete cytoreduction ^[10].

Lymph nodes affection in patients with gynecological malignancies may affect the patient's survival, so it is very important to diagnose and remove the affected lymph nodes ^[11].

Lymphadenectomy is associated with many complications that may appear during or after the procedure. Leg oedema, lymphocele and injury to nearby structures are common complications of pelvic lymph nodes dissection ^[3].

Complete versus selective lymphadenectomy may be performed during surgical treatment of gynecological cancers; laparoscopy and laparotomy may be used to achieve this mission. Sentinel lymph node dissection is applied now in different types of female gynecological cancers [3].

Aim of the study

Was to assess the sensitivity, specificity and accuracy of ultrasound, CT, MRI and clinical intra-operative assessment to final histopathological examination for detection of affected pelvic lymph nodes in patients with gynecological cancers.

Patients and methods

This study is a retrospective comparative study, included 300 patients with operable gynecological cancers, the operability was assessed by surgical and anaesthesia teams, gynecological cancers include: endometrial, ovarian and cervical cancers. This research is conducted in Gyne-Oncology unit at Elshatby maternity hospital, Alexandria Egypt. Different imaging modalities were used to detect malignant pelvic lymph nodes. Pelvic Ultrasound, pelvic CT scan and pelvic MRI were performed when indicated. During operations, palpation and examination of pelvic lymph nodes to feel enlarged lymph nodes followed by complete bilateral pelvic lymph nodes dissection The surgical treatment was performed by the same surgical team at the same hospital, pre-operative radiological assessment was performed by the same radiology team, the main goal was to detect the malignant pelvic lymph nodes either by ultrasound, MRI &/CT scan.

Histopathological diagnosis was performed on dissected pelvic lymph nodes then correlation between results of imaging techniques and clinical assessment in relation to the final pathological diagnosis was done.

Inclusion criteria

Operable endometrial, ovarian and cervical cancers, acceptance to share in the research, fit for surgery and pelvic lymph nodes assessment was performed using ultrasound, CT &/MRI.

Exclusion criteria

Advanced gynecological cancers, sarcomas and history of radiotherapy &/ chemotherapy

All women accept to participate in this research and sign a written consent This research was registered and approved by ethics committee in faculty of medicine, Alexandria university in June 2021/ 0305200

Statistical analysis

The data was collected and entered into the personal computer. Statistical analysis was done using Statistical Package for Social Sciences (SPSS/version 20) software. This study is a prospective study; the sample size is estimated according to statistical rules and data are normally distributed.

The statistical test is used as follows:

The arithmetic mean, standard deviation, for the categorized parameters, Chai square test, was used. While for two groups, t-test was used for parametric data. The level of significance was 0.05.

Results

This study included 300 patients with operable gynecological cancer; different imaging techniques were used to detect pelvic lymph nodes metastasis. Clinical and final histopatological examination was performed to all patients (300 patients). While Ultrasound examination was performed to 203 cases, CT examination was performed to 179 cases and MRI was performed to 98 cases. Of 300 patients with gynecological cancer; 162 patients with endometrial cancer, 129 patients with ovarian cancer and 9 patients with cancer cervix were included in our research.

Most patients were above 50 years (about 60%), 10% were before 40 years and 30 % of them were between 40 and 50 years. CT scan was able to detect malignant pelvic lymph nodes with sensitivity, specificity & accuracy of 47.1%, 92.2% and 66.5% respectively. Table (1)

Table 1: Sensitivity, specificity and accuracy of CT in detection of pelvic lymph nodes metastasis in comparison to final histopathological examination.

| Pelvic lymphnodes metastasis detection by CT | histopathological examination | | | | Total |
|--|-------------------------------|-------|---------------|-------|-------|
| | Malignant | | Non-malignant | | |
| | No. | % | No. | % | |
| present | 48 | 47.1 | 6 | 7.8 | 54 |
| absent | 54 | 52.9 | 71 | 92.2 | 125 |
| Total | 102 | 100.0 | 77 | 100.0 | 179 |
| Sensitivity | 47.1 | | | | |
| Specificity | 92.2 | | | | |
| Accuracy | 66.5 | | | | |

While MRI can detect malignant pelvic lymph nodes with sensitivity, specificity & accuracy of 51.4%, 96.2% & 63.3 % respectively. Table (2)

Table 2: sensitivity, specificity and accuracy of MRI in detection of malignant pelvic lymph nodes in comparison to final histopathological examination.

| Malignant pelvic lymph nodes detection by MRI | histopathological examination | | | | Total |
|---|-------------------------------|-------|---------------|-------|-------|
| | Malignant | | Non-malignant | | |
| | No. | % | No. | % | |
| present | 37 | 51.4 | 1 | 3.8 | 38 |
| absent | 35 | 48.6 | 25 | 96.2 | 60 |
| Total | 72 | 100.0 | 26 | 100.0 | 98 |
| Sensitivity | 51.4 | | | | |
| Specificity | 96.2 | | | | |
| Accuracy | 63.3 | | | | |

Clinical intra-operative assessment of suspicious pelvic lymph nodes was sensitive in 83% of patients, with 77% & 81% specificity and accuracy respectively. Table (3)

Table 3: sensitivity, specificity and accuracy of clinical detection of malignant pelvic lymph nodes in comparison to final histopathological examination.

| Pelvic lymph nodes detection by intra-operative clinical assessment | histopathological examination | | | | Total |
|---|-------------------------------|-------|---------------|-------|-------|
| | Malignant | | Non-malignant | | |
| | No. | % | No. | % | |
| present | 178 | 82.8 | 20 | 23.5 | 198 |
| absent | 37 | 17.2 | 65 | 76.5 | 102 |
| Total | 215 | 100.0 | 85 | 100.0 | 300 |
| Sensitivity | 83 | | | | |
| Specificity | 77 | | | | |
| Accuracy | 81.0 | | | | |

Ultrasound could detect malignant pelvic lymph nodes with sensitivity of 61.5%, specificity of 91.2% and accuracy of 71.4%. Table (4)

Table 4: sensitivity, specificity and accuracy of ultrasound in detection of pelvic lymphnodes affection in comparison to final histopathological examination.

| Pelvic lymph nodes metastasis by ultrasound | histopathological examination | | | | Total |
|---|-------------------------------|-------|---------------|-------|-------|
| | Malignant | | Non-malignant | | |
| | No. | % | No. | % | |
| present | 83 | 61.5 | 6 | 8.8 | 89 |
| absent | 52 | 38.5 | 62 | 91.2 | 114 |
| Total | 135 | 100.0 | 68 | 100.0 | 203 |
| Sensitivity | 61.5 | | | | |
| Specificity | 91.2 | | | | |
| Accuracy | 71.4 | | | | |

Discussion

Detection of lymph nodes affection is very important in staging, prognosis and management of different cancers. Many imaging tools can be used to diagnose pelvic lymph nodes metastasis in patients with malignant genital tumors; ultrasound, CT & MRI are commonly used.

The rationale of this research was to assess the differences in accuracy, sensitivity and specificity of different methods for malignant pelvic lymph nodes affection in patients with gynecological cancers.

Clinical intra-operative assessment, pre-operative ultrasound, CT scan and pelvic MRI were used to detect malignant pelvic lymph nodes with different degrees of accuracy, sensitivity and specificity.

Few studies are found to compare different methods for pelvic lymph nodes in different gynecological cancers, our research is one of them and it conducted on large number of patients.

Female genital cancers are commonly seen in old postmenopausal women; in our study about 60 % of patients were above 50 years old.

Sensitivity, specificity & accuracy of Ultrasound, CT, MRI and clinical intra-operative assessment in malignant pelvic lymph nodes detection were 61.5%, 91.2%, 71.4%, 83%, 77% & 81% respectively.

In a study performed by Bart Wet al, MRI sensitivity and specificity in detection of malignant pelvic lymph nodes were 82–96% & 93–98% respectively [2]. And in another study performed by Goro Kasuya et al, CT & MRI were used to detect single or multiple pelvic lymph nodes metastasis in patients with female genital tract cancers with high accuracy and sensitivity [12]. Bellomi M et al reported that the sensitivity and specificity of CT were 64% and 93%, respectively and those of MRI were 72% and 93%, respectively [13]. Choi HJ et al compared the sensitivity and specificity of MRI and positron emission tomography/computed tomography (PET/CT). With

MRI, the sensitivity and specificity were 30% and 92%, respectively, and with PET/CT, the sensitivity and specificity were 57% and 92%, respectively [14].

Follen M et al concluded that CT sensitivity and specificity in diagnosing lymph node disease in patients with cancer cervix ranges from 64.7 to 96.6% [15].

In a study performed by Bell DJ et al; (16) MRI and CT have low sensitivities for detection of malignant lymph nodes, while in another study PET CT is more sensitive than others [17].

It is very important to use different available techniques to obtain data that help us to achieve better diagnostic and therapeutic plans for patients with gynecological cancers. In low resource countries, we need cheap, reliable techniques to detect malignant pelvic lymph nodes, ultrasound and intra-operative assessment could be used safely in this group of patients, so we need more and more researches to improve our knowledge in this area.

Points of strength in our study: large number of patients, use of many diagnostic modalities with variable costs, comparative study and strict inclusion and exclusion criteria.

Points of weakness in this study: retrospective study, single institutional study

So we recommend doing more research on these points using a large number of population, multicentric research and prospective study.

Conclusions

Detection of malignant pelvic lymph nodes is an important issue. Ultrasound, CT, MRI and clinical intra-operative assessment could be used for this purpose. Clinical assessment is associated with the highest sensitivity and accuracy (83% & 81 %) but the most specific tool is MRI (96.2%).

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Study registration

Research is registered in faculty of medicine, Alexandria University in June 2021/ 0305200

Conflicts of Interests

The author declares that he has no conflict of interests.

Ethical Approval

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Also this research is approved by Ethics committee in faculty of medicine, Alexandria university in June 2021 with the serial number 0305200

Consent to participate

Informed consent was obtained from all individual participants included in the study

Consent of publication

Informed consent was obtained from all individual participants included in the study

Availability of data and material

Data available on request from the author, the data that support the findings of this study are available from the corresponding author upon reasonable request.

Code availability

All data and materials as well as software application support published claims and comply with field standards.

Authors Contribution

Not applicable due to single author.

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