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Original Research Article

Comparison between Transvaginal Sonography and Magnetic Resonance Imaging Study Findings in Patient with Endometrial Carcinoma

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Abstract

The main objective of this study is to compare between the findings that obtained from both TVS and MRI study in diagnosis of endometrial carcinoma and differentiate it from other endometrial pathology and to assess the accuracy of both techniques in evaluation and detection of myometrium invasion. This prospective study was done in AL- Hilla Teaching Hospital from August 2016 to August 2017 on (22) patients, their ages were from 46-79 years old, (18) of them are postmenopausal and (4) patients are premenopausal, all of them were suffering from recurrent dysfunctional vaginal bleeding. Patients are examined by both TVS and MRI study with contrast endometrial carcinoma is suggested and histopathology insisted the diagnosis, comparison between two techniques is reported.

By TVS (7) of the patients have bulky size uterus with different endometrial masses size and texture, other (15) patients have just irregular increase in endometrial thickness. Myometrial invasion which is the most important prognostic factor was as follows: (2) patients have no distinct invasion, (7) patients have less than 1/3 myometrial invasion, (9) patients have more than 2/3 of myometrial invasion; in comparison with enhanced MRI study; findings were that (13) of patients have well defined different sizes and intensity masses, (9) patients have irregular increase in endometrial thickness with different degree of myometrial invasion, myometrial invasion was as follows: (9) patients with less than 1/3 of myometrial invasion, (9) patients with more than 2/3 of myometrial invasion, (2) patients the invasion reaching to serosa and involving the cervix. The conclusions from this imaging assumes increasing importance in the management of patients with endometrial carcinoma in recent years. Transvaginal sonography that performed by expert specialist can be consider a feasible, economic imaging modality with diagnostic accuracy comparable to that of MRI in preoperative local staging of endometrial cancer. Dynamic contrast enhanced MRI study is more accurate in diagnosis and evaluation of endometrial carcinoma and assessment of myometrial invasion. Early disease detection and accurate staging provide optimal management and minimize mortality and morbidity.

Key Words: transvaginal sonography, magnetic resonance imaging and endometrial carcinoma.

المقارنة بين نتائج فحص الرنين المغناطيسي والسونار المهبلي لدى النساء المصابات بسرطان بطانة الرحم في محافظة بابل

الخلاصة

الغرض من هذه الدراسة هو المقارنة وايجاد الفرق بين نتائج فحص السونار المهبلي والرنين المغناطيسي ودقة كل منهما في تشخيص سرطان بطانة الرحم في مراحله المختلفة من اجل ايجاد الطريقة المثلى في التعامل مع المرض ومعالجته، هذه الدراسة اجريت في الفترة ٢٠١٦-٢٠١٧ في مستشفى الحلة التعليمي على (٢٢) مريضه تتراوح اعمارهن بين (٤٦-٧٩) سنة، اغلب المريضات كن في سن اليأس اجري لهن فحص السونار المهبلي ودراسة الرنين المغناطيسي وذلك لاشتباه اصابتهن بسرطان بطانة الرحم حيث كن يعانين من حدوث نزف رحمي غير وظيفي متكرر. تم تقيم كلا الطريقتين ومقارنتهما مع بعضهما البعض وتوثيق التشخيص بنتائج الفحص النسيجي المختبري. بعد اجراء الفحوصات وجد بأن سبعة من المصابات تم تشخيصهن بوجود ورم مميز في بطانة الرحم باستخدام السونار المهبلي وثلاثة عشر مريضه باستخدام الرنين المغناطيسي مع صبغة. يتراوح حجم الورم بين ١١×١٣ملم-٤٠×٥٠ملم. خمسة عشر من المريضات كان لديهن فقط تثخن في بطانة الرحم غير منتظم الحواف باستخدام السونار المهبلي و تسعة مريضات باستخدام الرنين المغناطيسي حيث كان قياس هذا الثخن الغير منتظم الحواف يتراوح بين ١٢-٤٠ملم كما تم ايجاد مدى انتشار المرض لطبقة الرحم العضلية المجاورة لبطانة الرحم. حيث وجد بأن الرنين المغناطيسي هو اكثر دقة في تشخيص سرطان بطانة الرحم في مختلف مراحله ولكن بفارق قليل عن دقة السونار المهبلي. على الرغم من ان الرنين المغناطيسي هو الاكثر دقة في تشخيص المرض إلا ان السونار المهبلي من الممكن ان يضاهيه في الدقة اذا استخدم من قبل ايادي ذات خبرة وتجربة دقيقة حيث انه متوفر وسهل الاستخدام ويستغرق وقت وجهد اقل بكثير من الرنين المغناطيسي واهمية كلا الفحصين في تشخيص ووضع خطة العلاج المناسبة. ان الكشف المبكر عن المرض يزيد من فرصة علاجه ومنع حدوث مضاعفات.

الكلمات المفتاحية: السونار المهبلي، الرنين المغناطيسي، سرطان بطانة الرحم.

Introduction

Uterus is most important organ in female reproductive system, have a pear shaped muscular organ with the apex directed down word back word, located at the pelvic cavity between the bladder and rectum. Endometrial carcinoma the cancer that arises from uterine endometrium lining [1]. It is result from abnormal growth of cells that have ability to invade other body parts [2].

It is considered the most frequent female pelvic malignancy and 7th. most common neoplasm word wide with high incidence in north America and Europe. It occurs commonly in post-menopausal women with incidence peaks around the 6th. decade [3]. Endometrial carcinoma is divided into two sub types (type I and type II); Type I: 80% it is mostly seen between 55-65 years, Type II: 20%, arises in setting of endometrial atrophy, mostly seen between age 65-75 years old.

MRI staging of endometrial carcinoma FIGO cancer staging: Stage 1: The tumor is confined to uterus. (Three stage 1a, 1b and 1c), stage 2: Tumor extend to cervical stroma. (Two stage 2a and 2b), stage 3: Tumor extension beyond uterus but not beyond the true pelvis. (Three stage 3a, 3b and 3c) and stage 4: Evidence of bladder, rectal or distant metastasis with peritoneal deposit, this deposit may out lined by ascites so is best seen by delayed contrast enhancement [3].

The main objective of the present study is to compare between the findings that obtained from both TVS and MRI study in diagnosis of the endometrial carcinoma and to differentiate it from other endometrial pathology and to assess the accuracy of both technique in evaluation and detection of myometrium invasion.

Materials and Methods:

Ethical Approval of the Study:

The study protocol was approved by ethical committee of general surgery department part of radiology in Babylon Medical College.

Subjects:

This prospective study is done in Babylon Teaching Hospital from August 2016 to August 2017 on 22 female patients their ages between 46-79 years. Most of them are post-menopausal, 18 in number, and 4 patients are premenopausal, all are presented with dysfunctional irregular uterine bleeding, all patient are examined in Al-Hilla Teaching Hospital in Babylon.

Because the Recent studies suggest that the most suitable current methods to assess endometrial ca. are transvaginal sonography and magnetic resonance imaging with gadolinium contrast enhancement so all patients are examined by two techniques with priority to TVS.

Instruments and Method of Examination

a. Transvaginal Sonography TVS:

Which is the first modality of diagnosis is performed on patient in supine lithotomy position by using 5-7.5 MHZ curvilinear array transducer prop, uterus was assessed in long and short axis, the devise of ultrasound used is volson EG. Measurement of uterine size, endometrial thickness, mass dimensions and character, echogenicity, junctional zone and myometrial invasion, cervical, ovarian and adnexal involvement and any other related abnormalities, all these are assessed and reported.

b. Magnetic Resonance Imaging MRI:

Is consider preferred method in diagnosis of endometrial cancer and their staging, and in differentiating between endometrial ca and other pathology as endometrial polyp, but it is expensive and time consuming, the devise used is Philips MRI 1.5 tesla. All MRI images were obtained before and after gadolinium administration T1 weighted spin echo MRI, T2 weighted spin echo MRI, T1 weighted spin echo with gadolinium contrast. All images done in sagittal, axial and coronal views.

Gadolinium is given intravenously 0.1 mill mole/Kg of body weight, at rate of 2 ml/sec. We assess the size of uterus, the thickness and intensity of endometrium with mass dimension and intensity at all sequences, degree of enhancement after contrast administration, if there is any myometrial invasion or extra uterine extension.

All cases are confirmed by histopathological study, which reveal endometrial adenocarcinoma in most of cases with different degree of differentiation.

Result: Twenty two women were enrolled in the study. The mean age for women in the study was 59±9.6 (46-79) years, eighteen (81%) of the (22) were postmenopausal as shown in figure [1].

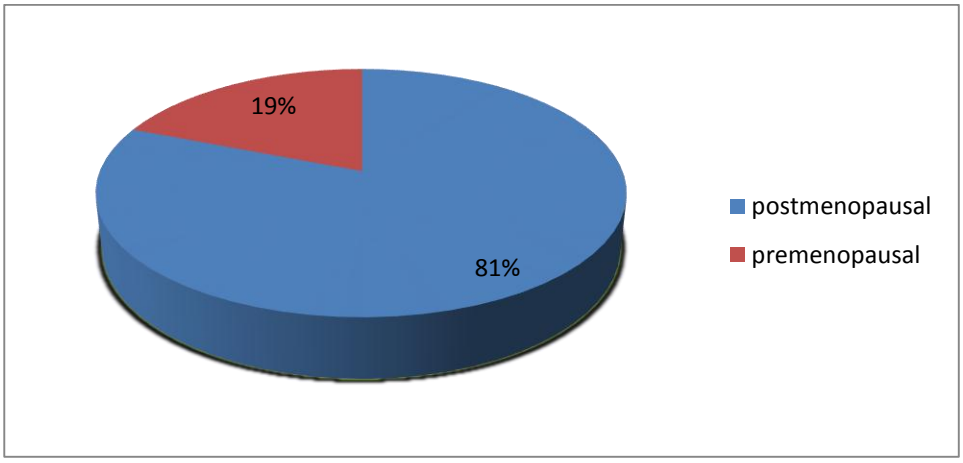

Figure (1): Percentage of pre and postmenopausal in sample.

(9) patients have significant increase in body weight (obesity), (7) of them of type two diabetes mellitus, (11) patients have history of hypertension on antihypertensive drugs, (16) patients have history of oral contraceptive pills for long period, (4) of them are nulliparous two of them with history of PCO, (15) of them have history of irregular menstruation with hormonal disturbance and finally one patient have history of breast cancer and on tamoxifin tablets.

Women diagnosed with endometrial cancer during the study period underwent preoperative TVS and MRI. Twelve patients evaluated during the study period were excluded from the database because of inconclusive sonographic results (seven cases, 8%) are unclear findings at MRI (five cases, 6%) owing to the presence of several uterine myomas and adenomyosis. Two patients were excluded because of uncertainty in the histological diagnosis with regard to the true extent of myometrium infiltration by the neoplasm. Tranvaginal sonography was the first line imaging modality in this study, MRI study which is more expensive and time consuming consider a second imaging line technique.

1. Transvaginal Ultrasonographic Findings

TVS found that there are Seven patient have bulky size uterus with endometrial masses of different size five of them are well defined regular out line, other two patients have well defined irregular out line mass with, the maximum mass measurement is between 50×40 mm-13×11 mm. The TVS findings of other (15) patient reveal just irregular increase thickness of endometrium with the maximum increase in this thickness is 40-12 mm, degree of myometrial invasion is very important prognostic factor, during scanning myometrial invasion was as following: two patient with increase endometrial thickness have no distinct myometrial invasion, in other (20) patient the finding were (7) patient with myometrial invasion of less than 1/3, and (9) patient have more than 2/3 of myometrial invasion, (2) patient the invasion is difficult to recognized and (2) patient the invasion is aggressive and reaching to serosal layer with down word cervical extension.

2. Enhanced Magnetic Resonance Study

By enhanced MRI study found that (13) patient of (22), have well-defined endometrial masses with different sizes and myometrium invasion, other (9) patient of (22) reveal irregular increase endometrium thickness with different degree of myometrium invasion, the size of mass is between 55×40mm-16×14 mm while endometrial thickness is of 42-15mm, depth of myometrial invasion is most important prognostic factor, enhanced MRI study found that (9) patient with myometrial invasion of less than 1/3 and (9) patient with invasion more than 2/3, and (2) patients show

that the invasion involved serosa reaching to cervix, vagina, one of these two patients have distant metastasis as shown in table (1).

Staging:

According to degree of myometrial invasion that detected in both techniques and after documentation with histopathological results, the stages were shown in table (2).

The endometrial morphology were as shown in table (3).

Table (1): Show the myometrial invasion.

	No invasion	**Invasion less than 1/3**	**Invasion more than 2/3**	**Difficult to distinct**	**Beyond myometrium**
By TVS	2	7	9	2	2
By MRI	2	9	9	0	2

Table (2): The degree of myometrial invasion.

Stage I 9 patient	40 %
Stage II 9 patient	40 %
Stage III A 1 patient	4.5 %
Stage IV B 1 patient	4.5 %

Table (3): Show the endometrial morphology (mass or increased thickness).

TVS	Mass	7
	Increase Thickness	15
MRI	Mass	13
	Increase Thickness	9

The difference in morphology between TVS and MRI were as shown in figure (2) When we doing comparison in finding between two instruments we notice that only (7) patients diagnosis mass by TVS in contrast (13) patients diagnosis by MRI as shown in table (4).

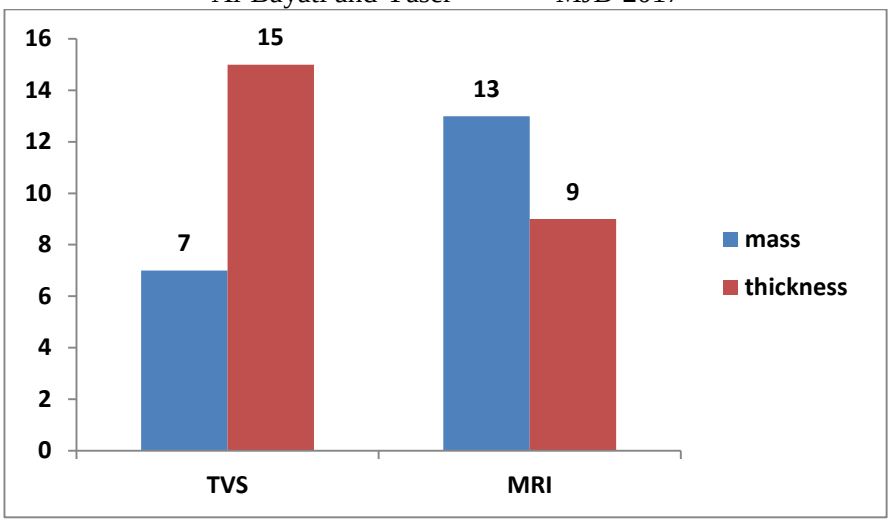

Figure (2): Difference in morphology (as a mass or increase thickness) between TVS and MRI.

Table (4): Comparison of TVS finding (as a mass or increase thickness) with MRI finding.

		MRI		
		Mass	Increase Thickness	Total
TVS	Mass	7	0	7
	Increase Thickness	6	9	15
	Total	13	9	22

This mean that the accuracy of MRI study is high in detecting the endometrial malignant (mass), than that of TVS.

Endometrial thickness measurements in this study were as shown in table (5). Most of tumors were arise from fundal part of endometrium and their sizes were as shown in table (6).

Table (5): Maximum and minimal endometrial thickness.

	Maximum	Minimum
By TVS	40 mm	12 mm
By MRI	42 mm	15 mm

Table (6): Maximum and minimum masses size

	Maximum	Minimum
By TVS	50* 40 mm	13 * 11 mm
By MRI	55 * 40 mm	16 * 14 mm

Notes:

1- In transvaginal sonography the normal interface between myometrium and endometrium is clearly out lined because the inner layer of myometrium is hyper echoic in comparison with endometrium which is hyper echoic so any interruption of this interphase suggest myometrium invasion seen as

endometrial thickness irregularity and loss of interphase.

2- By MRI study the endometrial mass or thickening seen iso- to hypo-intense at T1 and hyper intense at T2, with different degree of enhancement after contrast administration.

3- All the results obtained are confirmed by histopathological study which reveal high percentage of endometrial adenocarcinoma with different degree of myometrium invasion.

The sensitivity, specificity, PPN, NPV and diagnostic accuracy of TVS and MRI for endometrial abnormality are shown in table (3). We find MRI had more sensitivity and more accurate than TVS test, as shown in table (7).

Table (7): Performance of TVS and MRI study in diagnosis of endometrial carcinoma.

	Sensitivity	**Specificity**	**PPV**	**NPV**	**Accuracy**
TVS	82	83	80	89	82
MRI	86	81	78	86	84

Figure (3): Sagittal view I patient with endometrial ca after contrast show endometrial mass.

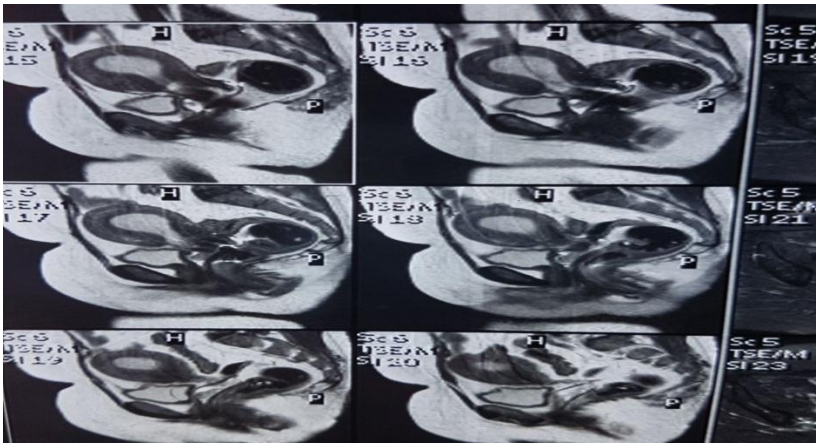

Figure (4): T2 sagittal view of female with endometrial malignant mass.

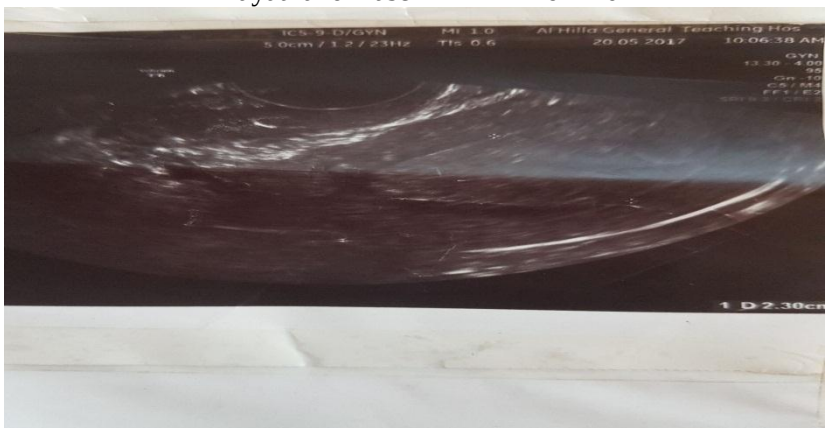

Figure (5): TVS for patient above show well defined mass.

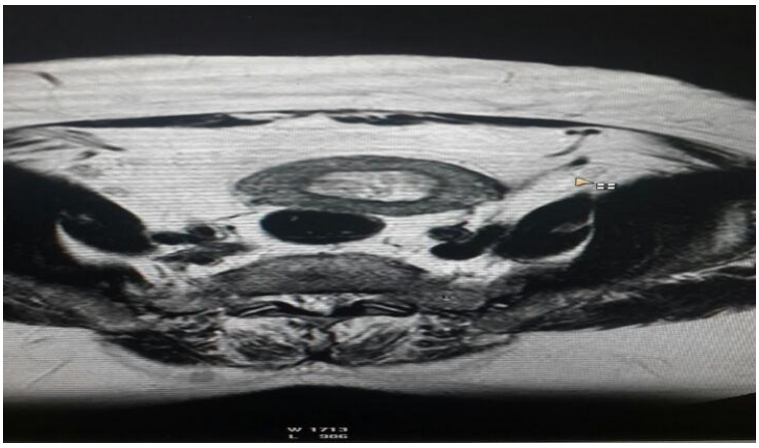

Figure (6): Axial view T2 MRI image show endometrial mass.

Figure (7): TVS for patient with endometrial carcinoma show just irregular endometrial thickening.

Figure (8): Sagittal view T2 MRI image for patient with increase endometrial thickness.

Discussion:

Many authors reported on value of **TVS** and **MRI** study in evaluating the endometrial carcinoma.

This study was to compare transvaginal ultrasonography with MRI in large number of patient and we have sought to identify imaging features that could influence the extent of surgery or adjuvant radiotherapy in order to confirm whether MRI is needed a robust technique for the preoperative assessment of endometrial cancer.

Ultrasound is the conventional first line imaging investigation in patient suspected of endometrial cancer clinically, contrast enhancing MRI is the modality of choice for evaluation and assessment of myometrial invasion by endometrium carcinoma [5], recent studies found that there is no differences between T2 weighted and contrast enhanced MRI in assessment of myometrial invasion [6].

This study reported sensitivity specificity PPV NPV and accuracy for MRI 86, 81, 78, 84 and for TVS 82, 83, 80, 89, 82 respectively. This study reported MRI more accurate than TVS which is the same results of other study such as Kim *et al* and yamashita *et al*. Advocate MRI in which they have demonstrate better diagnosis and staging accuracy [7].

Garzetti *et al.* found in the study of 34 patients with endometrial carcinoma stage I and stage II, transvaginal sensitivity was 82.6% and specificity of 81.8%, the diagnostic accuracy was 82.3%, in assessing the myometrial invasion in compared with histopathological finding [8].

Gordon *et al* reported in study of 25 patients assessed with transvaginal sonography, reported that sensitivity of invasion was 76%, specificity was of 75% and diagnostic accuracy of 76% [9].

Prompeler *et al* found sensitivity of 93% compared with histopathological findings [10].

Gordon *et al.* found that there is no significant differences between both technique [7].

Yamashita *et al* reported these results on (40) patients.

Accuracy with transvaginal sonography and MRI without contrast is 68%, with contrast used accuracy was 85%.

When less or more than half of myometrium is invade the TVS accuracy was 88% [8].

Delmachio *et al.* in study comparing TVS and MRI.

Sonographic findings were comparing with histopathological results is 69% while MRI with histopathological results was of 74%. These authors reported results between MRI and IVS techniques in 76%, and found there is no significant differences between both [7].

Saez *et al* on study of (38) patient examined by MRI reported 100% sensitivity in stage IA, 87% in stage IB and 86% in stage IC, specificities were 99%, 91%, and 100% respectively [10].

Accuracy of 74%-87% of MRI, have been reported [11-15], sometime the carcinoma and surrounding endometrial tissue or myometrium are indistinguishable, because of similar signal intensity specially at T2, this problem is over came by use of contrast by which we can differentiate between the tumor, endometrium and myometrium (14-16), also the tumor invasion can be differentiated from necrosis or residual secretion.

In our study contrast enhanced MRI study is very accurate in diagnosis of endometrial carcinoma this because higher contrast between the tumor and endometrium [14,15].

Transvaginal sonography is firstly used because it noninvasive, inexpensive and accepted technique for diagnosis of endometrium carcinoma [17,18]. Many authors reported 80-90% accuracy of TVS in diagnosis of endometrial carcinoma and assessment of myomaterial invasion [17-19], which is close to accuracy of our study.

In comparison with results that obtained by other studies our diagnostic errors with TVS seen when polypoidal tumor present [17-19], intraluminal, large amount of secretion, the presence of myoma or fibroids and myomaterial atrophy. Similar problem were noted in T2 MRI image, but on contrast enhanced MRI these limitations not effect accuracy of our study. Minimal or microscopical myometrium invasion is very difficult to documented by two studies.

In the present study, TVS and contrast enhancing MRI study were found to have comparable accuracy in diagnosis of endometrium carcinoma and contrast enhanced MRI was significantly more accurate than

transvaginal sonography and non-enhanced MRI in detecting myomaterial invasion, although contrast enhanced MRI was superior for evaluation especially for myometrium invasion but is very expensive and time consuming and not suitable for screening test of endometrial carcinoma [8]. TVS has proved to be helpful in evaluating endometrial carcinoma being more suitable if deep myometrium invasion ruled out than when IA, IB, IC stages are to be differentiated some authors have reported rate ranging from 66%-100%. Future studies may determine whether ultrasound alone is sufficient for preoperative assessment in patient with very small early tumors, where MRI perhaps offers limited " added value ".

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