

Evaluation of Abdominal Malignancies by Minimal Access Surgery: Our Experience in a Rural Setup in Central India

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ABSTRACT

Introduction: A diagnostic surprise or finding a tumor unresectable at laparotomy is an undesirable situation for every surgeon. A surgeon should never regret for having done a laparotomy on a patient which otherwise was avoidable. Many surgeons worldwide have had challenging experiences of facing an uncertain diagnosis or staging of abdominal malignancies. History-taking, physical examination, laboratory tests, and advanced noninvasive imaging studies might provide some help but are insufficient for accurate diagnosis and staging of abdominal tumors.

Aim: To assess the role of diagnostic staging laparoscopy in abdominal malignancies.

Objectives: To evaluate the role of laparoscopy as a diagnostic tool in abdominal malignancies. To compare the findings of laparoscopy with noninvasive imaging modalities. To assess the efficacy of laparoscopy as a definitive tool in the evaluation of staging and operability before definitive intervention.

Materials and methods: This is a prospective observational study with a sample size of 250 patients. The study duration was 3.5 years from July 2013 to October 2016 and was conducted at Acharya Vinoba Bhave Rural Hospital (AVBRH), Sawangi (Meghe), Wardha.

Results: Due to the use of diagnostic laparoscopy, out of 250 cases of abdominal malignancies, in 120 (48%) patients, nontherapeutic laparotomy could be avoided.

Conclusion: This study highlights the emphatic utility of diagnostic laparoscopy procedures in staging and management of abdominal malignancy. Laparoscopic evaluation of a patient with intra-abdominal malignancies is a desirable tool against imaging modalities in improving the detection of metastatic disease and accurate staging of the disease process.

Keywords: Diagnostic, Laparoscopy, Metastatic, Nontherapeutic laparotomy, Unresectability.

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INTRODUCTION

A proper diagnosis, pretherapeutic staging for assessment of resectability in abdominal malignancy, is important to select the patient for appropriate treatment strategies. Identifying tumors that are not surgically resectable is the most important issue at hand. Performing laparotomies in patients with nonresectable abdominal tumors may increase mortality and morbidity, and cost as well as affect quality of life in the remaining lifetime.¹

The magnified view offered by the laparoscope enables the surgeon to detect small liver, peritoneal, and omental metastases that are not visible with current noninvasive imaging modalities.

If the distance between the tip of the telescope and object is 5 cm, we get a six times magnification. If it is 15 cm, the magnification is 2.2 times, and if it is 33 cm, we can see the same size object.²

If laparoscopic findings result in an unresectable disease, then further management can be planned, such as neoadjuvant chemotherapy, radiotherapy, etc. Laparoscopy can give a tissue diagnosis and include a biopsy where the definitive treatment or surgery is not possible. Obtaining biopsies of organs, lymph nodes, and suspicious lesions during laparoscopy is an important part of the diagnosis and staging of malignancies.

Thus, it is recommended that diagnostic laparoscopy for staging of abdominal malignancy be performed in cases where resectability is doubtful in spite of preoperative imaging, or at the time of planned laparotomy.³

Many authors have stressed the importance of laparoscopic ultrasonography during diagnostic laparoscopy for abdominal

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malignancy. Ultrasonography during laparoscopy gives the surgeon information that otherwise would not be obtained from laparoscopic visual exploration. Lesions deep in the parenchyma of an organ, especially solid organs such as the liver and pancreas, can be identified by ultrasonography. Invasion of a tumor into other structures, such as major vessels, can also be evaluated, thus determining that the tumor is not resectable in a patient who otherwise might undergo laparotomy.³

Since the introduction of laparoscopic staging, lavage of the peritoneal cavity has been added to the procedure. Free cancer cells found in the peritoneal lavage fluid are thought to induce or indicate early peritoneal seeding with subsequent peritoneal metastases.

Diagnostic laparoscopy can be beneficial to the patient in avoiding unnecessary surgery, unnecessary delay in diagnosis and treatment, and in shortening the operative and hospitalized periods.

The usefulness and efficacy of laparoscopy as a preoperative tool in the management of intra-abdominal malignancy for diagnosis, evaluation, staging, and therapeutic assessment are the areas which need appraisal and analysis to standardize the procedure and bring into a more frequent use.

This study explores the applications of laparoscopy with imaging studies in staging and diagnosis of abdominal malignancy and its advantages over only imaging studies and conventional laparotomy, and it seeks to suggest implementation of a defined protocol in mandating diagnostic laparoscopy as a necessary diagnostic tool before an explorative laparotomy.

AIM AND OBJECTIVES

To assess the role of diagnostic staging laparoscopy in abdominal malignancies. To evaluate the role of laparoscopy as a diagnostic tool in abdominal malignancies. To compare the findings of laparoscopy with noninvasive imaging modalities and assess the efficacy of laparoscopy as a definitive tool in the evaluation of staging and operability before definitive intervention.

MATERIALS AND METHODS

This study was a prospective observational study. The study was conducted in the Department of Surgery, AVBRH, Sawangi (Meghe), Wardha. The sample size taken was 250. It was calculated according to the formula stated below:

$$\text{Sample size } n = \frac{Z^2 \times p \times (1-p)}{d^2}$$

n = sample size, Z = standard normal distribution = 1.96, P = expected beneficial population = 20%, d = absolute precision = 5% points (15%–25%), and $N = (1.96 \times 1.96) \times 0.2 \times (0.8) / (0.05 \times 0.05) = 245.86 = 246$

The ethical committee clearance was taken. The duration of the study was 3.5 years (July 2013–October 2016).

Inclusion Criteria

Patients of abdominal malignancies who were fit for anesthesia and had given consent for the procedure.

Exclusion Criteria

Patients with prior multiple surgeries, gross ascites, ASA grade >III, performance scale: Karnofsky grade <50.

Tools and Methods

Diagnostic laparoscopy, various imaging modalities (USG/CT/MRI), histopathological/cytological examination, intraoperative findings. The tools and procedures were standardized and were performed by a single operator from the concerned department.

Technique

As per the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) Guidelines. After complete history-taking and thorough clinical examination, patients with suspected abdominal malignancies were subjected to the following investigations.

Investigations

Hematological investigations, tumor marker, chest X-ray, abdomen USG, abdomen CT/MRI/MRCP, upper and lower GI endoscopy, biopsy, and histopathological examination.

Thorough evaluation of peritoneal surfaces, omentum, presence of ascitic fluid, supra/intrahepatic spaces, surface of the bowel, lesser sac, root of the transverse mesocolon, small bowel, ligament of Treitz, abdominal lymph nodes, paracolic gutters and pelvis, prior to any manipulation, ascites when present, fluid was sent for cytological examination, biopsies were done for any suspicious abdominal lesions, findings of laparoscopy and imaging modalities were correlated and further management of the patient was decided.

OBSERVATIONS AND RESULTS

This prospective study was carried out from July 2013 till October 2016. A total of 250 patients with abdominal malignancies were enrolled in the study. The observations have been shown in the form of charts and tables for ease of understanding as follows. Most of the cases were of colorectal malignancies followed by gastric malignancy. The mean age of presentation was 52 years, with a range between 16 years and 80 years. In our study, out of 250 patients, 175 (70%) were males and 75 (30%) were females. Among 250 patients, all patients presented with loss of appetite and weight, 204 (81.6%) presented with pain in abdomen, 124 (49.6%) with lump in abdomen, 110 (44%) with vomiting, 52 (20.8%) with jaundice, 91 (36.4%) with Malena, 79 (31.6%) with hematochezia, and 98 (39.2%) with altered bowel habits (Fig. 1).

The distribution of abdominal malignancies based on the type of cancer was as follows. Out of 250 patients, 105 (42%) patients were of colorectal malignancy, 67 (26.8%) patients were of carcinoma stomach, 23 (9.2%) patients were of biliary tract tumors, 9 (3.6%) patients were of hepatocellular carcinoma (HCC), 7 (2.8%) patients were of periampullary carcinoma, 19 (7.6%) patients were of carcinoma head of pancreas, and 9 (3.6%) patients were of ovarian malignancy. Six (2.4%) patients had presentation of metastatic disease with unknown primary. In these six cases, with the help of radiology, through endoscopic evaluation and tumor markers, tissue diagnosis could not be obtained, and the source of primary could not be detected. Out of five (2%) patients in other groups, one had duodenal malignancy, one had jejunal malignancy, one had ileal malignancy, and two cases were of undescended testis (abdominal) harboring malignancy. Out of 105 cases of colorectal malignancies, 54 (22%) cases were of carcinoma colon, including carcinoma appendix and caecum and 51 (20.4%) cases were of rectal malignancy. Out of 23 cases of biliary tract tumors, 15 (6%) cases were of gall bladder carcinoma, and 8 (3.2%) cases were of cholangiocarcinoma (Fig. 2).

The distribution of abdominal malignancies based on the radiological stage of the cancer was as follows. Out of 250 patients, 30 (12%) patients were in stage I, 122 (48.8%) patients were in stage II, 92 (36.8%) patients were in stage III, and 6 (2.4%) patients were in stage IV (Fig. 3).

The distribution of abdominal malignancies according to the stage of the cancer based on laparoscopy was as follows. Out of 250 patients, 12 (4.8%) patients were in stage I, 69 (27.6%) patients were in stage II, 77 (30.8%) patients were in stage III, and the remaining most of the patients were in stage IV, i.e., 92 (36.8%) (Table 1).

After comparing radiological and laparoscopic staging, after diagnostic laparoscopy, a considerable number of cases getting diagnosed at stage IV as the p value is quite significant. The sensitivity of diagnostic laparoscopy in the overall abdominal malignancy is 93.88%, specificity 54.44%, and diagnostic accuracy 68.91%. After comparing radiological and laparoscopic staging,

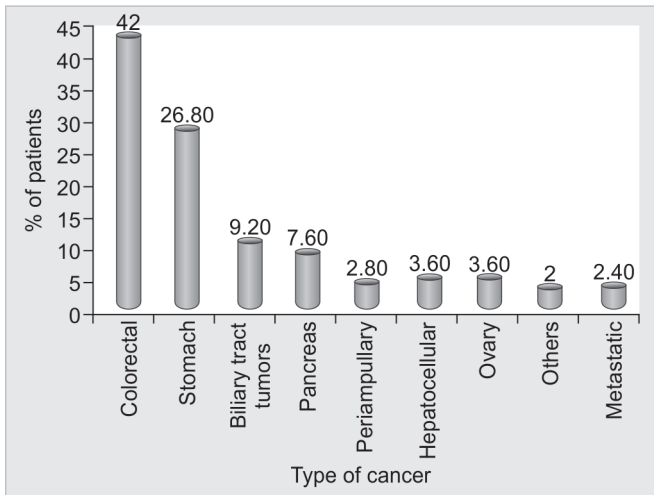


Fig. 1: Distribution of patients according to the type of cancer

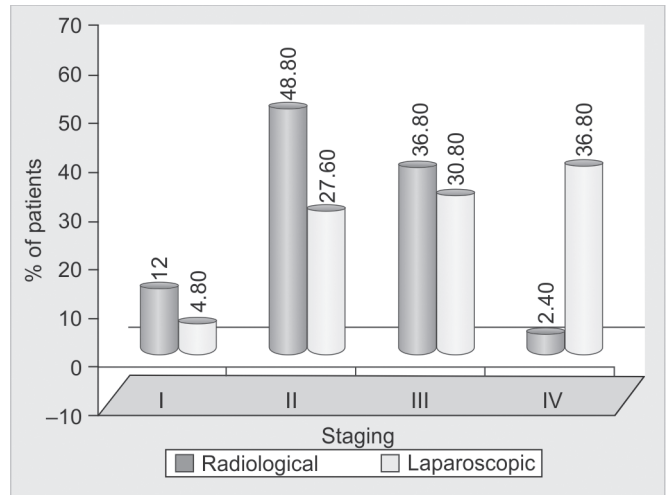


Fig. 2: Distribution of patients according to the radiological and laparoscopic stage of overall cancer patients

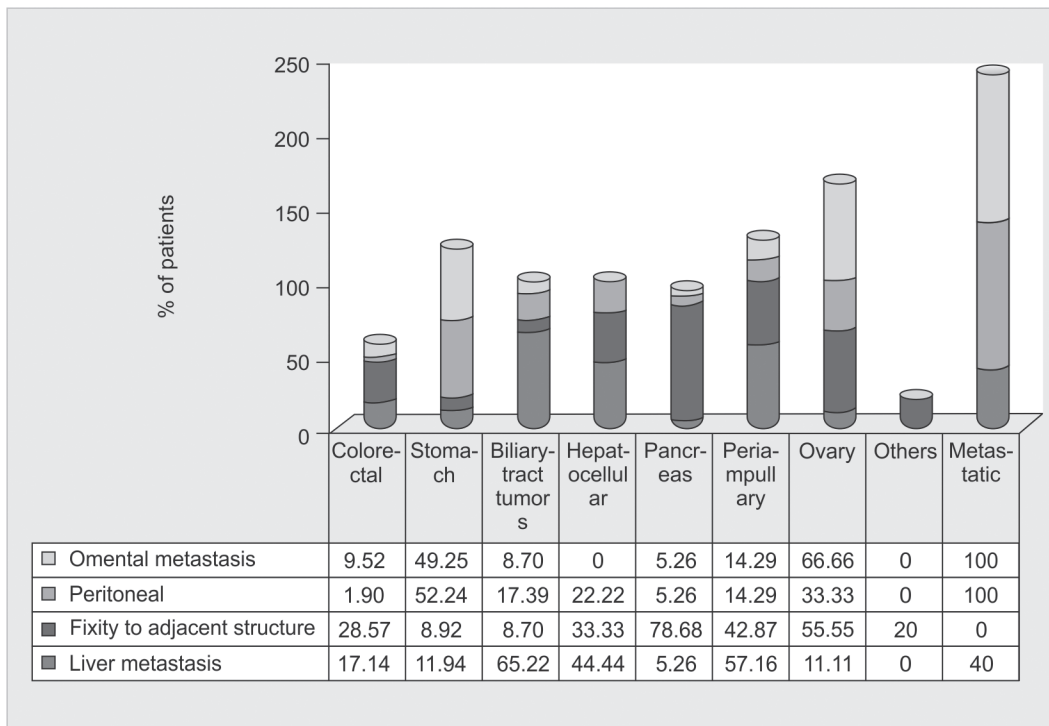


Fig. 3: Distribution of patients according to the reasons for unresectability

Table 1: Distribution of patients according to the radiological and laparoscopic stage of overall cancer patients

Stage	Radiological		Laparoscopic		p value
	No of patients	Percentage	No of patients	Percentage	
I	30	12	12	4.8	99.22 p = 0.0001, S
II	122	48.8	69	27.6	
III	92	36.8	77	30.8	
IV	6	2.4	92	36.8	

34.4% of cases were diagnosed as metastatic disease (stage IV) by diagnostic laparoscopy, which was understated by radiological imaging (Table 2).

Operability is with regard to the patient. If a malignant disease can be cured with a radical surgery, such a patient is said to be operable. If one cannot cure a malignant disease by a surgical

procedure, it is called inoperable. Resectability is with regard to the tumor. A lesion or tumor is said to be unresectable if there is local fixity or neural/vascular encasement. In our study, the reason for unresectability was local tumor fixity to adjacent structures and neural/vascular encasement. Out of 105 patients of colorectal malignancies, 31 (29.52%) patients were unresectable. 10 patients

Table 2: Diagnostic accuracy

	Percentage	95% confidence interval
Sensitivity	93.88	87.15–97.72
Specificity	54.44	46.61–62.10
PPV	54.44	46.61–62.10
NPV	93.88	87.15–97.72
Accuracy	68.91	

underwent palliative colostomy/diversion procedures, followed by chemotherapy. Rest of the patients were subjected to chemotherapy directly. Out of 67 patients of carcinoma stomach, 40 (59.70%) patients were unresectable, and a palliative bypass was done in four patients. Rest of the patients were subjected to chemotherapy. Out of 23 cases of biliary tract tumors, 15 patients were of gall bladder malignancies, and all patients were unresectable. In gall bladder cancers, no further palliative procedure was done. All were subjected to chemotherapy. Out of eight cases of cholangiocarcinoma, two cases were subjected to biliary stenting, and six cases were subjected to percutaneous transhepatic biliary drainage (PTBD). Out of 19 patients of pancreatic malignancies, 16 (84.21%) patients were unresectable. One patient underwent palliative triple bypass procedure, and rest were subjected to chemotherapy. Out of nine patients of HCC, 9 (100%) patients were unresectable. Out of seven patients of periampullary malignancies, six (85.7%) patients were unresectable. Two cases were subjected to biliary stenting, and four were subjected to PTBD. Out of nine cases of ovarian malignancies, 7 (77.77%) cases were unresectable and were subjected to chemotherapy. Out of five cases, in the miscellaneous group, palliative bypass procedure (gastrojejunostomy) was done for duodenal malignancy. As the total number of patients in stage III

and IV were 169, of which, 77 were of stage III of which 24 were of colorectal and 22 were of gastric malignancy. Of the two malignancies in stage III, 19 patients of colorectal malignancy were resectable, and 11 of gastric malignancies were resectable being Stage IIIA—T3N1M0 disease (Tables 3 and 4).

In our study, a total of 139 patients were unresectable. The reason for unresectability was more than one of the above-mentioned causes in the same patient, i.e., a single patient can have liver metastasis with local fixity with peritoneal metastasis (Table 5).

Due to the use of diagnostic laparoscopy, out of 250 cases of abdominal malignancies, in 120 (48%) patients, nontherapeutic laparotomy could be prevented. In the rest of the unresectable patients, 19 patients were subjected to laparotomy for bypass procedures.

DISCUSSION

Staging and Operability of Intra-abdominal Malignancies

Staging laparoscopy avoids unnecessary laparotomies and changes the therapeutic plan in a significant number of patients. It can be performed just before the planned surgery or as a separate diagnostic procedure. The laparoscopy indications in gastrointestinal cancers are changing fast, with ongoing new developments in cancer treatment and laparoscopic technology.⁴

Gastric Cancer

Diagnostic staging laparoscopy may aid in the more accurate staging of gastric cancers and guide appropriate treatment without the morbidity associated with exploratory laparotomy.⁵ In our present study, a total of 67 patients of gastric malignancies who underwent diagnostic laparoscopy revealed peritoneal metastasis

Table 3: Distribution of patients according to unresectability

Type of cancer	No of patients	Unresectable	(%) of unresectability
Colorectal	105	31	29.52
Stomach	67	40	59.70
Biliary tract tumors	23	23	100.00
Hepatocellular	9	9	100.00
Pancreas	19	16	84.21
Periampullary	7	6	85.7
Ovary	9	7	77.78
Others	5	1	20.00
Metastatic	6	6	100
Total	250	139	55.3

Table 4: Distribution of patients according to the reasons for unresectability

Type of cancer	No of patients	Liver metastasis	Fixity to adjacent structure	Peritoneal metastasis	Omental metastasis
Colorectal	105	18 (17.14%)	30 (28.57%)	2 (1.90%)	10 (9.52%)
Stomach	67	8 (11.94%)	6 (8.95%)	35 (52.24%)	33 (49.25%)
Biliary tract tumors	23	15 (65.22%)	2 (8.7%)	4 (17.39%)	2 (8.70%)
Hepatocellular	9	4 (44.44%)	3 (33.33%)	2 (22.22%)	0 (0%)
Pancreas	19	1 (5.26%)	14 (78.68%)	1 (5.26%)	1 (5.26%)
Periampullary	7	4 (57.16%)	3 (42.87%)	1 (14.29%)	1 (14.29%)
Ovary	9	1 (11.11%)	5 (55.55%)	3 (33.33%)	6 (66.66%)
Others	5	0 (0%)	1 (20%)	0 (0%)	0 (0%)
Metastatic	6	2 (40%)	0 (0%)	6 (100%)	6 (100%)
Total	250	53 (21.2%)	64 (25.6%)	54 (21.6%)	59 (23.6%)

Table 5: Distribution of patients according to preventable laparotomy due to metastatic disease

Type of cancer	Total patients	No of patients	Percentage
Colorectal	105	21	20.00
Stomach	67	36	53.73
Biliary tract tumors	23	23	100.00
Hepatocellular	9	9	100.00
Pancreas	19	15	78.95
Periampullary	7	3	42.86
Ovary	9	7	77.78
Others	5	0	0.00
Metastatic	6	6	100.00
Total	250	120	48.00

in 35 (52.24%) and liver metastasis in eight (11.94%) patients and Omental metastasis in 33 (49.25%) patients. Unresectability was predicted in 40 (59.70%) patients with a diagnostic accuracy of 78.43%. Thus our study correlates with studies conducted by Burke et al.⁶ Kriplani and Kapur⁷, Leake et al.⁸

Pancreatic Cancer

Pancreatic adenocarcinoma, when diagnosed, has a dismal prognosis. Surgery is the only modality that can lead to cure; however, most patients present with inoperable disease. In our present study, 19 patients of pancreatic malignancies underwent preoperative laparoscopy after radiological investigations. CT could detect locally advanced disease in five (26.31%) cases. Laparoscopy detected metastatic disease in three (15.78%) patients and locally advanced disease in 13 (68.42%) patients. Unresectability predicted in 16 (84.21%) patients^{9,10} thus avoiding laparotomy in 15 (78.94%) patients. The overall efficacy of laparoscopy was 38.09%. Out of 19 patients, three patients underwent Whipple’s procedure, and one underwent triple bypass procedure. Preventable laparotomy in our study for pancreatic malignancy was 15 (78.94%) cases out of 19.^{9,10,11}

Periampullary Cancer

In our present study, Seven patients underwent preoperative laparoscopy after radiological imaging. CT detected locally advanced disease in three (42.85%) cases. Laparoscopy detected metastatic and locally advanced disease in six (85.4%) patients predicting the resectability rate for periampullary cancers was 15.6%, avoiding laparotomy in three (42.85%) patients. The patient having resectable disease underwent Whipple procedure. Out of six unresectable cases, two had biliary stenting, one had PTBD, and three had undergone triple bypass procedure. The results are comparable with the above-mentioned studies (Tables 6 and 7).^{12,13}

Biliary tract tumors can be divided into two main categories: gallbladder cancers and cholangiocarcinomas. The two groups differ in their patterns of spread and prognosis.

Hepatocellular Carcinoma

The prognosis of patients with hepatocellular carcinoma (HCC) may be improved with the appropriate selection of treatment, which depends on the accurate identification of all hepatic lesions, including size, number, and location. Nontherapeutic laparotomy and its associated morbidity may be prevented by the detection of unresectable disease with SL. Since peritoneal disease is uncommon with HCC, surface laparoscopy may be less valuable compared with laparoscopic ultrasound.² Diagnostic laparoscopy

Table 6: Studies assessing the role of staging laparoscopy in colorectal tumors

Studies	No. of patients	Unresectability (%)
Rahusen et al. ¹⁷	50	38
Jarnagin et al. ¹⁸	104	14
Grobmyer et al. ¹⁹	264	10
Present study	105	29.52

Table 7: Studies assessing the role of staging laparoscopy in biliary tract tumors

Studies	No. of patients	Unresectability (%)
Weber et al. ¹⁴	100	35
Tilleman et al. ¹⁵	110	41.8
Goere et al. ¹⁶	39	36
Present study	23	100

is useful in the evaluation of the potentially resectable patient with HCC. Information obtained from laparoscopy may change the clinical management.¹⁸ In our study, out of nine cases of HCC, four (44.44%) cases had intrahepatic metastasis, one (11.11%) patient had omental and peritoneal metastasis, and three (33.33%) cases had fixity to adjacent structures with vascular encasements. In HCC fixity to adjacent structures with vascular encasement in three (33.33%) patients that were diagnosed preoperatively on radiological imaging. Nontherapeutic laparotomies 100%. These findings correlate with Weitz et al.²⁰ Lai et al.²¹

Metastatic Carcinoma

Diagnostic laparoscopy is a safe, feasible, and accurate staging tool in patients with suspected radiological investigations suggestive of metastatic disease with unknown primary. In our study, six (2.4%) cases were of radiologically detected metastatic disease, whose diagnostic laparoscopy was suggestive of metastatic deposits over omentum and peritoneum (100%). Two (40%) cases had hepatic metastasis also. According to the study done by Marmor et al., diagnostic laparoscopy is a safe, feasible, and accurate staging tool in patients with suspected peritoneal metastases being considered for cytoreductive surgery and hyperthermic intraperitoneal chemotherapy.²²

Peritoneal Lavage Cytology

The value of cytology of peritoneal lavage performed during laparoscopic staging of GI malignancies was evaluated in a large series of patients. The additional value of the lavage was defined as the number of patients in whom a positive lavage result adequately predicted irresectable disease in addition to the laparoscopy results. A positive lavage result could have additional value for laparoscopic staging only if it were a unique finding, without the presence of metastases or ingrowing disease. When the lavage results were combined with the laparoscopy results, the additional value of the lavage was not significant because in our study 109/250 patients (43.5%) with a positive lavage result also had metastases proven with laparoscopic staging. This result correlates with the study of Nieveen.²³

In our study, there was upgrading of stage after diagnostic staging laparoscopy, and in 34.4% cases, metastatic disease could be diagnosed on laparoscopy that could not be detected on radiological imaging due to the smaller (subcentimetric) size of metastatic omental, peritoneal and hepatic deposits. Out of a total of 250 patients of abdominal malignancies, 139 (55.6%) patients

were diagnosed unresectable on laparoscopy. The reasons for unresectability were liver metastasis in 53 (21.2%), fixity to adjacent structures in 64 (25.6%), peritoneal metastasis in 54 (21.6%) and omental metastasis in 59 (23.6%) patients that could be diagnosed on laparoscopy. Thus 111 (44.44%) patients were subjected to definitive surgery depending upon the type of abdominal malignancy after diagnostic laparoscopy. Rest of the patients had undergone palliative management depending upon the type of malignancy and were subjected to chemotherapy. Because of the use of diagnostic staging laparoscopy, out of 250 patients, in 120 (48%) cases, nontherapeutic laparotomy could be prevented and could be subjected to further palliative management like chemotherapy without much delay and minimum morbidity. The advantages are very minimal procedure-related complications, no pain, faster recovery minimum morbidity, no mortality, no procedure-related adverse oncological effects. Out of 250 patients of abdominal malignancies, 109 (43.6%) patients had positive peritoneal cytology who also had metastases proven with laparoscopic staging. The sensitivity and specificity of laparoscopy in abdominal malignancies to detect resectable disease was 93.88% and 54.44%, respectively.

CONCLUSION

This study highlights the emphatic utility of diagnostic laparoscopy procedures in staging and management of abdominal malignancy. Laparoscopic evaluation of a patient with intra-abdominal malignancies is a desirable tool against imaging modalities in improving the detection of metastatic disease and accurate staging of the disease process.

LIMITATIONS OF STUDY

Long-term follow-up of patients could not be done.

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