Endoscopic Ultrasonography Examination Of (100) Iraqi Patients With Curved Array Transducer

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Introduction:

Ultrasound scanning under endoscopic guidance, called endoscopic ultrasonography (EUS) ,is one of more recent application of diagnostic ultrasound. There are two types of echoendoscope : radial scanning and longitudinal scanning echoendoscopes . the optical axis and the working channel are in the same plane in the linear echoendoscop, thus allowing visualization of interventional instrumentation in the endoscopic as well as in the ultrasound image .this facilitates EUS guided procedures such as fine needle aspiration (FNA).Ultrasound probe were developed to offer access to narrow intraluminal spaces for which standard echoendoscope can not pass.

Generally accepted indications for EUS of upper gastrointestinal tract:-

1. Staging of upper GIT tumors
2. Hypertrophied gastric folds
3. Extraluminal compression in the stomach
4. Exclusion of pseudoachalasia
5. Intramural gastric varices
6. EUS guided FNA

Aim of study was to evaluate:

1. If is possible to visualize a malignant tumor of the esophagus ,stomach, pancreas and ampulla with EUS using curved array transducer .
2. If EUS reliably can diagnose a malignant tumor of esophagus , stomach ,pancreas and ampulla in patients suspected of these disease .
3. If EUS can visualize other benign conditions related to the upper gastro intestinal tract.

Methods:

One hundred patient were seen at the Gastroenterology and Hepatology Teaching hospital between April / 2002 and October / 2003 were submitted to the EUS examination for different indications. According to these indications, patients had been divided into groups: hypertrophied gastric folds (21 patients), staging of gastric tumor (22 patients), staging of esophageal tumor (19 patients), staging of pancreatic tumor (8 patients),diagnosis of pancreatitis and pancreatic pseudocyst (6 patients),diagnosis and staging of ampllary tumor (4 patients), external compression on the gastric wall (6 patients), and other indication (14 patients) .

All these patients were examine by Pentax-Hitachi FG34UX unite which consists of an oblique forward viewing fibroptics gastroscope with curved array transducer (7.5 MHz).

Results:

Seven out of 21 patients with hypertrophied gastric folds were considered by EUS as having malignancy. Twenty one out of 22 patients with gastric lesions suspected of malignancy were considered by EUS as having malignancy.

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In 17/19 patients with esophageal lesions suspected of malignancy EUS considered the lesions as malignant. Eight patients had pancreatic mass detected by either abdominal ultrasound or by CT. In 6/8 patients malignancy was confirmed histopathologicaly by EUS guided FNA .In six patients with external compression of gastric wall ,EUS suggested the compressions to be caused by liver or spleen in 3 patients , large extra luminal lieomyoma (1 patient), pancreatic body tumor (1 patient) and mesenteric hydatid cyst (1 patient).

In these patients (4) with ampullary tumor , EUS suspected infiltrative lesions in three patients & choledochocele in 1 patient .Pancreatic peseudo cyst. Were visualized by EUS & examination of aspirated material verified the inflammatory origin of these cysts . The obtained EUS results were compared with final diagnosis (surgical exploration or follow up with biopsy) and there was similarity between two results.

Conclusion:

It is concluded that it is possible to visualized various lesions of upper GI tract well as various lesions adjacent to it by using curved array transducer.

Introduction:-

Ultrasuond scanning under endoscopic guidance. called endoscopic ultrasound (EUS), is one of the more recent application of diagnostic ultrasound.

EUS use has rapidly expanded since its first clinical utilization starting around 1980. The first flexible instrument was based on longitudinal scanning technique using electronic curved array transducer and the complementary radial scanning technique with mechanical transducers.

Today, a range of instruments are available and improvements are being made with respect to:

- The size and frequency of ultrasound transducers in order to achieve the highest resolution and sufficient penetration .
- The efficiency of ultrasound processors used to visualize the morphology of gastrointestinal structures in real – time
- The maneuverability and thickness of rigid distal part as well as the insertion tube, giving efficient access to lesions and lessening patient discomfort.
- Endoscopic image quality comparable to that available in conventional flexible endoscopes [(1)] .

Echoendoscopes:-

There are two types of echoendoscopes:

1. Radial scanning echoendoscopes :

This ultrasuond endoscope is equipped with side viewing optic and distally placed mechanically rotating scanning transducer , perpendicular to the axis of insertion tubule the ultrasonic scan filed is generated by single crystal element undergoing 360 degree rotation . Due to the circumferential visualization of luminal structures and adjacent organ's, the orientation is considered easier compared with the longitudinal approach of the curved linear array scanner.

Most radial scanning instruments also include working channel mainly used for irrigation and suction. However, due to the 90 offset between the ultrasonic filed and direction of the working channel, an ultrasuond guided puncture cannot be safely performed .

This is because there is no visual control of the needle tip during advancement of the needle.

2. Linear array scanning echoendoscopes

This instrument consists of an oblique forward viewing fibroptics gastroscope with curved linear array transducer mounted in front of the lens.

The electronic curved array transducer generated a120 sector scans in longitudinal plan, with scanning direction along the axis of gastroscope.

The optical lens (axis) and the working channel are in the same plane, thus allowing visualization of interventional instrumentation in the endoscopic as well as in the ultra sound image.

This facilitates EUS guided procedures such as Fine - needle Aspiration biopsy (FNA), Fine-needle Injection(FNI),or single– step placement of stent for drainage of pancreatic pseudocysts.
For both types of echoscopes, the transducer frequency can be selected from between 5-12 MHz, depending on the Ultrasound Base Unit 12 MHz, in order to optimize axial resolution and penetration depth according to the clinical requirements.
A water filled balloon may be attached to the transducer to improve acoustic coupling and to optimize visualization of interest. Filling or emtying of balloon is controlled by the air/water and suction valves of endoscope.
For direct water instillation into the stomach, approximately 200-300 ccm water should be delivered through the working channel [1,2,3].

Probes: -

The standard echoendoscopes are limited by their diameter and resultant inability to gain access to ductal system or through stenosis . until now , the echoendoscopes were limited by the relatively low US frequencies(7.5-12 MHz).US probe were developed to offer access to narrow intraluminal space and the pancariatico - biliary system. The newer models of being inserted over a guidewire offering accessto the pancareatic duct, and better acoustic coupling with provision for balloon as a method to maintain acoustic copling.
The scannig range of these probes is 360 and frequency range between 20-30 MHz.

In addition to these probes, in tracavitary and transrectal transducers have been developed , some with biopsy capability [2,3].

Needles : -

The ability to visualize a needle within the field of alongitudinally oriented echoendoscope has made it possible for endoscopists to perform FNA and to consider other therapeutic interventions [4].

Miscellaneous Accessories : -

A stent placement device for transluminal pseudocyst drainage has been developed by medi–Globe company and is currently available only as a prototype. The device consists of a sphincterotome (5F) and stent that can be straight, curved, single, or double - pigtail and is 8.5 Fin diameter [4].

Indication of EUS:-

EUS is usually performed at the end of diagnostic work up in order to answer one or more specific questions.
The capability of visualizing 5 wall layers with high resolution qualifies EUS as the method of choice to other imaging modalities such as CT or MRI in imaging luminal lesions.
Generally accepted indication for EUS of upper gastrointestinal tract [1,2,5,6,7,8,9,10,11,12]:-

- Staging of esophageal and gastric cancer.
- Staging of malignant gastric Lymphoma.
- Assessing operability of pancreatic cancer.
- Localization of pancreatic cancer.
- Staging of ampullary tumor.
- Staging of ductal biliary cancer.
- Submucosal tumors , extramural impression.
- Exclusion of pseudoachalasia.
- Giant gastric folds.
- Intramural gastric varices
- EUS guided FNA of paraesophageal tumors, pancreatic lesions, left adrenal gland, and intramural tumor.

Indications for EUS of upper gastrointestinal tract under discussion [1,2] :

- Achalasia.
- Follow – up after surgery of esophageal or gastric cancer.
- Follow – up after radiation and / or chemotherapy for esophageal cancer.
- Esophageal varices (treatment success).
- Staging of lung cancer.
- Mediastinal staging of malignant Lymphoma.
- Chronic pancreatitis.
- Detection of biliary stones.
- EUS guided FNA of submucosal tumers.
- EUS guided drainage of pancreatic pseudocysts.

Aim of the study:-

The aim of this study is to evaluate:-

1. If is possible to visualize a malignant tumor of the esophagus , stomach , pancrease and ampulla with endoscopic ultrasonography using curved array transducer.
2. If EUS reliably can diagnose a malignant tumor of esophagus , stomach, pancrease and ampulla in patients suspected of these diagnosis.
3. The accuracy of EUS staging of upper GI tract malignancy and various malignamcies adjacent to it using curved array transducer.

Patients and methods :-

This study included 100 patients seen at the gastroentrology and hepatology teaching hospital between April 2002 and October 2003 were submitted to the EUS examination for different indications.

These patients had been divided into the following groups according to the indications of examination:

Group 1: Hypertrophied gastric folds
(21 patients)
Group 2: Staging of gastric tumor
(22 patients)
Group 3: Staging of esophageal tumor
(19 patients)
Group 4: Proving the diagnosis and staging of pancreatic tumor (8 patients)
Group 5: Proving the diagnosis of pancareatitis and pancreatic pseudocyst (6 patients)
Group 6: Proving the diagnosis and staging of ampullary tumor (4 patients)
Group 7: External compression on the gastric wall (6patients)
Group 8: Others indications (14 patients)

All these patientes were examined by Pentax - Hitachi FG 34 UX units . This instrument consists of an oblique forward viewing fibroptics gastroscope with curved array transducer mounted infront of the lens .

The transducer frequency is 7.5 MHz . This echoendoscope has a working channel of 2.0 mm for biopsy taking and FNA .

The examination reports contained an endoscopic and ultrasonic description including the location of possible lesion, it is outline , presence or absence of stenosis , description of echo characteristics, possible involvement of the surroundings including possible lymph nodes.

Results:-

According to the indications of examination, these 100 patients were divided into the following groups:

Group 1:

Twenty – one patients had hypertrophied gastric folds detected during upper endoscopic examination.

The histopathological results were nonconclusive in 18 patients, but these were positive for malignancy in 3 patients.

Seven of these patients had hypoechoic of gastric wall (more than 1 cm) with or without presence of perigastric lymph nodes . According to the TNM staging, these tumorous lesions have been staged as T3 N0 – T3N2. These findings were confirmed by surgery .

Two patients had hypoechoic thickening of 2nd and 3rd layers of gastric wall (Mucosa + submucosa). Fellow up of these two patients histopathologicaly verified maltoma.

Others 12/21 patients had normal gastric wall. Repeated gastric biopsy

Remained negative for malignancy verified the inflammatory nature of the conditions.

Group 2:-

Included 22 patients with gastric lesions (exophytic or polypoid mass and giant ulcer with high suspicion of malignancy) detected by upper endoscopic examination .

Malignancy was confirmed histopathologically in 18 patients (13 adenocarcinoma and 5 lymphoma) .Twenty - one patients had hypoechoic thickening of gastric wall at the site of lesion with perigastric lymph nodes detected by EUS.

The staging was T2N1 – T3N2 which was confirmed by surgery .

One patient had an ulcer in the body of stomach, which showed hypoechoic thickening of mucosa with preservation of the outer layers by EUS examination. Initially considered as a benign condition ,but follow up with biopsy confirmed malignancy (adenocarcinoma).

Group 3:-

Included 19 patients presented with dysphagia referred to the EUS for evaluation of esophagial lesions detected by upper endoscopy with high suspicion of malignancy. In 4 patients the lesions located in the middle esophagus and in 15 patients in the lower esophagus with or without involvement of the cardia . Seven of these 19 lesions were impassable stenosis. Malignancy was confirmed histopathologicaly in 13 patients (10 adenocarcinoma and 3 squemous cell carcinoma) . In the other 6 patients the histopathological results was non – conclusive but still had suspicion of malignancy.

EUS examination showed hypoechoic thickening of esophageal wall with loss of normal echo pattern of esophageal wall layers with or without presence of periesophageal and celiac lymph nodes in 17 patients.

The staging was depending on the findings (T2N1 – T3N2). Only one patient had tumor invading the descending aorta (T4).

These findings were confirmed by surgery in 9 patients. Others 8 patients had irresectable tumor because of distant metastasis or the patients unfit for operation because of concomitant medical illness.

One patient had hypoechoic thickening of the esophageal wall (6mm) with preservation of the 4 th layer (musculoris propria). Follow up with histopathological examination of biopsy confirmed chronic esophagitis with fibrosis.

One patient had normal esophageal wall by EUS examination was diagnosed as having achalasia.

Group 4:

This group includes patients (8) with pancreatic mass discovered by ultrasound or CT scanning and submitted to the EUS examination to confirm the diagnosis by FNA and for staging of tumor.

Malignancy was confirmed histopathologicaly by EUS guided FNA in 6 patients while the results of aspiration in the other 2 patients were non – conclusive. These findings were confirmed by surgical exploration.

Group 5:

Including 6 patients with acute and chronic pancreatitis that complicated by pseudocysts (head :1, body :4, tail :1) as detected by ultrasound or CT scanning and submitted to EUS to exclude malignancy by FNA of the cysts.

Examination of aspirated material verified the inflammatory origin of these cysts .

Group 6:

Four patients presented with obstructive Jaundice were submitted to ERCP examination which showed prominent ampulla . Biliary cannulation failed in these patients. Malignancy was confirmed histopatholagicaly by endoscopic biopsy in one patient only .

EUS examination showed hypoechoic lesions (in 3 patients) limited to the ampullay region . The final diagnosis (adenocarcinoma) was achieved by surgery and biopsy. Anechoic cystic lesion confined to the ampulla was found in one patient (ampullary mucocele)? Which was interpreted by CT scanning as pancreatic pseudocyst.

Group 7:

Includes 6 patiens with extenal compression on the stomach discovered by upper endoscopic evaluation. In 3 patients EUS suggested the compression to be caused by the liver and spleen . In the other (3) patients the causes of compression were a large extraluminal lieomyoma , pancreatic body tumor , and a large mesenteric hydatid cyst.

Group 8:
Includes patients with different presentations and findings :

Gastric polyps (4 patients) were confirmed by EUS to be mucosal in origin without feeding artery inside.
Polypectomy and histopathology considered these polyps as hyperplasic .

Susbmucosal elevations were identified in (5) patients by upper endoscopy and confirmed by EUS as lieomyoma. Later on surgical resection of these lesions was done.

Tow patients had ulcerated masses in the 2nd part of duodenum detected by upper endoscopy. Lieomyoma was confirmed by EUS and later on by surgery in one patient . In the 2nd patient EUS showed transmural hypoechoic thickening of duodenal wall with multiple preiduodinal lymph nodes . The final diagnosis was confirmed by surgery as adenocarcinoma.

One patient presented with obstructive jaundice with normal conventional ultrasuond and MRCP , was subumitted to the EUS examination which showed a stone (8 mm) in the distal end of CBD . The final diagnosis was achieved by ERCP with extraction of the stone after sphincterotomy.

EUS evaluation of patient presented with ascites (suspicion of Budd – chiari syndrome) looking for hepatic veins that were not seen by conventional ultrasound. EUS showed partial oblitration of the left and middle hepatic veins with complete obliteration of the right hepatic veins.

Last patients had left hilar mass detected by CXR and CT scanning . EUS showed hypoechoic rounded mass Limited to the left lung , with large lymph node(3 × 1.5 cm) at the subcarinal space that was missed by CT scanning .
EUS guided FNA showed malignant cells.

Discussion :-

This study is the first study done in Iraq by the EUS evaluation of 100 patients with different indications referred to the Gastroentrrology and Hepatology Teaching hospital .
In first group , EUS correctly diagnosed all Malignant Lesion of the stomach that was confirmed by surgery and during follow up with biopsy . similar finding were observed in the study done in Copenhagen by Peter Vilmann.
In 2nd group ,the EUS diagnosis was correct. In all cases except one patient (False negative diagnosis) .
In a study done by peter Vilmann[2] in Copenhagen including 9 patients with exophytic Lesion of the stomach , 7 patients diagnosed by EUS as having Malignancy and 5 patients the tumors were invading the adjacent structures to the stomach (T4), while in the other 2 patients the staging was (T3) . However ,in our study only one patient had tumor staged as (T4) .
In 3rd group of patients that had esophageal tumor , seven of them had impassable stenosis . Inspite of sever tumor stenosis , most tumours can be visualized almost entirely , probably as consequence of curved array orientation of ultrasoud transducer . In a study done by Vinay Dhir[13] in Mumbai , India which included 600 patients with esophageal tumor underwent EUS examination ,442 (73%) were stenotic . The author foud that 2/3 of stenosed esophageal tumor have resectable lesions and hence , staging is essential .He found the EUS is superior to helical CT for staging non – stenotic lesion . For stenotic Lesion staging by MH 908 probe was the only Method found superior to helical CT .
In our study 2 patients with esophageal tumor had periesophageal lymph nodes detected by EUS and confirmed by surgery , but Missed by helical CT.

The 4th group that was including (8) patients with pancreatic tumor. Two patients had pancreatic tumors of the head and body were invading the portal and splenic vein respectively detected by EUS confirmed by surgery . these findings were missed by CT scanning . Similar findings were observed in a study done by PankaJ J. Patel(14) in India ,who consider EUS to be more accurate modality for local T staging and predicting vascular invasion.

Conclusion and Recomondation:-

- From this study it is concluded that it is possible to visualized various lesions of upper GI tract as well as various lesions adjacent to it by using EUS with curved array transdercer
- It seems that EUS has high diagnostic potential regarding exclusion of malignancy if normal wall layers are imaged in the oesophagus or stomach and also if no lesion suggestive of malignancy is found in the pancreas.
- EUS image alone can not reliably diffrentiate a benign lesion from malignant one (esophagus , stomach, pancreas).
- EUS is the most accurate modality for T staging (wall invasion) of esophagus and stomach.
- EUS seems valuable for evaluation of hypertrophied gastric wall
- It is documented that EUS is very useful for detecting the cause behind external compression of gastric wall and also for submucosal elevation caused by submucosal and stromal tumors.
- Certainly we need more experience with EUS examination.

Table 1 EUS of (21) patients with hypertrophied Gastric wall

Age	Sex	Hypertrophied gast. Folds detected by	Histopathology prior to EUS	EUS Findings	Staging	Operative Findings
60	M	**Endoscopy**	Gastritis	Hypoechoic transmural thickenning of wall	T3N2	Same EUS findings (adenocarcinoma)
30	F	**Endoscopy**	Gastritis	**Normal**	-	-
25	F	Endoscopy	Gastritis	Normal	-	-
55	M	Endoscopy + U/S	Gastritis	Hypoechoic transmural thickenning of wall	T3N1	Same EUS findings (adenocarcinoma)
42	F	Endoscopy + CT scanning	Lymphoma	Hypoechoic transmural thickenning of wall	T3 N2	-
65	F	Endoscopy	Adenocarcimona	Hypoechoic transmural thickenning of wall	T3 N1	-
32	M	Endoscopy	Gastritis	Normal	-	-
21	M	Endoscopy	Gastritis	Normal	-	-
75	M	Endoscopy	Gastritis	Normal	-	-
68	F	Endoscopy	Gastritis	Hypoechoic transmural thickenning of wall	T3 N2	Same EUS findings (adenocarcinoma)
37	M	Endoscopy + CT scanning	Adenocarcinoma	Hypoechoic transmuural thickenning of wall	T3 N1	Same EUS findings
19	M	Endoscopy	Gastritis	Normal	-	-
53	M	Endoscopy	Gastritis	Normal	-	-
29	M	Endoscopy	Gastritis	Normal	-	-
59	F	Endoscopy	Gastritis	Normal	-	-
62	M	Endoscopy	Gastritis	Hypoechoic transmural thickenning of wall	T3 N2	Same EUS findings (non – Hodgkin Lymphoma)
33	F	Endoscopy	Maltoma	Hypoechoic Thickenning of 2nd and 3rd layers	T3 N0	Not respond to antibiotics ,Send for Chemotherapy
40	M	Endoscopy	Gastritis	Normal	-	-
49	F	Endoscopy	Maltoma	Hypoechoic transmural thickenning of wall	T1 N2	Send for chemotherapy.
47	F	Endoscopy	Gastritis	Normal	-	-
58	M	Endoscopy	Gastritis	Normal	-	-

Table 2 EUS of 19 Patients with Suspected Cancer of Esophagus.

Age	Sex	Tumor Suspected by	Locations of Lesions	Stenosis	Histopathology Prior to EUS	EUS Findings	Staging	Operative Findings and Follow up
61	M	Endoscopy	Lower 1/3	-	Adenocarcinoma	Hypoechoic transmural thickening of wall	T3 N2	Same EUS Findings
47	M	Endoscopy, + CT scanning	Lower 1/3	-	Adenocarcinoma	Hypoechoic transmural thickening of wall	T3 N2	Same EUS Findings
53	F	Endoscopy	Middle 1/3	+	Squemous cell carcinoma	Hypoechoic transmural thickening of wall	?	-
63	M	Endoscopy, + CT scanning	Lower 1/3 + Cardia	-	Adenocarcinoma	Hypoechoic transmural thickening of wall	T3 N2	Same EUS Findings
57	F	Endoscopy	Lower 1/3	-	Adenocarcinoma	Hypoechoic transmural thickening of wall	T3 N2	Same EUS Findings
49	F	Endoscopy, + CT scanning	Middle 1/3	+	Squemous cell carcinoma	Hypoechoic transmural thickening of wall	?	T3 N1
59	M	Endoscopy	Lower 1/3 + Cardia	-	Adenocarcinoma	Hypoechoic transmural thickening of wall	T3 N2	Same EUS findings
75	M	Endoscopy	Lower 1/3 + Cardia	+	Adenocarcinoma	Hypoechoic transmural thickening of wall	?	Stenting
56	M	Endoscopy	Middle 1/3	+	Squemous cell carcinoma	Hypoechoic transmural thickening of wall	?	T3 N1
32	M	Endoscopy	Lower 1/3	+	Esophagitis	Hypoechoic transmural thickening of wall	?	Chronic esophagitis and fibrosis

Table 2 (continue)

Age	Sex	Tumor Suspected by	Locations of Lesions	Stenosis	Histopathology Prior to EUS	EUS Findings	Staging	Operative Findings and Follow up
80	F	Endoscopy	Lower 1/3	-	Esophagitis	Hypoechoic transmural thickening of wall	T2 N1	-
45	M	Endoscopy, + CT scanning	Lower 1/3	-	Esophagitis	Hypoechoic transmural thickening of wall	T3 N2	Same EUS findings
39	M	Endoscopy, + CT scanning	Lower 1/3	-	Adenocarcinoma	Hypoechoic transmural thickening of wall	T2 N1	Same EUS findings
54	M	Endoscopy	Lower 1/3	-	Esophagitis	Hypoechoic transmural thickening of wall	T3 N2	Same EUS Findings
70	F	Endoscopy, + CT scanning	Lower 1/3	-	Esophagitis	Hypoechoic transmural thickening of wall	T3 N1	Follow up with biopsy - Adenocarcin-oma
41	M	Endoscopy	Lower 1/3	-	Normal	Normal	-	Follow up Achalasia
75	M	Endoscpy	Lower 1/3	-	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T4 N1	-
60	F	Endoscopy	Lower 1/3 + Cardia	+	Adenocarcinoma	Hypoechoic transmural thickening of wall	T3 N2	Same EUS findings

Table 3 EUS of 22 Patients with Gastric Lesions Suspected of Malignancy

Age	Sex	Endoscopic Findings	Location	Histopathology Prior To EUS	EUS Findings	Staging	Operative Findings and Follow up
50	M	Ulcerated mass	Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
62	M	Polypoid mass	Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
45	F	Ulcerated mass	Body + Cardia	Non – Hodgkin Lymphoma	Hypoechoic trasmural thickening of wall	T3 N2	Send For Chemotherapy
80	F	Giant ulcer	Antrum	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T2 N1	-
26	F	Ulcerated mass	Fundus + body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
75	M	Polypoid mass	Cardia	Gastritis	Hypoechoic trasmural thickening of wall	T3 N2	-
52	M	Ulcerated mass	Body	Non – Hodgkin Lymphoma	Hypoechoic trasmural thickening of wall	T3 N2	Chemotherapy
57	M	Ulcerated mass	Body + Antrum	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
49	F	Ulcerated mass	Lesser Curve	Non – Hodgkin Lymphoma	Hypoechoic trasmural thickening of wall	T3 N2	Chemotherapy
68	F	Polypoid mass	Antrum	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N1	Same EUS Findings
36	M	Ulcerated mass	Antrum	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N1	Same EUS Findings

Table 3 (continue)

Age	Sex	Endoscopic Findings	Location	Histopathology Prior To EUS	EUS Findings	Staging	Operative Findings and Follow up
62	M	Ulcerated mass	Body	Gastritis	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings (adenocarcinoma)
60	F	Giant ulcer	Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N1	Same EUS Findings
33	M	Polypoid mass	Body + Antrum	Non – Hodgkin Lymphoma	Hypoechoic trasmural thickening of wall	T3 N2	Chemotherapy
58	F	Ulcerated mass	Fundus	Gastritis	Hypoechoic trasmural thickening of wall	T3 N1	Same EUS Findings (adenocarcinoma)
76	M	Ulcerated mass	Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	-
49	F	Ulcerated mass	Body +Antrum	Non – Hodgkin Lymphoma	Hypoechoic trasmural thickening of wall	T3 N2	Chemotherapy
52	M	Ulcerated mass	Cardia + Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
61	M	Gaint ulcer	Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
57	F	Gaint ulcer	Cardia	Gastritis	Hypoechoic trasmural thickening of 2^{nd} and 3^{rd} layers	-	Follow up with biopsy - Adenocarcinoma
55	M	Ulcerated mass	Body	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings
55	M	Ulcerated mass	Body + Cardia	Adenocarcinoma	Hypoechoic trasmural thickening of wall	T3 N2	Same EUS Findings

Table 4 EUS of 8 Patients with Suspicion of Pancreatic Cancer

Age	Sex	Lesions suspected by	Location	Size of Lesion by U/S or CT	EUS Findings	Staging by EUS	FNA Findings by EUS	Operative Findings and Follow up
60	F	CT scanning	Head	3 cm	Head Mass (3.5 cm) Dilated CBD + Pancreatic duct	T3 N0	Adenocarcinoma	Same EUS Findings
53	M	CT scanning + U/S	Head	5 cm	Head Mass (5 cm) Dilated CBD + Pancreatic duct	T3 N0	Adenocarcinoma	Same EUS Findings
72	M	CT scanning	Head	3.5 cm	Head Mass (3.7 cm) Dilated CBD + Pancreatic duct	T3 N0	Adenocarcinoma	-
63	M	CT scanning + U/S	Body	4 cm	Body Mass (4.2 cm) Invasion of splenic vein	T4 N0	Adenocarcinoma	-
55	F	CT scanning	Head	5.5 cm	Head Mass (5.2 cm) Invasion of portal vein	T4 N0	Non - Conclusive	Same EUS Findings
49	M	CT scanning + U/S	Head	5 cm	Head Mass (5 cm) Dilated CBD + Pancreatic duct	T2 N0	Adenocarcinoma	Same EUS Findings
65	F	CT scanning	Body	3 cm	Body Mass (3.2 cm)	T2 N0	Adenocarcinoma	Same EUS Findings
59	F	CT scanning	Tail	2.5 cm	Tail Mass (3 cm)	T2 N0	Non – Conclusive	Same EUS Findings (Adenocarci -noma)

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