THE DISSERTATION ON

THE ROLE OF PRETREATMENT LAPAROSCOPY IN SELECTIVE ABDOMINAL MALIGNANCY

M.Ch. BRANCH – VI

SURGICAL GASTROENTEROLOGY & PROCTOLOGY

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CERTIFICATE

Certified that this dissertation entitled **"THE ROLE OF PRETREATMENT LAPAROSCOPY IN SELECTIVE ABDOMINAL MALIGNANCY"** is the bonafide record work done by **Dr.K.SREENIVASAN**, during the period 2003-06, done under my guidance and supervision and is submitted in partial fulfillment of the requirement for the M.Ch. (Branch – VI) Surgical Gastroenterology & Proctology, of 'The Tamilnadu Dr. M.G.R. Medical University, August 2006 examination.

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CONTENTS

1. INTRODUCTION

Although surgeons and gastroenterologists have used diagnostic laparoscopy since the early 1900s, today's surgical oncologists have been relatively slow to embrace this technology. Together with the fervor and benefits afforded by laparoscopic therapeutic interventions in the management of patients with benign disease and the diagnostic usefulness in blunt trauma and abdominal pain, awareness has been rekindled regarding the advantages of laparoscopy for the staging of abdominal malignancy. The morbidity and mortality of exploratory laparotomy with unresectable tumors has been from 13 to 23% and 10 to 21% respectively[42]. As surgeons begin to realize that extirpative procedures are doomed to failure in curing patients with diffuse abdominal metastases disclosed on laparoscopic assessment, palliative measures, such as stent placement, ablative procedures, balloon dilatation, intraluminal high-dose radiation, and laser techniques will be used commonly by surgical endoscopists and gastroenterologists. Similarly, it is hoped that the use of systemic chemotherapy will achieve better specificity in cell destruction in patients identified laparoscopically to have uncontained disease in the

abdominal cavity. The sensitivity of imaging combined with laparoscopy has been shown to approach that of celiotomy in the evaluation of solid organs, thereby avoiding unnecessary laparotomy and its associated morbidities. Using imaging as a complement to laparoscopy will extend the usefulness of both techniques. The application of laparoscopy and the advent of miniaturized laparoscopic instrumentation, both diagnostic and therapeutic, in the management of patients with abdominal malignancy will be limited only by the creativity and expertise of physicians and instrument makers.

Accurate cancer diagnosis and staging are crucial to the determination of an efficacious treatment plan for localized and advanced malignancy. The physician must differentiate patients with potentially resectable, localized disease from those with advanced and /or distant disease. The diagnostic and staging modalities currently available are expensive and often inaccurate. This can result in the nonoperative management of potentially resectable malignancies or, more commonly, in an underestimation of the preoperative cancer stage with intraoperative evidence of advanced / metastatic disease. The combination of laparoscopy and laparoscopic ultrasonography can be used to help diagnose and stage malignancies and select patients for either curative or palliative procedures.

The role of laparoscopy in the care of patients with cancer is currently evolving. Numerous experimental and clinical studies have attempted to elucidate the nature and cause of port-site metastases, particularly to discern whether they simply are a marker of advanced disease, or if they are a result of the laparoscopic intervention. Laparoscopy has a role in establishing the diagnosis of cancer in some situations by allowing biopsy of intraperitoneal and retroperitoneal masses, lymph nodes, peritoneal and visceral lesions, as well as examination of abdominal contents under direct vision or with ultrasound probes. Laparoscopy also has a role in the surgical treatment of a variety of malignancies including gastric carcinoma, pancreatic cancer, splenic malignancies, adrenal cancers, and colon cancer. Lastly, laparoscopy can play an important role in the palliative care of the cancer patient in performing procedures such as feeding-tube placement or intestinal stoma creation. It is imperative that using laparoscopy in the care of patients with malignancies is carefully and thoroughly evaluated since this technique can either benefit or adversely affect survival or quality of life.

2. AIM

The aim of the present study were to evaluate the relative benefit of the 'pretreatment / diagnostic laparoscopy' in selective patients of intra-abdominal malignancy for identifying occult surface metastasis and locally invasive lesions, thereby reducing unnecessary / nontherapeutic laparotomy and their associated morbidity and mortality. The present imaging (USG, CT-scan, MRI) fails to identify all the metastasis and local invasion lesions [see figures – 1 to 4] especially when metastasis are below 1 cm. in size.

The other aims of the present study was also to assess the diagnostic value of laparoscopy compared to imaging (US, CT, MRI) in detecting intra-abdominal metastatic spread. The major advantage of diagnostic laparoscopy for patients with a gastrointestinal tumor is the prevention of unnecessary explorative laparotomy. However, it is doubtful whether this procedure also prevents late laparotomy that are necessary for palliative treatment during follow-up. Staging laparoscopy should be performed to identify patients with liver or peritoneal metastases who have an expected

survival of approximately 3 to 9 months[14, 29,32,39,46,63], in whom minimally

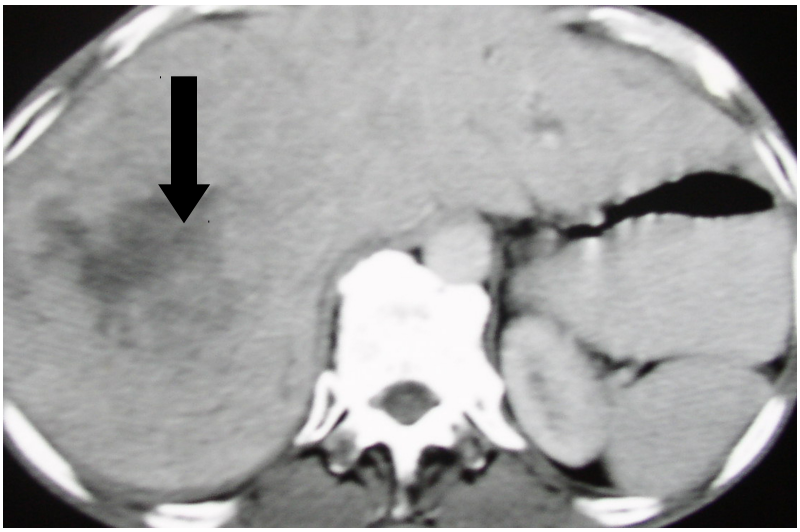


Fig: 1 CT Scan - Hepatocellular carcinoma

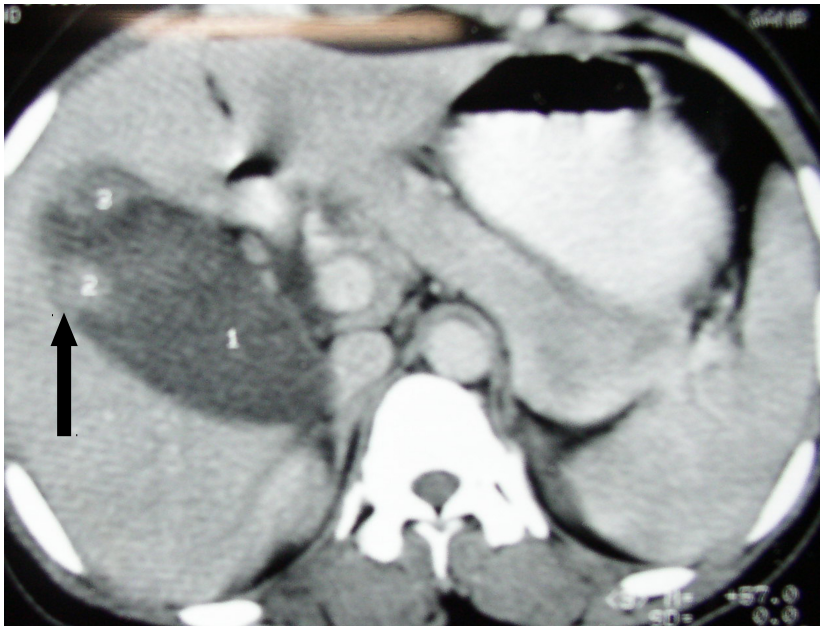


Fig: 2 CT Scan - Gall-bladder carcinoma

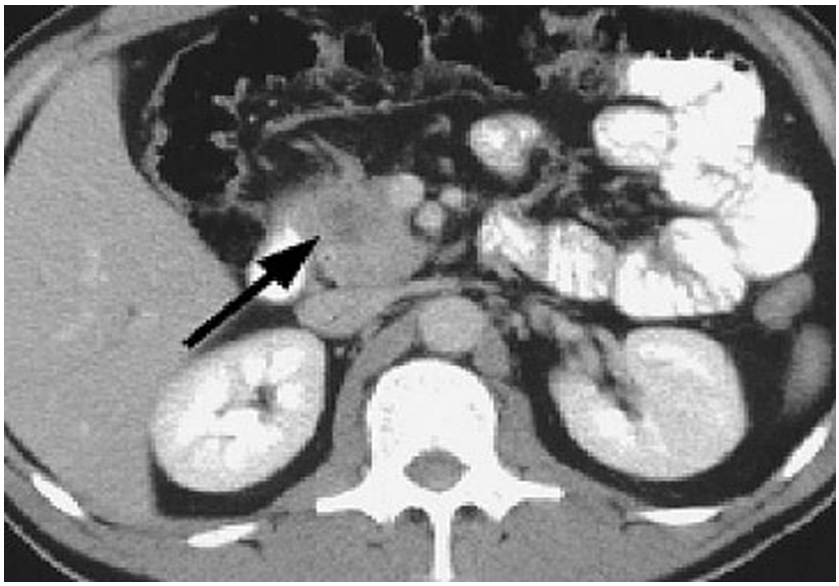


Fig: 3 CT Scan-Pancreatic head carcinoma

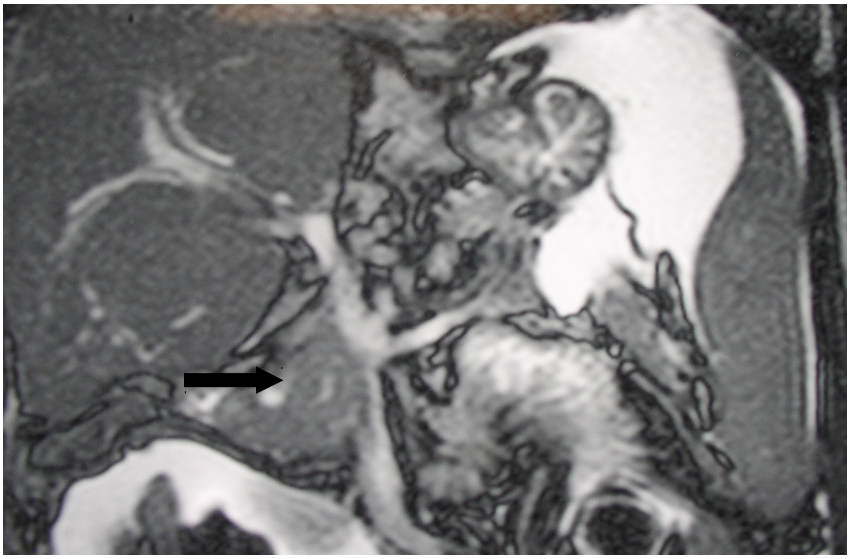


Fig: 4 MRI Scan-Pancreatic head carcinoma

invasive palliation will be satisfactory.

Before the era of laparoscopy all patients suspected of abdominal malignancy undertook explorative laparotomy. Only a minority (10 to 30%)[14,29,32,39,46,63] had curative or palliative surgery and the rest suffered the morbidity and mortality of the nontherapeutic laparotomy. With the inventions of glass-rod optic (telescope) and Veress needle more patients are having minimally invasive evaluation. On this basis, we studied the usefulness of the preliminary / diagnostic laparoscopy in avoiding unnecessary / nontherapeutic laparotomy.

3. MATERIALS & METHODS

The present study was done in the Department of Surgical Gastroenterology, Madras Medical College, Chennai-3, from September 2003 to October 2005 in a series of 60 patients of which 40 males, 20 females and age varied from 35 to 77 years (Fig.: 15 & 16).

The pretreatment laparoscopy were performed in selective patients with intra-abdominal malignancy in order to accurately stage their lesions and ascertain resectability. Patients in whom conventional imaging had disclosed obviously unresectable lesions (i.e. ascites, pelvic deposits, distant lymphadenopathy, liver metastases) were excluded from present study. Patients with comorbid diseases, complications requiring open palliative bypass procedures were also excluded from this study.

All laparoscopy was performed under general anesthesia with intermittent positive-pressure ventilation. The site for the CO_2 pneumoperitoneum needle and trocar were selected, when possible, below the umbilicus and insufflated until the intra-abdominal pressure reached 8 to 10 mmHg (4 to 5 liters of CO_2). Both 0° forward-viewing and 30° side-viewing 5mm telescopes were used. The visible surfaces of the liver, diaphragm,

omentum, visceral and parietal peritoneum were carefully examined for evidence of malignant deposits and ascites. Most of the anterior wall of the stomach, anterior-inferior liver surface, anterior parietal peritoneum, and anterior surface of omentum could be inspected without manipulation. However, a second puncture to the lateral of the midline permitted introduction of a probe with which the viscera could be moved so as to determine the extent of infiltration of the primary lesion and invasion of the adjacent structures (See Fig. 7). Inserting the laparoscope through a small opening at the gastro-colic or gastro-hepatic omentum facilitated inspection of the lesser sac. Areas infiltrated by tumor feel hard and fixed. Combined inspection and probing provide a fairly accurate estimate of the extent of disease. By elevating the left lobe of the liver with the probe, the undersurface can be inspected by means of the side-viewing telescope for evidence of metastases. Rotating the telescope by 180° brings into view the lesser curve of the stomach, lesser omentum and the caudate lobe of the liver.

If the patient is not obese, the anterior surface of the pancreas can be seen through the translucent gastro-hepatic omentum. Infiltration by tumor is reflected in neovascularization and loss of its normal smooth, glistening appearance. Inspection and manipulation are aided by elevating the head-end of the table. The pelvic cavity is examined by elevating the foot-end of the table. Guided-biopsy were performed(see Fig.16), with proper caution, including

tissue from the mass, parietal peritoneum, omentum and nodes but deferred until inspection and probing is complete, as blood trickling from a biopsy site may hamper proper visualization. The ascitic fluid and peritoneal lavage fluid were taken for cytological studies in few patients (100ml of normal saline was instilled into the sub-phrenic space, pelvic cavity and 20ml of lavage fluid were recovered for cytologic evaluation). In the present study the procedure were accomplished in about 15 to 45 minutes. Patients found to be laparoscopically operable underwent laparotomy.

Strict observation of the patients in the postoperative ward was done and all the complications were treated. Patients were either referred or discharged between 2 to10 days.

Patient demographics, preoperative imaging, laparoscopy findings and postoperative course were analyzed. Postoperative complications were scored by 'Memorial Sloan-Kettering cancer center grading system', which ranks complications according to severity as follows:

1) Requiring oral antibiotics or bedside management such as local wound care;
2) Requiring intravenous treatment;
3) Requiring operative or radiological intervention;
4) Resulting in significant chronic disability; and
5) Resulting in death as a result of the complication.

Statistical analysis:

The 'Sensitivity' is expressed as the ratio of the true-positive to all of those with the diseases [true-positive / (true-positive + false-negative)]. The 'Specificity' is expressed as the ratio of true-negative to all those without diseases [True-negative / (true-negative + false positive)]. The 'Positive predictive value' is the ratio of true disease positive to all positive test [true-positive / (true-positive + false-positive)] and the 'Negative predictive value' is the ratio of the true-negative to all negative test [true-negative / (true-negative + false-negative)]. The 'Accuracy' of laparoscopy was calculated by dividing the

number of patients found to be inoperable at laparoscopy by the total number of patients found to be inoperable. The 'Yield' of laparoscopy was defined as the number of patients spared a laparotomy divided by the total number of patients in this study.

4. OBSERVATIONS AND RESULTS

In this study of 60 patients, there were 40 men and 20 women, with mean age of 53.2 years (range 35 to 77). Cancers involving proximal stomach were seen in 21 patients(35%), pancreas in 18 patients(30%), liver in 10 (16.6%) patients and gall-bladder in 11 (18.3%) patients.

Table 1: Laparoscopy.

	Organ	**No(%)** **60**	**L** **23**	**P** **12**	**A** **5**	**I** **11**	**M1/Adv** **37(61.6%)**	**Bx** **6/37** **(16.2%)**	**Cy** **15/37** **(40.5%)**	**Compl** **6/37** **(16.2%)**
1.	***PGC/OGJ***	21(35)	2	5	4	9	10(47.6)	4	6	3
2.	***Panc.***	18(30)	4	4	1	-	8(44.4)	2	5	2
3.	***Liver***	10(16.6)	10	-	-	-	10(100)	-	-	-
4.	***Gallbl.***	11(18.3)	7	3	-	2	9(81.8)	-	4	1

L-Liver, P-Peritoneum, A-Ascites, I-Invasion, M1/Adv.-Metastasis/Advanced,
Bx- Biopsy, Cy-Cytology, Compl-Complication,
PGC/OGJ- Proximal gastric /Oesophago-gastric junction carcinoma

* Liver & Peritoneum in 4, Peritoneum & Ascites in 3, Liver, Peritoneum & Ascites in 1.

Laparoscopic examination was judged to be complete in all patients. All the patients tolerated and recovered well from the procedure. Laparoscopic diagnosis and the outcome are shown in the following Table-1. In 37 (61.6%) patients, previously unrecognized local and distant spread of tumor were found by laparoscopy and confirmed by biopsy in 6 patients (16.2%).

Most of the occult metastasis were multiple and varied in size (1 to 15 mms). They were commonly seen on the liver (17 patients, 28.3%) and peritoneal (12 patients, 20%) surfaces. Liver metastatic lesions were seen in 2 of 21 patients in PGC, 4 of 18 patients in pancreatic malignancy, 4 of 10 patients in liver cancers and 7 of 11 patients in gallbladder malignancy. Peritoneal deposits were seen in 5 of 21 patients in PGC, 4 of 18 in pancreatic malignancy and 3 of 11 patients in gallbladder malignancy. In 6 of 10 patients with hepatocellular carcinoma and 2 of 18 patients in pancreatic malignancy showed cirrhosis. Minimal ascites was seen in 4 of 21 patients with PGC and in one patient with pancreatic malignancy. Adjacent structure invasion and enlarged regional lymphnodes were seen in 9 of 21

Fig: 5 Port Sites

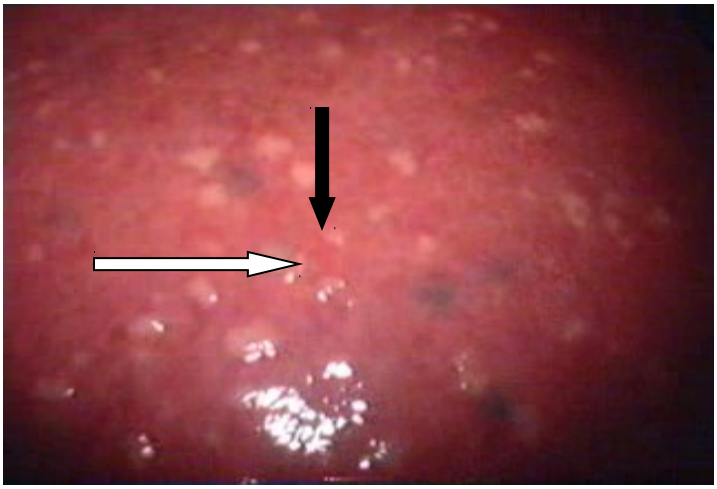


Fig: 6 Liver secondaries with cirrhosis

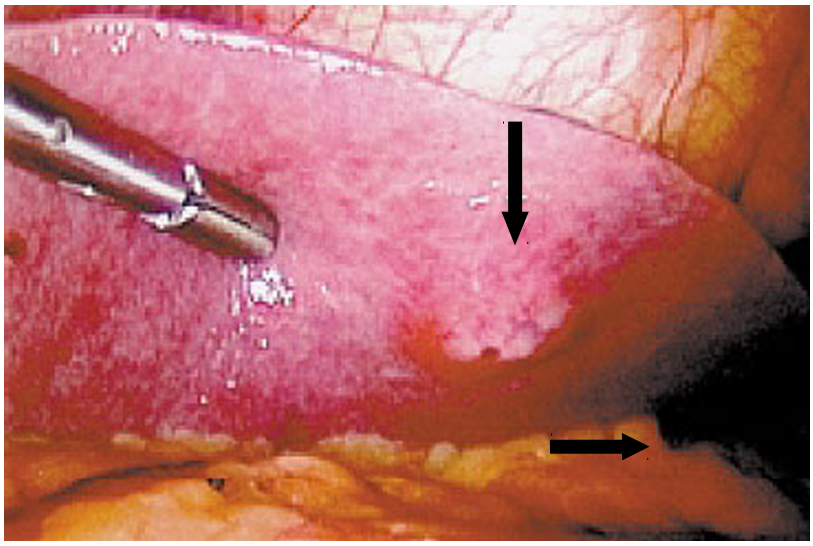


Fig: 7 Oesophago-gastric carcinoma with liver secondaries

Fig: 8 Omental deposits

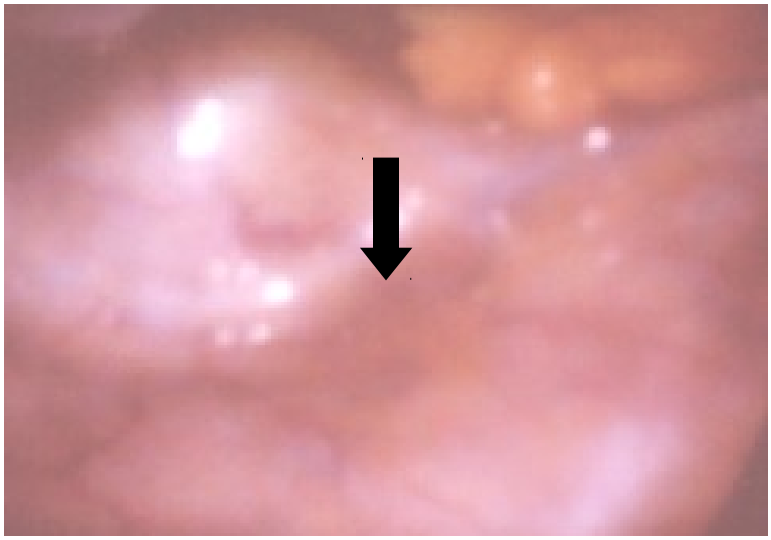


Fig: 9 Minimal ascites

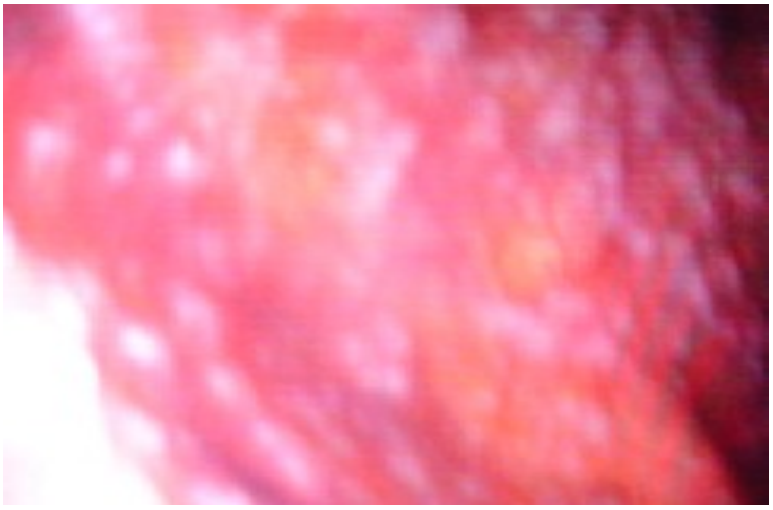


Fig: 10 Parietal wall secondaries

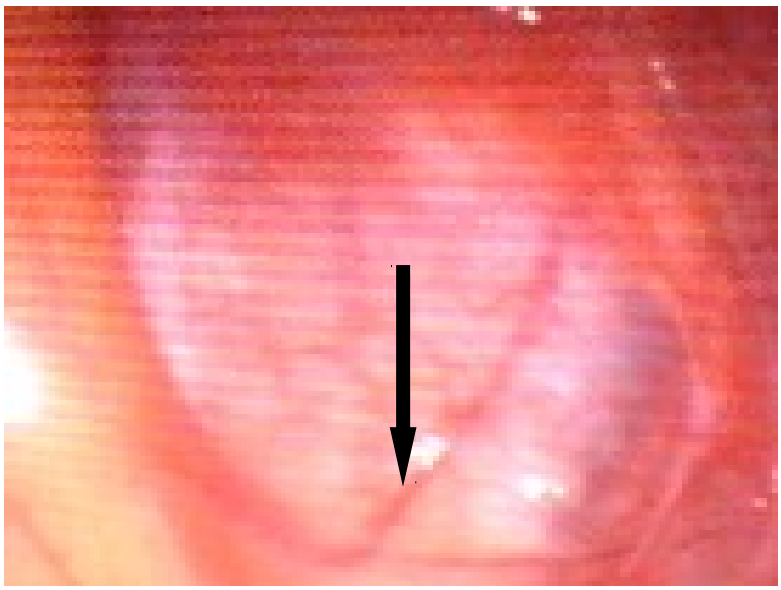


Fig:11 Gall bladder carcinoma

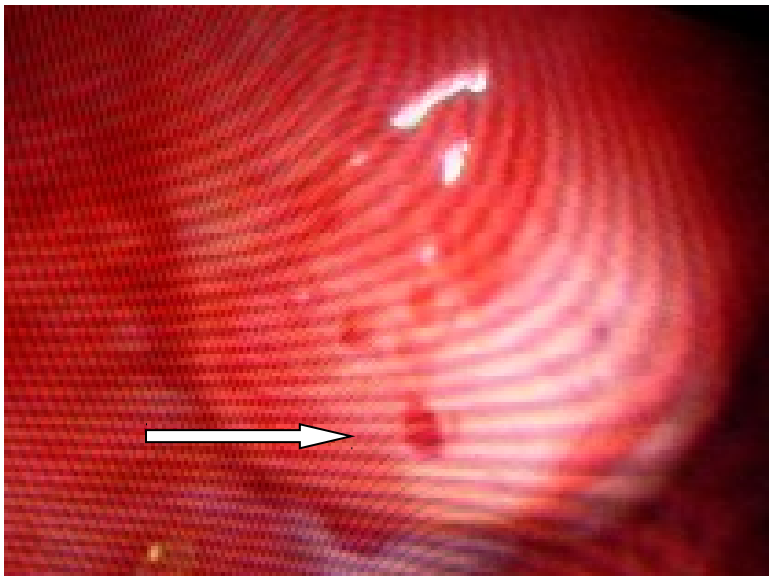


Fig: 12 Hepatocellular carcinoma

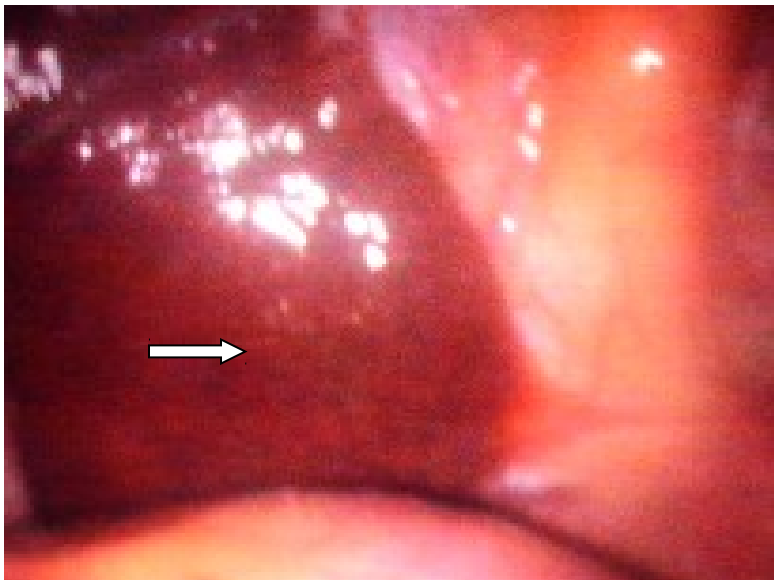


Fig: 13 Pancreatic carcinoma with liver secondaries

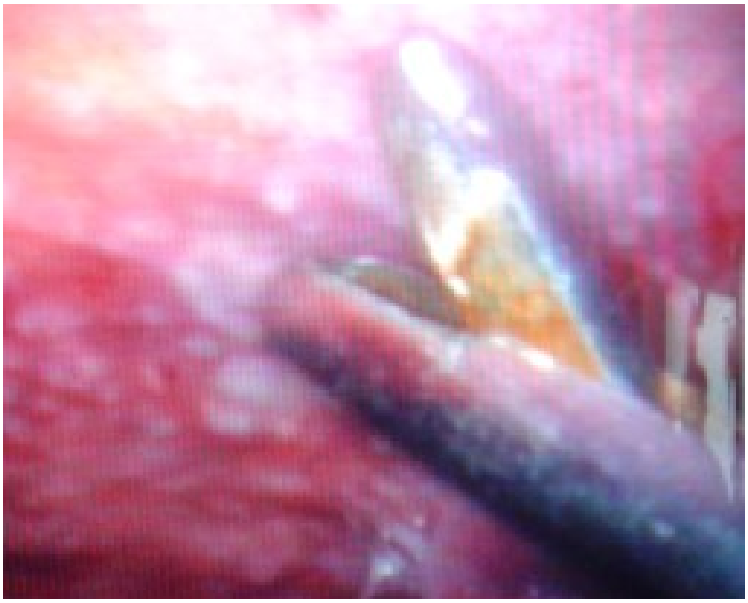


Fig: 14 Laparoscopic-guided biopsy

patients in PGC and 2 of 11 patients in gallbladder malignancy [see figure – 8 to 16]. All the guided-biopsy (6 patients, 16.2%) were positive for metastasis [see figure – 16]. Ascites / peritoneal lavage was taken in 15 (40.5%) patients of which only 4 (26.6%) patients showed positive cytology. Incurable disease was detected in 37 of 60(61.6%) patients by laparoscopy.

Table 2: Laparotomy.

	Organ	**No(%)** **60**	**For** **Laparotomy** **23(38.3%)**	**L** **-**	**P** **-**	**A** **-**	**I** **8**	**Surgery** **15** **(25%)**	**Total** **M1/Adv** **45 (75%)**	**Avoid** **laparotomy** **37 (61.6%)**
1.	***PGC/OG***	21(35)	11	-	-	-	3	8(72.7)	13(61.9)	10(47.6)
2.	***Panc.***	18(30)	10	-	-	-	3	7(70)	11(61.1)	8(44.4)
3.	***Liver***	10(16.6)	-	-	-	-	-	-	10(100)	10(100)
4.	***Gallbl.***	11(18.3)	2	-	-	-	2	2(100)	9(81.8)	9(81.8)

L-Liver, P-Peritoneum, A-Ascites, I-Invasion, M1/Adv.- Metastasis/Advanced, PGC/OGJ- Proximal gastric / Oesophago-gastric junction carcinoma.

The rest 23 (38.3%) patients underwent laparotomy and found to have advanced diseases in 3 of 11 patients with PGC and 3 of 10 patients with pancreatic malignancy and 2 of 2 in gallbladder cancer as shown in Table-2. These patients had large bulky lesions with infiltration and enlarged, fixed regional lymphnodes.Definitive surgery was done in the remaining 15 (65.2%) patients (8 Total gastrectomy with Roux-en-y reconstruction, 7 Whipples procedure) depending on organ of involvement and 2 palliative

segment-III bilioenteric anastomosis.

Complications were seen in 6 of 37(16.2%) patients and these includes basal atelectasis in 2(5.4%) patients, port-site infection in 2(5.4%) patients, prolonged ileus and urinary retention in one each (2.7%) as shown in Tables – 1 & 8. There was no mortality in the present study. Patients were either referred or discharged between 2 to 10 days, resulting in an average postoperative hospital stay of 2 days for laparoscopy and 8 days for laparotomy as shown in Table - 9.

Laparoscopic examination indicated resectablity of tumor in 23 of 60 (38.3%) patients and the surgery was accomplished in 15 of 23 (65.2%) patients as shown in Table - 10. In the remaining 8 of 23 (34.7%) patients, local spread of the disease, unappreciated at laparoscopy precluded surgery.

The 'diagnostic accuracy' of laparoscopy in the present study can be calculated as 82.2%(37 of 45 patients). Laparoscopic assessment of unresectable tumor proved consistently correct. The assessed accuracy of resectable disease was 65.2% (15 of 23 patients). The overall resectablity rate in the present study was 25% (15 of 60 patients) as shown in Tables – 2, 10 & 13. All laparoscopically targeted biopsy were positive (6 of 6 patients) with 100% specificity.Cytological examinations of the ascitic / lavage fluid were performed in 15 of 37 patients in which only 4(26.6%) patients showed

positive cytology as shown in Table - 7.

Pretreatment laparoscopy had the sensitivity of 84.9%, specificity of 100%, positive-predictive value of 100%, negative-predictive value of 65.2% and an overall accuracy of 82.2% for detection of occult metastases and locally advanced diseases. Laparoscopy disclosed otherwise unrecognized spread (‘yield’) in 37 (61.6%) patients who were thus spared the burden and the risk of laparotomy as shown in Tables – 11 & 13. This guided to alter the course of therapy in these patients.

5. PROFORMA

NAME: **AGE**: years **SEX**: male/female

ADDRESS: **I.P.NO**: **SGE.NO**:
OCCUPATION:

CLINICAL FEATURES:

DIAGNOSIS: ORGAN- **CLINICAL STAGE-**

IMAGING: USG / CT-scan / MRI- scan
Liver- , **P**eritoneum- , **A**scites- , **I**nvasion- .

LAPAROSCOPY: Pneumoperitoneum- Open / Closed
Port- 1 / 2 / 3
Biopsy / Cytology.
Liver- , **P**eritoneum- , **A**scites- , **I**nvasion- .

OTHERS PROCEDURES:

HPE / CYTOLOGY REPORT:

POSTOPERATIVE COMPLICATIONS: Major- 3 / 4 / 5 ;
Minor- 1 / 2 ;

HOSPITAL STAY: DAYS

FOLLOW-UP:

OTHERS REMARKS:

6. DISCUSSION WITH ANALYTICAL DATA

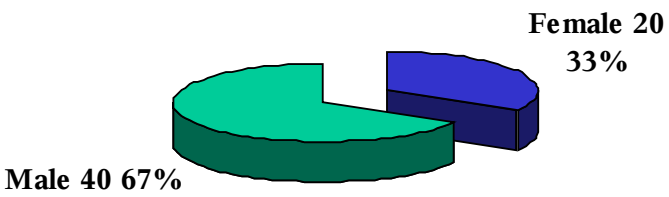
Age and sex incidence:

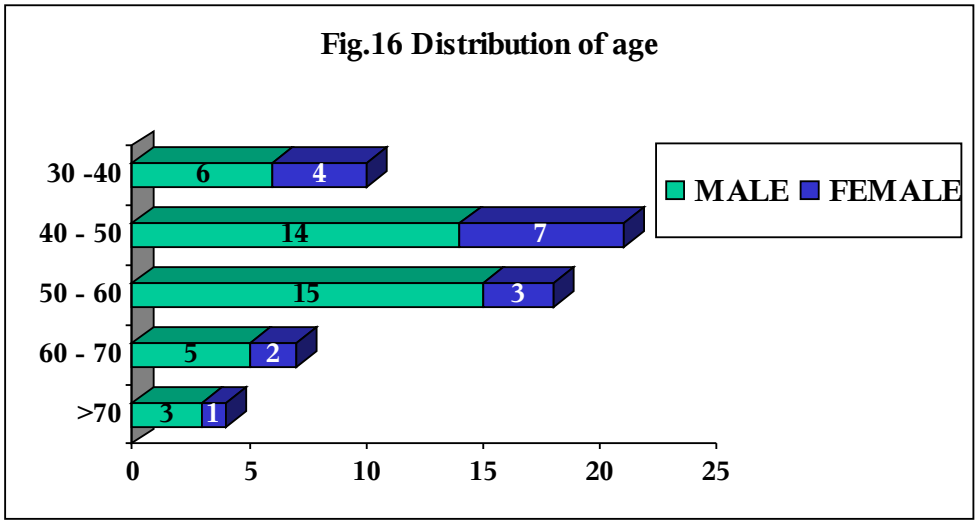
In the present study the youngest patient was 35 years and the oldest 77 years. Majority of the diseases were seen in the forth and fifth decades. The mean age being 53.2 years. Among 60 patients, 40 males and 20 females were seen in the present study while in the study by Molloy[57] et al and Lehnert[48] et al more than 2/3rd were males as shown in Table-3 and Fig.15 & 16.

Table 3: Demography

S.no.	Study	Total	Male (%)	Female(%)
1.	***Present study***	60	40(66.6)	20(33.3)
2.	***Molloy[57] et al,'94***	244	165(67.6)	79(32.3)
3.	***Lehnert[48] et al,'02***	120	78(65)	42(35)

Fig.15 Sex incidence





Organ involvement:

In the present study, malignant growth were seen involving proximal stomach in 35%(21), pancreas in 30%(18), liver in 16.6%(10) and gallbladder in 18.3%(11) of patients as shown in Table-4 and Fig.17.

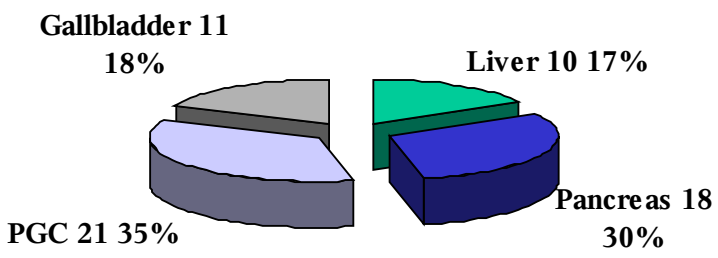
Table 4: Types of organ tumors

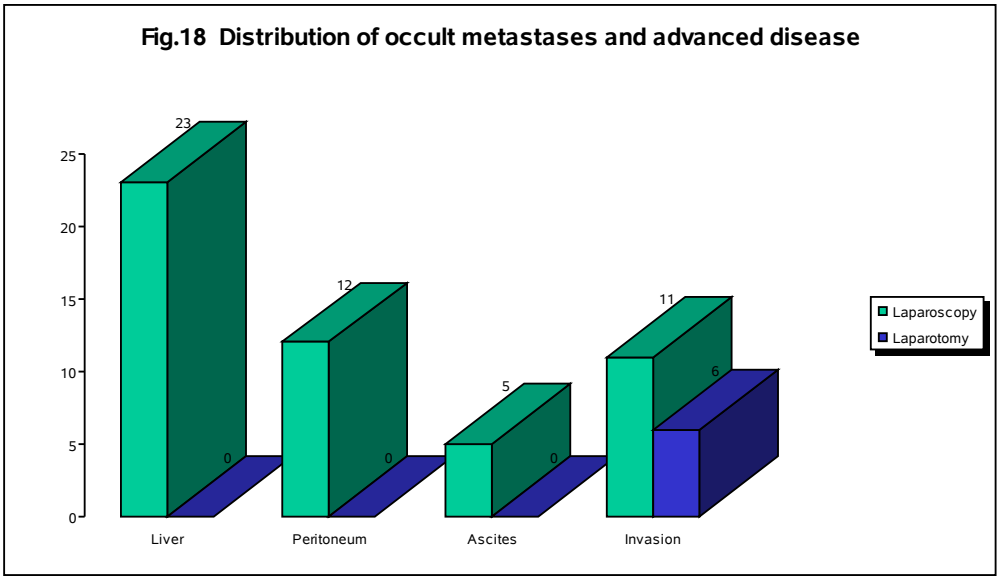
S.no.	Study	Total	PGC/OGJ (%)	Pancreas (%)	Liver (%)	Gallbladder (%)
1.	***Present study***	60	21(35)	18(30)	10(16.6)	11(18.3)
2.	***Arnold[2] et al,'99***	89	49(55)	33(37)	-	-
3.	***van Dijkum[78,79] et al,'97***	226	-	118(50.6)	23(9.8)	-

* PGC/OGJ- Proximal gastric / Oesophago-gastric junction carcinoma.

In comparison with Arnold[2] et al study in which 55% were proximal stomach, 37% were pancreas and in van Dijkum[78, 79] et al study 50.6% were pancreas and 9.8% were liver lesions.

Fig.17 Types of organ tumours





Occult metastases / Advanced diseases:

In the present study, laparoscopy identified occult metastases in 61.6%(37) in which liver lesions were seen in 23 patients, peritoneal deposits in 12 patients, liver and peritoneal deposits in 4 patients, peritoneal deposits and ascites in 3 patients, cirrhosis in 8 patients, all three in 2 patients, adjacent organ invasion in 11 patients and ascites in 5 patients as shown in Table-5 and Fig.18 & 19.

In comparison with Kriplani & Kapur[46] study, laparoscopy detected occult metastases in 32.5% of patients, in Warshaw[82] et al and Yano[87] et al studies, 35% and 53% of patients respectively.

However laparotomy revealed an additional 13.3% (8 of 60) of patients having advanced diseases in the present study, in which 8 patients had locally invasive lesions. In the studies by Kriplani & Kapur[46], Warshaw[82] et al, Arnold[2] et al and Yano[87] et al, an additional lesions detected by laparotomy were 7.5%, 7.5%, 10.1% and 6.25% respectively.

Table 5: Occult metastases and locally advanced diseases

S.no.	Study	T	Laparoscopy	For Laparotomy	Laparotomy	Total M1/Adv(%)

			L	P	A	I	Tot.(%)		L	P	A	I	Tot.(%)	
1.	***Present study***	60	23	12	5	11	37(61.6)	23(38.3)	-	-	-	8	8(13.3)	45(75)
2.	***Kriplani &Kapur [46,47],'91***	40	5	3	-	5	13(32.5)	27	-	-	-	3	3(7.5)	16(40)
3.	***Arnold[2] et al,'99***	89	12	9	-	-	21(23.5)	68	5	4	-	-	9(10.1)	30(33.7)
4.	***Warshaw[82] et al,'86***	40	6	7	1	-	14(35)	26	3	-	-	-	3(7.5)	17(42.5)
5.	***Yano[87] et al,'00***	32	2	13	-	2	17(53)	15	-	2	-	-	2(6.25)	19(59.3)

L-Liver, P-Peritoneum, A-Ascites, I-Invasion, M1/Adv.- Metastasis/Advanced.

The total number of patients with metastases / advanced diseases were 71.6%(43), 40%,33.7%, 42.5% and 59.3% in the present, Kriplani & Kapur[46], Arnold[2] et al, Warshaw[82] et al and Yano[87] et al studies respectively.

Fig.19 Laparoscopic distribution of the metastasis

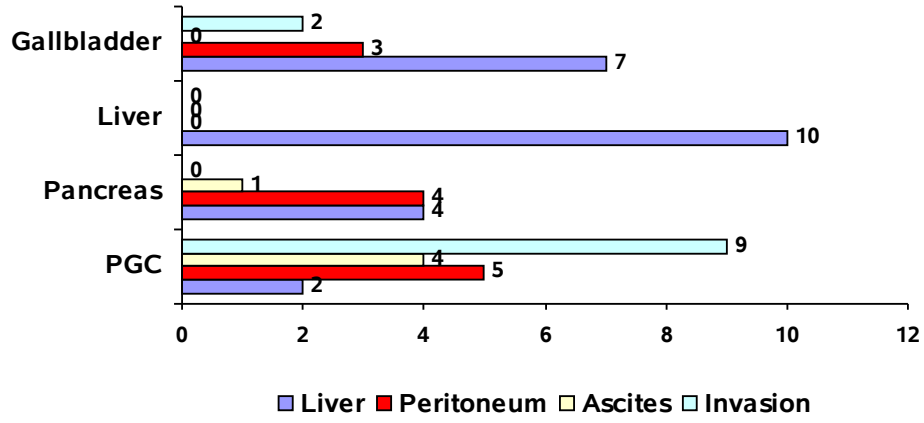
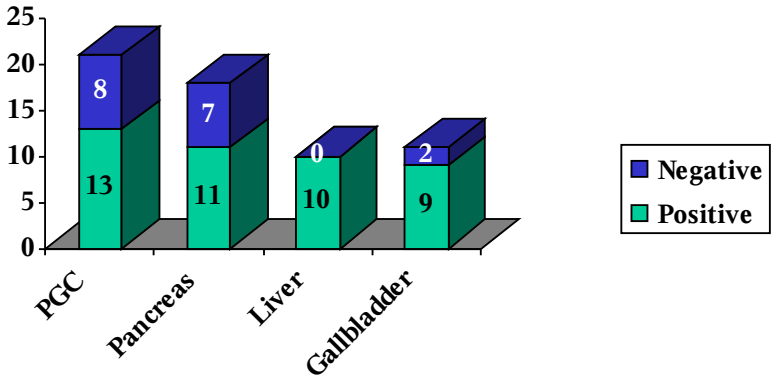


Fig.20 Total distribution of occult metstasis and advanced diseases



Distribution of total occult metastases / advanced diseases

The distribution of the total metastases / advanced lesions were 61.9% (13 of 21) in proximal stomach, 61.1% (11 of 18) in pancreas, 100% (10 of 10) in liver and 100% (11 of 11) in gallbladder cancers in the present study as shown in Table-6 and Fig.20.

Table 6: Distribution of total occult metastases / advanced diseases

S.no.	Study	Total (%)	PGC/OGJ (%)	Pancreas (%)	Liver (%)	Gallbladder (%)
1.	***Present study***	43 of 60 (71.6)	13 of 21 (61.9)	11 of 18 (61.1)	10 of 10 (100)	9 of 11 (81.8)
2.	***Arnold[2] et al,'99***	30 of 89 (33.7)	14 of 49 (28.5)	15 of 33 (45.4)	-	-
3.	***van Dijkum[78,79] et al,'97***	47 of 226 (20.7)	-	20 of 118 (16.9)	10 of 23 (43.4)	9 of 21(42.8)

* PGC/OGJ- Proximal gastric / Oesophago-gastric junction carcinoma

In comparison, in the study by Arnold[2] et al inoperable diseases were seen in 28.5% in proximal stomach and 45.4% in pancreas malignancies, while in study by van Dijkum[78, 79] et al they were 16.9% in pancreas, 43.4% in liver and

42.8% in gallbladder carcinomas.

Tissue study:

In the present study, laparoscopic-guided biopsy were taken in 16.2% (6 of 37) of patients and all were positive for malignancy as shown in

Table 7: Tissue study

S.no	Study	Total	Biopsy		Cytology	
			Taken (%)	Positive (%)	Taken (%)	Positive (%)
1.	***Present study***	37	6(16.2)	6(100)	15(40.5)	4(26.6)
2.	***Kriplani &Kapur[46,47],'91***	40	11(27.5)	11(100)	-	-
3.	***Yano[87] et al,'00***	32	10(31.25)	10(100)	27(84.3)	14(51.8)
4.	***Warshaw[82] et al,'86***	40	14(35)	14(100)	-	-

Table-7. In comparison, by Kriplani & Kapur[46], Yano[87] et al and Warshaw[82] et al studies, biopsy were taken in 27.5%, 31.25% and 35% of patients espectively and all were positive.

Peritoneal fluid / lavage for cytology were taken in 40.5% (15 of 37) patients of which only 26.6% (6) were positive for malignancy. In the study by

Yano[87] et al, fluid was taken in 84.3% of patients and 51.8% showed positive results.

Complications:

In the present study, 61.6% (37) of patients had laparoscopy only and additional 38.3% (23) had both laparoscopy and laparotomy. Complications in 'laparoscopy only' group were seen in 16.2% (6) patients. They were basal atelectasis in 5.4% (2) patients, port-site infections in 5.4% (2) patients, urinary retention and ileus in 2.7% (1) each as shown in Table-8.

Table 8: Complications

S.no	Study	Total	Major(%)	Minor(%)
1.	***Present study***	6/37(16.2)	2(5.4)	4(10.8)
2.	***Luketich[52] et al,'97***	9/26(33.7)	1(3)	8(30.7)
3.	***van Dijkum [78,79] et al,'99***	25/420(5.9)	8(1.9)	17(4)

In the studies by Luketich[52] et al and van Dijkum[78, 79] et al complications were seen in 33.7% and 5.9% of the patients respectively.

Hospital stay:

In the present study, among the patients with unresectable diseases, the average number of postoperative in-patient stay was 2 days for 'laparoscopy only' group and 8 days for laparotomy patients as shown in Table-9.

Table 9: Hospital stay(Days)

S.no	Study	Laparoscopy	Laparotomy
1.	***Present study***	2	8
2.	***Ramshaw[65] et al,'99***	1.5	5.6

Ramshaw[65] et al in their study found the hospital stay of 1.5 days for laparoscopy and 5.6 days for laparotomy.

Resectability:

In the present study, the ability of the laparoscopy to find the resectability were 38.3% (23 of 60) and for the laparotomy were 65.2%
(15 of 23) as shown in Table-10.

Table 10: Resectability

S.no	Study	Total	Laparoscopy		Laparotomy		Without Laparoscopy
			No.	%	No.	%	%
1.	***Present study***	60	23	38.3	15	65.2	25
2.	***Kriplani &Kapur[46,47],'91***	40	24	60	20	83.3	50
3.	***Conlon[17,18] et al,'96***	115	74	64.3	61	82.4	53
4.	***Yano[87] et al,'00***	32	15	46.9	13	86.7	40

In comparison, the resectability rate were 60% and 83.3% by Kriplani & Kapur[46], 64.3% and 82.4% by Conlon[16, 17,18] et al, 46.9% and 86.7% by Yano[87] et al studies respectively.

Avoided laparotomy:

Laparoscopy detected occult metastases / advanced lesions in 61.6% (37) imaging-negative patients and unnecessary laparotomy were avoided in these patients in the present study as shown in Table-11.

Table 11: Avoided laparotomy

S.no.	Study	Total	No.	%
1.	***Present study***	60	37	61.6
2.	***Kriplani &Kapur[46,47],'91***	40	16	40
3.	***Arnold[2] et al,'99***	89	21	23.5
4.	***Conlon et al,'02***	144	52	36
5.	***van Dijkum[78,79] et al,'99***	420	88	21

In the studies by Kriplani & Kapur[46], Arnold[2] et al, Conlon[16, 17,18] et al and van Dijkum[78, 79] et al, laparotomy were avoided in 40%, 23.5%, 36% and 21% of patients respectively.

Distribution of avoidance of laparotomy

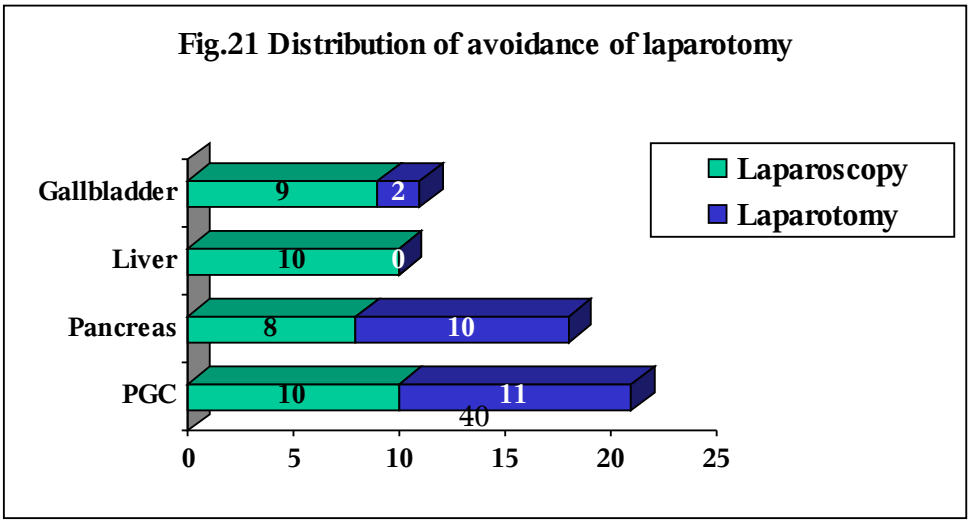
The distribution of avoidance of laparotomy were 47.6% (10 of 21) in proximal stomach, 44.4% (8 of 18) in pancreas, 100% (10 of 10) in liver and 81.8% (9 of 11) in gallbladder cancers in the present study as shown in Table-12 and Fig.21.

Table 12: Distribution of avoidance of laparotomy

S. no.	Study	Total %(no.)	PGC/OGJ %(no.)	Pancreas %(no.)	Liver % (no.)	Gallbladder % (no.)
1.	***Present study***	61.6 (37 of 60)	47.6 (10 of 21)	44.4 (8 of 18)	100 (10 of 10)	81.8 (9 of 11)
2.	***Arnold[2] et al,'99***	23.5 (21 of 89)	18.3 (9 of 49)	33.3 (11 of 33)	-	-
3.	***van Dijkum[78,79] et al,'99***	20 (84 of 420)	20	40	35	40

In Arnold[2] et al study the avoidance of laparotomy were 18.3% in proximal stomach and 33.3% in pancreas cancers, while in van Dijkum[78, 79] et al study they were 20% in proximal stomach, 40% in pancreas, 35% in liver and 40% in gallbladder cancers.

Fig.21 Distribution of avoidance of laparotomy



Sensitivity, Specificity, Predictive value and Accuracy:

In the present study, the sensitivity and specificity were 84.9% and 100% respectively as shown in Table-13, while in the study by Arnold[2] et al they were 60% and 92%. The negative predictive value were 65.2%, the positive predictive value were 100% and the accuracy were 82.2% in the present study while in the study by Yano[87] et al they were 89%, 100% and 94% respectively.

Table 13: Sensitivity, Specificity, Predictive value and Accuracy

S. no	Study	No.	Sensitivity %	Specificity %	Negative predictive value- %	Positive predictive value-%	Accuracy %
1.	***Present study***	60	87.7	100	73.9	100	86
2.	***Arnold[2] et al,'99***	89	60	92	-	-	-
3.	***Yano[87] et al,'00***	32	-	-	89	100	94

Upper intra-abdominal malignancy has been marked by a relatively low rate of resectability (23 to 53%) and a generally carries poor prognosis. Results of palliative surgery are also disappointing, while morbidity and mortality also

remains high.

Large primary (>2 to 3cms.), lymphadenopathy, hepatic and pelvic deposits can be detected preoperatively by conventional imaging (i.e. USG, CT, MRI). However, occult metastases and local invasion, often found only at laparoscopy and laparotomy in ordinary circumstances, remains the frequent causes for unresectability (32 to 65%).

In this study, using the technique described, we found that a fairly accurate assessment of the extent of the disease can be made by laparoscopy in a majority of the patients. By selecting appropriate patients for operation, solely on the basis of pretreatment laparoscopic evaluation, the resectability rate in the present study were 65.2%, an appreciable improvement when compared with rates of approximately 25 to 53% when patients are selected without pretreatment laparoscopy (i.e.imaging). Thus, pretreatment laparoscopy can alter therapy in a large percentage (61.6%) of patients with intra-abdominal malignancy.

7. REVIEW OF LITERATURE

Jacobaeus[37] coined the term 'Laparoscopy' in 1911 and Kelling[45] performed the first 'Coelioskopie' in the dog using cystoscope in 1923.The use of laparoscopy in the staging of cancer was described by Bernhein[7] in 1911. Fervers[27] supported the concept of creating pneumoperitoneum in 1933. Veress[80] developed the spring-loaded needle for safe pneumoperitoneum in 1938. It was Cuscheri[19, 20] who popularized its use in evaluating abdominal malignancy in 1970's.

The laparoscopy technique is universally same, using either carbondioxide pneumoperitoneum or abdominal-lift devices, done under general or local anesthesia. In the post-surgical abdomen and in suspected adhesions 'open (Hasson) method' were applied for the insertion of the cannula. Microlaparoscopic technique using 5mm, 3mm, 2mm laparoscope having O° or 30° angle telescopes were also described, using single umbilical port in most of the cases. Additional ports in the right and/or left hypochondrium may be required for the instruments used for retraction and biopsy [see figure – 14].

Greene et al[1, 63] in the 'SAGES manual' and Conlon[16, 17] et al description of 'multiport extended laparoscopy' stressed the importance and the methodology of the thorough abdominal, pelvic and lesser-sac evaluation. These includes general preoperative preparations, careful Veress-needle insertion, CO2 insufflation and pressure maintainance between 8 to 10mmHg, 'head-down' during trocar insertion and pelvic evaluation, 'head-up' during upper abdominal screening. With two additional ports instrumentation 'lesser-sac' can be evaluated through a small opening in the gastro-colic or gastro-hepatic omentum [see figure – 22 & 23] .The order of inspection includes trocar sites and underlying tissue, visible surfaces of liver, diaphragm, distal stomach, spleen, right paracolic gutter, caecum and ascending colon, pelvic organs and cavity, sigmoid, desending colon, omentum, small intestine and peritoneum. By gentle organ retraction with the additional port instruments proximal stomach, oesophagogastric junction, pelvic organs and parts of small intestine and colon can be visualized. Taking peritoneal fluid, laparoscopic-guided tissue and lymph node biopsies for histological study [see figure – 14] and use of laparoscopic ultrasound adds to the diagnostic yield.

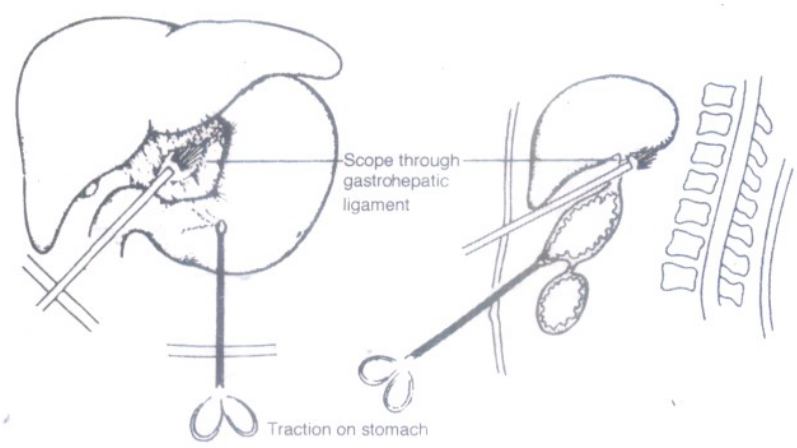


Fig: 22 Lesser-Sac evaluation

Fig: 23 Lesser-sac evaluation

7.1 Gastric malignancy

Possik[61] et al reported from a cohort study of 360 patients that laparoscopic examination had a sensitivity of 87% for the detection of hepatic metastases and 83% for peritoneal dissemination. Kriplani & Kapur[46, 47] found a comparable laparoscopic staging accuracy of 92% and predicted resectability in 87% of patients. Forse[29] et al demonstrated the benefit of laparoscopy in reducing the hospital stay of the patients with unresectable tumor. In Burke[13] et al study of 103 patients, laparotomy was avoided in 23% of patients. Molloy[57] et al evaluated 244 patients and found prevention of ill-advised laparotomy in 42% of patients. Ribeiro[66] et al have demonstrated that laparoscopy with peritoneal lavage should be obtained for detecting microscopic spread. Lowy[51] et al demonstrated that of 16 patients found to have metastatic disease at laparoscopy, only 5% required laparotomy at a later date for palliation and 95% of patients were spared unnecessary laparotomy. D'ugo[24] et al report on a series of 100 patients, wherein distant metastases was found in 21 patients and 58 patients had different stage of disease on laparoscopy. Conlon[16, 17] et al report of 92 patients wherein one third found to have unsuspected disease. Asencio[3] et al studied 91 patients and concluded that laparoscopy was most valuable in metastatic disease with 40% were spared unnecessary laparotomies.

7.2 Pancreatic malignancy

Fernandez-Del Castillo[26] et al found that unsuspected abdominal spread was identified at laparoscopy in 24% of patients and addition of peritoneal lavage, laparoscopic sonography may increase the yield. Merchant[55] et al studied 228 patients and found that 52% of the positive cytology patients had unresectable disease. Minnard[56] et al study of 90 patients, 46% were found to be unresectable. John[41] et al demonstrated from 40 patients that staging laparoscopy is essential in the detection of occult intra-abdominal metastases and LUS improves the accuracy. Espat[25] et al examined 155 patients with unresectable disease and identified only 3 patients required surgical bypass. Bemelman[7] et al study of 73 patients and found 60% were unresectable. Warshaw[82] et al found that the laparoscopy can change the treatment plan in 35% of the 40 patients. Jimenez[40] et al study of 125 patients, laparoscopy obviated 39(31.2%) unnecessary laparotomies.

7.3 Hepatic malignancy

Lo[50] et al studied 91 patients and found laparoscopy avoided laparotomy in 63% of patients. Steele[71] et al found 54% patients were unresectable at laparoscopy. Rahusen[64] et al study of 47 patients, only 23 underwent resection. Weitz[86] et al study of 60 patients, 22% were spared laparotomy.

7.4 Gall-bladder malignancy

Dagnini[22] et al found metastases in 90.8%(89 of 98) of the patients by preoperative laparoscopy and biopsy were positive in 90% of patients. Hard white plaques on the gallbladder wall were noted in 30 patients. Jarnagin[38] et al study of 100 patients supports staging laparoscopy, which correctly identified unresectable disease and prevented unnecessary laparotomy in one third of the patients. Weber[84] et al study of 44 patients, the laparoscopy yield of detecting unresectable disease was 48%. Vollmer[81] et al strongly recommends the staging laparoscopy.

Successful laparoscopy can be done in most cases except in extensive adhesions, which may cause failure. The efficacy of detecting occult metastases and local invasion were better with laparoscopy (40 to 65%) than with ultrasound (20 to 70%) and CT-scan / MRI (38 to 94%), especially when the lesions were less-than 10 mms[2, 5,10,11,15,16,21,23,31,36,38,40,54,57,69,75,76,77,79,81,84,86,87]. Laparoscopy yields were better for the malignancy involving lower esophagus / cardia (38 to 42%)[10,21,57], stomach (18 to 41%)[2,16,31,36,87], pancreas (26 to 46%)[5,11,16,40,75,76,79,81], and liver(30 to 67%)[23,38,75,76,84,86]. Cytological studies were positive in 15 to 59% of the patients[16, 57]. When laparoscopic-guided biopsy, lymph node fine-needle cytology / excision were done it showed

malignancy in 90 to 100% of the cases[10, 16,31,38]. In many series the diagnostic laparoscopy caused tumor 'up-staging' (34 to 52.5%) and 'down-staging' (15.6 to 30%)[2,11,36,40,57], resulting in 'change of therapeutic plan' in 11 to 17% of the patients[10]. Diagnostic laparoscopy helped in identifying incurable / unresectable disease in 24 to 39% of the patients[15, 23,54,57,69,75,76,77], thereby avoiding unnecessary / nontherapuetic laparotomy in 10 to 76% of the patients[,57,78,79,86]. Procedural complications were minimal (1 to 9%), usually port-site infection, basal atelectasis, ileus, urinary retention and the mortality were negligible (less than 1%)[1,39,42,43]. Thus the selective preliminary / diagnostic laparoscopy in the intra-abdominal malignancy helps in better tumor staging and prognostication.

8. SUMMARY

Laparoscopy is superior (sensitivity of 84.9%, specificity of 100%, positive predictive value of 100%, negative predictive value of 65.2%, an overall accuracy of 82.2% and yield of 61.6%) to ultrasonography, CT and MRI scans in identifying cirrhosis and small surface hepatic metastases (1 to 3cms.), omental and peritoneal deposits, thereby influencing the choice of management. The limitations of the laparoscope include deposits concealed by the adhesions, stomach, omentum or mesentery and deep liver lesions, which were not accessible . Laparoscopy-guided biopsy has an advantage of safety in avoiding vessels, to detect and control of undue bleed.Laparoscopy makes it possible to perform cytological detection of free cancer cells in ascites or in lavage fluid. Laparoscopic inspection is better than macroscopic examination under open laparotomy in detection of small deposits due to its magnifying power. The complication rate were 16.2% and the 'nil' mortality concluded that laparoscopy was safe or safer than other methods in establishing the extent of the diseases and tissue diagnosis under direct vision. Another benefit of performing laparoscopy as a separate staging procedure is that it allows an assessment of the patient's ability to tolerate anesthesia and surgical trauma before embarking on major resection surgery.

Unnecessary / non-therapeutic laparotomy were avoided in 37(61.6%) patients with locally advanced diseases (17 patients, 28.3%) and occult deposits (33 patients, 55%) put together. Treatable complications like basal atelectasis (2 patients, 5.4%), port-site infections(2 patients, 5.4%),ileus and urinary retention (1 patient, 2.7%) were seen in the present study. There was no mortality. Patients were either referred or discharged early (2 to 8 days) with the mean postoperative hospital stay of 2 days. The resectability rate without pretreatment laparoscopy would have been only 25%. This was improved by pretreatment laparoscopy to 65.2% (15 of 23).

9. CONCLUSION

Pretreatment / diagnostic laparoscopy is safe, effective and carries minimal complications. It can be done in selective group of abdominal malignancy to prognosticate the diseases outcome and to avoid unnecessary / non-therapeutic laparotomy, morbidity and mortality associated with it and it also increases the rate of resectability. The laparoscopy is an important tool in the staging of intra-abdominal malignancy for patients with locally advanced disease without signs of tumor spread in imaging. It is a relatively simple, well-tolerated and safe procedure. It should be considered in all patients with 'imaging-based' resectable intra-abdominal malignancy in which laparotomy is planned, either to establish the diagnosis or before an attempt at resective surgery.

Accurate tumor staging facilitates the selection of patients for resection, neoadjuvant therapy and selective planning for better palliation. It differentiates potentially resectable localized disease from those with advanced or metastatic disease. Laparoscopy has a role in establishing the diagnosis in some situation by allowing guided biopsy of the intra / retroperitoneal masses, lymph node,

peritoneal and visceral surface lesions. Laparoscopy also has a role in the surgical treatment and in palliative care such as feeding tube placement, stoma creation. Since it may benefit or adversely affect the survival or quality of life, ‘Pretreatment laparoscopy’ can be used in carefully selected patients.

10.MASTERCHART

S.No.	NAME	AGE	SEX	I.P.NO.:	CLIN. FEAT	DIAGNOSIS	LAPAROSCOP	SURGERY	COMPLICATION	HPE/CYTOLOGY	REMARKS
	LIVER TUMOURS						L P A I				
1	Rengan	60	M	676118	mass	HCC	C – – –	DL			
2	Uthandaraman	60	M	701747	mass	HCC	C – – –	DL			
3	Vijaya	35	F	618708	mass	secondaries	+ – – –	DL			
4	Chinnappan	77	M	635158	mass	HCC	C – – –	DL			
5	Velu	48	M	639251	mass	secondaries	+ – – –	DL			
6	Dasarathan	60	M	663728	mass	HCC	C – – –	DL			
7	Govindaswamy	62	M	606477	mass	HCC	C – – –	DL			
8	Penicilliah	50	M	615687	mass	secondaries	+ – – –	DL			
9	Dharmalingam	55	M	616890	mass	secondaries	C – – –	DL			
10	Chandra	45	F	623246	mass	secondaries	+ – – –	DL			
S.No.	NAME	AGE	SEX	I.P.NO.:	CLIN. FEAT	DIAGNOSIS	LAPROSCOPY	SURGERY	COMPLICATION	HPE/CYTOLOGY	REMARKS
	GALL BLADDER						L P A I				
1	Thulasi	50	F	619982	mass	carcinoma	+ – – –	DL		Cytology/Lavage	
2	Prema	39	F	622414	mass	carcinoma	+ – – –	DL		Cytology/Lavage	
3	Parvathy	68	F	679165	mass	carcinoma	+ + – –	DL		Cytology	
4	Elumali	60	M	678684	mass	carcinoma	+ + – –	DL	Ileus	Bx	
5	Ranganayagi	53	F	694633	mass	carcinoma	+ – – –	DL		Cytology	
6	Pichaikaran	50	M	693321	mass	carcinoma	+ – – –	DL		Bx	
7	Sivalingam	46	M	701205	mass	carcinoma	+ – – –	DL		Cytology	
8	Bavani	42	F	705291	mass	carcinoma	– – – +	seg iii bp			
9	Devan	60	M	708928	mass	carcinoma	– – – +	seg iii bp			
10	Sekar	38	M	649179	mass	carcinoma	– + – –	DL		Bx	
11	Papathiammal	65	F	652892	mass	carcinoma	– – – +	DL		Cytology/Lavage	
S.No.	NAME	AGE	SEX	I.P.NO.:	CLIN. FEAT	DIAGNOSIS	LAPROSCOPY	SURGERY	COMPLICATION	HPE/CYTOLOGY	REMARKS
	PANCREAS						L P A I				
1	Emmanuvel	38	M	630184	jaundice, (	periampullary	– – – –	Whipple			
2	Jeevarathinam	53	M	639270	jaundice, (	periampullary	– – – –	Whipple			
3	Devaraj	60	M	638500	jaundice, (	periampullary	– – – –	Whipple			
4	Sundaram	53	M	638643	jaundice, (	periampullary	– – – –	Whipple			
5	Saroja	50	F	669777	jaundice, (	head	– – – –	inv			
6	Murugasen	47	M	674036	jaundice, (	head	– + – –	DL		Cytology/Lavage	
7	Sushi	75	F	682175	jaundice, (	head	C+ – – –	DL	infection		
8	Dhanalaxmi	56	F	684393	jaundice, (	head	– – – –	inv			
9	Arumugam	45	M	688658	jaundice, (	periampullary	– – – –	Whipple			
10	Suguna	52	F	682786	jaundice, (	head	– – – –	Whipple			
11	Sekar	47	M	696784	jaundice, (	head	C+ – – –	DL			
12	Veeraswamy	70	M	697332	jaundice, (	head	– – ––	inv			
13	Muniammal	42	F	700597	jaundice, (	periampullary	– – – –	Whipple			
14	Prakashrao	45	M	700598	jaundice, (	head	– + – –	DL		Cytology/Lavage	
15	Basha	56	M	712334	jaundice, (	head	+ – – –	DL			
16	Babu	43	M	700876	jaundice, (	head	– + – –	DL		Bx	
17	Saravanan	35	M	677433	jaundice, (	head	+ – – –	DL			
18	Jagannathan	68	M	678899	mass	head	– + + –	DL	atelectasis	Cytology/Lavage	
S.No.	NAME	AGE	SEX	I.P.NO.:	CLIN. FEAT	DIAGNOSIS	LAPROSCOPY	SURGERY	COMPLICATION	HPE/CYTOLOGY	REMARKS
	PROXIMAL GASTRIC / OG JUNCTION CANCER						L P A I				
1	Vasuki	35	F	613343	loa	PGC	– – – –	TG			
2	Palanivel	53	M	615544	loa	PGC	– – – –	TG			
3	Thara	35	F	619142	loa	PGC	+ + + +	DL		Cytology	
4	Gandhimathy	45	F	629486	loa	PGC	+ + + +	DL	infection	Cytology	
5	Arulanandan	72	M	630535	loa	PGC	– – – –	TG			
6	Abdulrahim	45	M	632709	loa	PGC	– – – –	inv			
7	Chakrapani	71	M	639410	loa	PGC	– – – –	inv			
8	Paulraj	50	M	644182	loa	PGC	– + – +	DL		Bx	
9	Kala	45	F	650005	loa	PGC	– – – +	DL			
10	Elangaiamdan	60	M	668268	loa	PGC	– – + +	DL	retention	Cytology	
11	Ekambaram	42	M	674106	loa	PGC	– – – –	TG			
12	Angali	35	F	668330	loa	PGC	– + – +	DL		Bx	
13	Elumali	50	M	687223	loa	PGC	– + – +	DL	atelectasis	Bx	
14	Rahamathullah	57	M	690657	loa, melen	PGC	– – – –	TG			
15	Arumugam	54	M	695153	loa, melen	PGC	– – – –	TG			
16	Venkatachalam	64	M	717780	loa,	PGC	– – – –	TG			
17	Amali	48	F	712501	loa	PGC	– – + +	DL		Cytology	
18	Ramachandran	57	M	716491	loa, melen	PGC	– – – –	TG			
19	Kaliaperumal	62	M	717299	loa	PGC	– – – –	inv			
20	Pachiammal	40	F	627026	loa	PGC	– – – +	DL		Cytology/Lavage	
21	Dasarathan	40	M	643338	loa	PGC	– – – +	DL			

LPAI- Liver, Peritoneum, Ascites, Invasion, C-Cirrhosis, DL- Diagnostic laparoscopy, seg iii bp- segment iii bypass, TG- Total gastrectomy, inv- invasion, Bx- Biopsy, HCC- Hepatocellular carcinoma, PGC- Proximal gastric cancer, OGJ- Oesophagogastric junction, loa- loss of appetite.

11. BIBLIOGRAPHY

1. **Answini GA**, Pratt BL, Greene FL. Strategies for laparoscopic diagnosis of malignancy. *Semin Laparosc Surg* 2000 Jun; **7(2)**: 68-77.

2. **Arnold JC**, Neubauer HJ, Zopf T, Schneider A, Benz C, Adamek HE, Riemann JF. Improved tumor staging by diagnostic laparoscopy.*Z Gastroenterol*. 1999 Jun; **37(6):** 483-8.

3. **Asencio F**, Aguilo' J, Salvador JL, Villar A, De la Morena E, Ahamed M et al. Video-Laparoscopic staging of gastric cancer- A prospective multicenter comparison with noninvasive techniques. *Surg Endosc* 1997;**11**:1153-8.

4. **Babineau TJ**, Lewis WD, Jenkins RL, Bleday R, Steele GD Jr., Forse RA. Role of staging laparoscopy in the treatment of hepatic malignancy. *Am J Surg* 1994;**167**:151-4.

5. **Barrat C**, Champault G, Catheline JM. [Is laparoscopic evaluation of digestive cancers legitimate? A prospective study of 109 cases][Article in French*] Ann Chir.* 1998; **52(7)**: 602-6.

6. **Barreiro CJ**, Lillemoe KD, Koniaris LG, Sohn TA, Yeo CJ, Coleman J, Fishman EK, Cameron JL. Diagnostic laparoscopy for periampullary and

pancreatic cancer: what is the true benefit? *J Gastrointest Surg*. 2002 Jan-Feb; **6(1)**: 75-81.

7. **Bemelman WA**, de Wit LT, van Delden OM, Smits NJ, Obertop H, Rauws EJ, et al: Diagnostic laparoscopy combined with laparoscopic ultrasonography in staging of cancer of the pancreatic head region. *Br J Surg* 1995;**82**:820-4.

8. **Bernhein B**. Organoscopy: Cystoscopy of the abdominal cavity. *Ann Surg*. 1911;**53**:764-767.

9. **Bhargava DK**, Sarin S, Verma K, Kapur BML. Laparoscopy in carcinoma of the gallbladder. *Gastrointest Endosc* 1983;**29**:21-2.

10. **Bonavina L**, Incarbone R, Lattuada E, Segalin A, Cesana B, Peracchia A. Preoperative laparoscopy in management of patients with carcinoma of the esophagus and of the esophagogastric junction. *J Surg Oncol*. 1997 Jul; **65(3)**: 171-4.

11. **Brooks AD**, Mallis MJ, Brennan MF, Conlon KC. The value of laparoscopy in the management of ampullary, duodenal, and distal bile duct tumors. *J Gastrointest Surg*. 2002 Mar-Apr; **6(2)**: 139-45; discussion 145-6

12. **Burdiles P**, Rossi RL. Laparoscopy in pancreatic and hepatobiliary cancer.*Surg Oncol Clin N Am*. 2001 Jul; **10(3)**: 531-55, viii.

13. **Burke EC**, Karpeh MS, Conlon KC, Brennan MF. Laparoscopy in the management of gastric adenocarcinoma. *Ann Surg* 1997;**225**:262-7.

14. **Buyske J**. Role of videoscopic-assisted techniques in staging malignant diseases.*Surg Clin North Am*. 2000 Apr; **80(2)**: 495-503.

15. **Clements DM**, Bowrey DJ, Havard TJ. The role of staging investigations for oesophago-gastric carcinoma.*Eur J Surg Oncol*. 2004 Apr; **30(3)**:309-12.

16. **Conlon KC**. Staging laparoscopy for gastric cancer.*Ann Ital Chir*. 2001 Jan-Feb;**72(1)**:33-7.

17. **Conlon KC,** Dougherty E, Klimstra DS, Coit DG, Turnbull AD, Brennan MF. The value of minimal access surgery in the staging of patients with potentially respectable peripancreatic malignancy. *Ann Surg* 1996;**223**:134-40.

18. **Conlon KC,** Karpeh MS. Laparoscopy and laparoscopic ultrasound in the staging of gastric cancer. *Semin Oncol* 1996;**23**:347.

19. **Cushieri A.** Value of laparoscopy in hepatobiliary disease. *Ann R Coll Surg* 1975;**57**:33-8.

20. **Cushieri A,** Hall AW, Clark J. Value of laparoscopy in the diagnosis and management of pancreatic carcinoma. *Gut* 1978;**19**:672-7.

21. **Dagnini G**, Caldironi MW, Marin G, Buzzaccarini O, Tremolada C, Ruol A. Laparoscopy in abdominal staging of esophageal carcinoma. Report of 369 cases.*Gastrointest Endosc*. 1986 Dec;**32(6)**:400-2.

22. **Dagnini G,** Marin G, Patella M, Zotti S. Laparoscopy in the diagnosis of primary carcinoma of the gallbladder- Astudy of 98 cases. *Gastrointest Endosc* 1984;**30**:289-91.

23. **D'Angelica M**, Fong Y, Weber S, Gonen M, DeMatteo RP, Conlon K, Blumgart LH, Jarnagin WR. The role of staging laparoscopy in hepatobiliary malignancy: prospective analysis of 401 cases. *Ann Surg Oncol.* 2003 Mar;**10(2)**:183-9.

24. **D'Ugo DM**, Persiani R, Caracciolo F, Ronconi P, Coco C, Picciochi A. Selection of locally advanced gastric carcinoma by preoperative staging laparoscopy. *Surg Endosc* 1997;**11**:1159-62.

25. **Espat NJ**, Brennan MF, Conlon KC: Patients with laparoscopically staged unresectable pancreatic adenocarcinoma do not require subsequent surgical biliary or gastric bypass. *J Am Coll Surg* 1999;**188**:649-657.

26. **Fernandez-Del Castillo C**, Rattner DW, Warshaw AL: Further experience with laparoscopy and peritoneal cytology in the staging of pancreatic cancer, *Br J Surg* 1995;**82**:1127-1129.

27. **Fervers C**: Die laparoskopie mit dem Zytoskope. *Medicinische Klinik* 1933;**29**:1042-1045.

28. **Feussner H**, Omote K, Fink U, Walker SJ, Siewert JR. Pretherapeutic laparoscopic staging in advanced gastric carcinoma. *Endoscopy* 1999;**31**:342-7.

29. **Forse RA,** Babineau T, Bleday, Steele G Jr. Laparoscopy / throcoscopy for staging; Staging endoscopy in surgical oncology. *Semin Surg Oncol* 1993;**9**:51-5.

30. **Friess H**, Kleeff J, Silva JC, Sadowski C, Baer HU, Buchler MW. The role of diagnostic laparoscopy in pancreatic and periampullary malignancies.*J Am Coll Surg*. 1998 Jun;**186(6)**:675-82.

31. **Fujimura T**, Kinami S, Ninomiya I, Kitagawa H, Fushida S, Nishimura G, Kayahara M, Shimizu K, Ohta T, Miwa K. Diagnostic laparoscopy, serum CA125, and peritoneal metastasis in gastric cancer.*Endoscopy.* 2002 Jul;**34(7)**:569-74.

32. **Giger U**, Schafer M, Krahenbuhl L. Technique and value of staging laparoscopy *Dig Surg*. 2002; **19(6)**: 473-8.

33. **Gouma DJ**, Nieveen van Dijkum EJ, de Wit LT, Obertop H. Laparoscopic staging of biliopancreatic malignancy. *Ann Oncol*. 1999; **10** Suppl 4:33-6.

34. **Gross E,** Bancewicz J, Ingram G. Assessment of gastric cancer by laparoscopy. *Br Med J* 1984;**288**:1577.

35. **Hennig R**, Tempia-Caliera AA, Hartel M, Buchler MW, Friess H. Staging laparoscopy and its indications in pancreatic cancer patients.*Dig Surg*. 2002; **19(6)**: 484-8.

36. **Hulscher JB**, Nieveen van Dijkum EJ, de Wit LT, van Delden OM, van Lanschot JJ, Obertop H, Gouma DJ.Laparoscopy and laparoscopic ultrasonography in staging carcinoma of the gastric cardia. *Eur J Surg*. 2000 Nov; **166(11)**: 862-5.

37. **Jacobaeus HC**: Kurze Ubersicht uber meine Erfahrungen mit der Laparoskopie. Munchener Medicinische Wochenschrift 58:2017-2019,1911

38. **Jarnagin WR**, Bodniewicz J, Dougherty E, Conlon K, Blumgart LH, Fong Y. A prospective analysis of staging laparoscopy in patients with primary and secondary hepatobiliary malignancies *J Gastrointest Surg.* 2000 Jan-Feb; **4(1)**: 34-43.

39. **Jerby BL**, Milsom JW. Role of laparoscopy in the staging of gastrointestinal cancer.*Oncology* (Huntingt). 1998 Sep; **12(9)**: 1353-60.

40. **Jimenez RE**, Warshaw AL, Rattner DW, Willett CG, McGrath D, Fernandez-del Castillo C. Impact of laparoscopic staging in the treatment of pancreatic cancer. *Arch Surg.* 2000 Apr; **135(4)**: 409-14; discussion 414-5.

41. **John TG**, Greig JD, Carter DC, et al: Carcinoma of the pancteatic head and periampullary region: Tumor staging with laparoscopy and laparoscopic ultrasonography, *Ann Surg* 1995;**221**:156-164.

42. **Kane MG**, Krejs GJ. Complications of diagnostic laparoscopy in Dallas: a 7-year prospective study. *Gastrointest Endosc* 1984; **30**:237-40.

43. **Karnam US**, Reddy KR. Diagnostic laparoscopy: an update. *Endoscopy.* 2002 Feb; **34(2)**: 146-53.

44. **Krasna MJ**; Advances in staging of esophageal carcinoma. *Chest* 1998;**113**(suppl):107-111.

45. **Kelling G**: Zur Celioskopie. Archiv Klinische Chirurgie 126:226-229,1923.

46. **Kriplani AK**, Kapur BML. Laparoscopy for pre-operative staging and assessment of operability in gastric carcinoma. *Gastrointest Endosc* 1991; **37(4)**:441-3.

47. **Kriplani AK**, Sharma LK. Peritoneoscopy in extrahepatic abdominal disease. *Arch Surg* 1986;**121**:818-20.

48. **Lehnert T**, Rudek B, Kienle P, Buhl K, Herfarth C. Impact of diagnostic laparoscopy on the management of gastric cancer: prospective study of 120 consecutive patients with primary gastric adenocarcinoma. *Br J Surg.* 2002 Apr; **89(4)**: 471-5.

49. **Lightdale CJ**. Clinical applications of laparoscopy in patients with malignant neoplasms. *Gastrointest Endosc* 1982;**28**:99-102.

50. **Lo CM**, Lai E, Liu CL, et al: Laparoscopy and laparoscopic ultrasonography avoid exploratory laparotomy in patients with hepatocellular carcinoma. *Ann Surg* 1998;**227**:527-532.

51. **Lowy AM**, Mansfield PF, Leach SD, Ajani J. laparoscopic staging for gastric cancer. *Surgery* 1996;**119**:611.

52. **Luketich J**, Schauer P, Landreneau R, et al: Minimal invasive surgical staging is superior to endoscopic ultrasound in detecting lymph node metastases in esophageal cancer. *J Thorac Cardiovasc Surg* 1997;**114**:817-23.

53. **Menon KV**, Dehn TC. Multiport staging laparoscopy in esophageal and cardiac carcinoma. *Dis Esophagus.* 2003; **16(4)**: 295-300.

54. **Menon V**. Br Impact of diagnostic laparoscopy on the management of gastric cancer: prospective study of 120 consecutive patients with primary gastric adenocarcinoma.. *Br J Surg* 2002; **89**: 471-5.

55. **Merchant NP**, Conlon KC, Salgo P, et al: Positive peritoneal cytology predicts unresectability of pancreatic adenocarcinoma. *J Am Coll Surg* 1999;**188**:421-426.

56. **Minnard E**, Conlon KC, Hoos A, et al: Laparoscopic ultrasound enhances standard laparoscopy in the staging of pancreatic cancer. *Ann Surg* 1998;**228**:182-187.

57. **Molloy RG**, McCourtney JS, Anderson JR. Laparoscopy in the management of patients with cancer of the gastric cardia and oesophagus. *Br J Surg*. 1995 Mar; **82(3)**: 352-4.

58. **Nagy A**, Pardavi G, Olah A. The role of diagnostic laparoscopy in staging of pancreatic cancers. *Acta Chir Hung.* 1999; **38(2)**: 193-6.

59. **Ozmen MM**, Zulfikaroglu B, Ozalp N, Ziraman I, Hengirmen S, Sahin B. Staging laparoscopy for gastric cancer. *Surg Laparosc Endosc Percutan Tech*. 2003 Aug; **1 3(4)**: 241-4.

60. **Pisters PW**, Lee JE, Vauthey JN, Charnsangavej C, Evans DB. Laparoscopy in the staging of pancreatic cancer. *Br J Surg.* 2001 Mar; **88(3)**: 325-37.

61. **Possik RA**, Franco EL, Pires DR, Wohnrath DR, Ferreira EB. Sensitivty, specificity and predictive value of laparoscopy for the staging of gastric cancer and for the detedtion of liver metastases. *Cancer* 1986;**58**:1-6.

62. **Potter MW**, Shah SA, McEnaney P, Chari RS, Callery MP. A critical appraisal of laparoscopic staging in hepatobiliary and pancreatic malignancy. *Surg Oncol*. 2000 Nov; **9(3)**: 103-10.

63. **Pratt BL**, Greene FL. Role of laparoscopy in the staging of malignant disease. *Surg Clin North Am*. 2000 Aug; **80(4)**: 1111-26.

64. **Rahusen F,** Cuesta M, Borgstein P, et al: Selection of patients for resection of colorectal metastases to the liver using diagnostic laparoscopy and laparoscopic ultrasonography. *Ann Surg* 1999;**230**:31-37.

65. **Ramshaw B**, Esartia P, Mason E, et al: Laparoscopy for diagnosis and staging for malignancy. *Semin Surg Oncol* 1999;**16**:279-283.

66. **Ribeiro UJ**, Gama-Rodrigues JJ, Bitelman B, et al: Value of peritoneal lavage cytology during laparoscopic staging of patients with gastric carcinoma. *Surg Laparoscopy Endosc* 1998;**8**:132-135.

67. **Rumstadt B**, Schwab M, Schuster K, Hagmiller F, Trede M. The role of laparoscopy in the preoperative staging of pancreatic carcinoma, *J Gastrointest Surg* 1997;**1**:245-50.

68. **Schlag PM**, Hünerbein M, Rau B. The importance of staging laparoscopy for the treatment of gastric cancer. *Onkologie* 1998;**21**:486-91.

69. **Shoup M**, Winston C, Brennan MF, Bassman D, Conlon KC. Is there a role for staging laparoscopy in patients with locally advanced, unresectable pancreatic adenocarcinoma. *J Gastrointest Surg*. 2004 Dec;**8(8)**: 1068-71.

70. **Spitz FR**, Abbruzzese JL, Lee JE, Pisters PW, Lowy AM, Fenoglio CJ et al. Preoperative and postoperative chemoradiation strategies in patients

treated with pancreaticoduodenectomy for adenocarcinoma of the pancreas. *J Clin Oncol* 1997;**15**:928-37.

71. **Steele G**, Bleday R, Mayer RJ, et al: A prospective evaluation of hepatic resection for colorectal carcinoma metastases to the liver: Gastrointestinal tumor study group protocol 6584. *J Clin Oncol* 1991;**9**:1105-1112.

72. **Steinberg WM**, Barkin J, Bradley EL, DeMagno E, Layer P. Controversies in clinical pancreatology. Workup of a patient with a mass in the head of the pancreas. *Pancreas* 1998;**17**:24-30.

73. **Stell DA**, Carter CR, Stewart I, Anderson JR. Prospective comparison of laparoscopy, ultrasonography and computed tomography in the staging of gastric cancer. *Br J Surg* 1996;**83**:1260.

74. **Sugarbaker PH**, Wilson RE. Using celioscopy to determine stages of intra-abdominal neoplasms. *Arch Surg* 1976;**111**:41-4.

75. **Tilleman EH**, de Castro SM, Busch OR, Bemelman WA, van Gulik TM, Obertop H, Gouma DJ. Diagnostic laparoscopy and laparoscopic ultrasound for staging of patients with malignant proximal bile duct obstruction. *J Gastrointest Surg*. 2002 May-Jun; **6(3)**: 426-30; discussion 430-1.

76. **Tilleman EH**, Kuiken BW, Phoa SS, de Castro SM, Busch OR, Obertop H, Gouma DJ. Limitation of diagnostic laparoscopy for patients with a periampullary carcinoma. *Eur J Surg Oncol.* 2004 Aug; **30(6)**: 658-62.

77. **Tsioulias GJ**, Wood TF, Chung MH, Morton DL, Bilchik A. Diagnostic laparoscopy and laparoscopic ultrasonography optimize the staging and resectability of intraabdominal neoplasms. *Surg Endosc*. 2001 Sep;**15(9)**:1016-9. Epub 2001 Jun 12.

78. **van Dijkum EJ**, de Wit LT, van Delden OM, Rauws EA, van Lanschot JJ, Obertop H, Gouma DJ. The efficacy of laparoscopic staging in patients with upper gastrointestinal tumors. *Cancer*. 1997 Apr 1;**79(7)**:1315-9.

79. **van Dijkum EJ**, de Wit LT, van Delden OM, Kruyt PM, van Lanschot JJ, Rauws EA, Obertop H, Gouma DJ. Staging laparoscopy and laparoscopic ultrasonography in more than 400 patients with upper gastrointestinal carcinoma. *J Am Coll Surg.* 1999 Nov; **189(5)**: 459-65.

80. **Veress J**: Neus instrument zur Ausfuhrung Von Brust oder Bauchpunktionen. *Deutche Medicinische Wochenschrift* 1938;**41**:1480-1481.

81. **Vollmer CM**, Drebin JA, Middleton WD, Teefey SA, Linehan DC, Soper NJ, Eagon CJ, Strasberg SM. Utility of staging laparoscopy in subsets of peripancreatic and biliary malignancies. *Ann Surg.* 2002 Jan; **235(1)**: 1-7.

82. **Warshaw AL**, Tepper JE, Shipley WU. Laparoscopy in the staging and planning of therapy for pancreatic cancer. *Am J Surg* 1986;**151**:76-80.

83. **Watt I,** Stewart I, Anderson D, Bell G, Anderson JR. Laparoscopy, ultrasound and computed tomography in cancer of the esophagus and gastric cardia: a prospective comparison for detecting intra-abdominal metastases. *Br J Surg* 1990;**77**:63-4.

84. **Weber SM**, DeMatteo RP, Fong Y, Blumgart LH, Jarnagin WR. Staging laparoscopy in patients with extrahepatic biliary carcinoma. Analysis of 100 patients. *Ann Surg*. 2002 Mar; **235(3)**: 392-9.

85. **Weerts JM**, Dallemagne B, Dewandre JM, Jehaes C, Markiewicz S, Monami B, Wahlen C. [Adenocarcinoma of the pancreas. Preoperative staging][Article in French] *Rev Med Liege*. 2000 Feb; **55(2)**: 95-6.

86. **Weitz J**, D'Angelica M, Jarnagin W, Gonen M, Fong Y, Blumgart L, Dematteo R. Selective use of diagnostic laparoscopy prior to planned hepatectomy for patients with hepatocellular carcinoma. *Surgery*. 2004 Mar; **135(3)**: 273-81

87. **Yano M**, Tsujinaka T, Shiozaki H, Inoue M, Sekimoto M, Doki Y, Takiguchi S, Imamura H, Taniguchi M, Monden M. Appraisal of treatment strategy by staging laparoscopy for locally advanced gastric cancer. *World J Surg*. 2000 Sep; **24(9)**: 1130-5; discussion 1135-6.