Role of Laparoscopy in Management of Intra-abdominal Tumors

Waheed Yousry Gareer MD, Mohamed El-Sayed Safa MD, Amr Seliem MD
Department of Surgical Oncology, National Cancer Institute, Cairo University

ABSTRACT

Staging laparoscopy allows internal visualization of the abdomen and is capable to accurately stage intraabdominal tumors. Between 2007 and 2013 at Cairo National Cancer Institute hospital 70 patients underwent laparoscopic procedures as follow: 20 patients underwent laparoscopic assessment (10 for hepatic tumors and 10 with pancreatic tumors) and 10 patients with hepatic tumors were subjected to laparoscopic radio frequency ablation (RFA) and 20 patients underwent laparoscopic resectional procedures (adrenalectomy in 10 patients and splenectomy in 10 patients). 10 patients underwent palliative laparoscopic procedures (gastrostomy in 5 patients and colostomy in 5 patients) and 10 patients underwent adjuvant laparoscopic procedures (oophropexy in 5 patients and oophrectomy in 5 patients). Results: Three out of 10 assessed patients with hepatic tumors proved to have inoperable disease and another three out of 10 assessed patients with pancreatic carcinoma proved to have inoperable disease. These six patients were spared unnecessary coeliotomy. Nine out of 10 patients who were subjected to laparoscopic RFA showed complete ablation of their hepatic tumors. For all patients there were no intraoperative complications and the relevant procedures were safe and feasible. The results of estimated time of each procedure, estimated blood loss, length of hospital stay and post-operative analgesia were comparable to the published results of other workers. Conclusion: It can be concluded that laparoscopic staging or resectional or palliative procedures are safe and feasible with the least morbidity.

Key words: *Laparoscopic, Resection, Palliative procedures*

INTRODUCTION

Laparoscopic cholecystectomy was first performed by Mouret in France in 1987, and was developed in that country during 1988 and 1989; patients had less pain and recovered more quickly[(1)]. Staging laparoscopy allows internal visualization of the abdomen and can detect any peritoneal spread of the cancer or the involvement of any adjacent structure. A biopsy and histopathological examination of any suspicious lesion can be performed and an unnecessary laparotomy to attempt curative resection is avoided.

Hepatocellular carcinoma (HCC) is the sixth most common malignancy world wide[(2)] and in Egypt, HCC contributes about 8% of all cancers[(3)]. Because liver resection is the only curative treatment option for HCC, adequate staging and selection for putative resection are mandatory. Although preoperative staging for malignancies is readily achieved by advanced imaging studies, a considerable number of unresectable disease still are detected at laparotomy. Staging laparoscopy is used to avoid these unnecessary laparotomies[(2)].

Laparosopic radiofrequnecy ablation (RFA) for selected patients with hepatocellular carcinoma (HCC) is comparable to percutaneous RFA but the use of laparoscopic US can identify new lesions[(4)].

In the West, pancreatic carcinoma constitutes 4% of all cancers[(3)]. Despite the availability of high-resolution CT scans, occult metastases can still be found in 11% of patients with pancreatic cancer during open surgical exploration so staging laparoscopy should be offered to all patients with radiographic localized disease[(5)]. Staging laparoscopy can result in avoidance of laparotomy without a therapeutic benefit in 6-26% of patients with pancreatic cancer scheduled for surgery with intentive cure[(5,6)].

The introduction of a laparoscopic approach to surgical adrenalectomy was first reported in the early 1990s[(7)], and in the subsequent two decades, this surgical technique has become the standard of care for the removal of most adrenal lesions[(7,8)]. Laparoscopic adrenalectomy (LA) has shown significant benefits versus open adrenalectomy in

terms of reduced postoperative pain, shorter hospital stays, faster return to preoperative activity level, and improved cosmesis[9-11].

Lymphomas represent a neoplastic disorder whose treatment is carried out by a multidisciplinary panel including medical oncologist, radiologist, surgeon and pathologist. An adequate treatment is determined by a correct staging and at the end of the medical treatment is often necessary to restage the disease to better plan the best management[12].

Laparoscopic surgery plays today an important role in the diagnosis and staging of abdominal lymphomas; in fact it provides adequate lymph node sampling for histological typing and immunophenotyping. The mini-invasive procedure is safe and effective. Intra-operative ultrasound permits to study the parenchymal organs is addition to intra-abdominal lymph node and/or masses[12].

Laparoscopic palliative procedures is suitable for the co-morbid patients with distressing symptoms due to their advanced cancer.

Aim of the work:

All patients subjected to laparoscopy in this work were evaluated as regard:

a) Technical feasibility of the procedure.
b) Estimation of time of the procedure.
c) Estimation of blood loss in ml.
d) Post- operative pain.
e) Length of hospital stay.

MATERIAL & METHODS

Sixty five consecutive patients (35 males and 30 females, their mean age was 51 years, range 33-72) with clinical and radiological diagnosis of intra-abdominal malignant tumors were subjected to laparoscopic procedures in the period from January 2007 to December 2013 at the Cairo National Cancer Institute (NCI) hospital, from whom 20 patients (10 with liver tumors and 10 with pancreatic tumors) underwent laparoscopic assessment for proper staging of their malignant disease, and 20 patients (10 patients with adrenal tumors and 10 patients underwent splenectomies) were subjected to laparoscopic resectional procedures. Ten patients with primary HCC were submitted to laparoscopic RFA. Another 10 patients with advanced malignant disease beyond curative surgery (5 with dysphagia and 5 with obstructing rectal cancer) were subjected to laparoscopic procedures aiming at palliative treatment of their malignant disease. Five patients were subjected to laparoscopic oophropexy before their definitive pelvic radiation therapy. Another 5 females (mean age 40, range 34-49) were subjected to laparoscopic oophrectomy as a sort of hormonal ablative therapy in their multidisciplinary treatment for advanced breast cancer.

For all patients included in this work, preoperative laboratory and radiological investigations as well as aenesthetic assessment were done before performing laparoscopy.

1. Routine laboratory investigations for fitness for major abdominal surgery and any abnormal laboratory findings were corrected preoperatively. The relevant serological tumor marker measurements were done.
2. Preoperative radiological investigations included: plain x-ray chest PA and lateral views, Computed Tomography of abdomen and pelvis, and other specific radiological studies when needed e.g. triphasic C.T study of the liver, MRI, MRCP, Angiograms and bone scan.
3. Anaesthetic assessment which included ECG, Echo cardiogram, and other studies required for general anesthesia and preoperative correction of any medical disease.

RESULTS

Table (1): Shows the laparoscopic procedures performed for 70 patients

	Type of procedures	*Number of Patients*
1	Laparoscopic assessment of Hepatic and Pancreatic tumors	20
2	Laparoscopic resectional procedures with intentive cure	20
3	Laparoscopic radiofrequency ablation for hepatic tumors	10
4	Laparoscopic Palliative procedures	10
5	Adjuvant laparoscopic procedure	10
	Total	70

1- Laparoscopic assessment of Hepatic and Pancreatic tumors (20 patients)

A- Laparoscopic assessment of hepatic tumors:

Ten patients with primary hepatocellular carcinoma, who were scheduled for open hepatic resection on basis of preoperative imaging (US and Triphasic CT), were subjected to laparoscopic assessment. Three out of the ten patients showed to have newly discovered hepatic focal lesions or satellites that were not detected by preoperative imaging. In two patients laparoscopic US detected multiple focal hepatic lesions outside the confines of the proposed segments planned for resection. In one patient laparoscopy detected satellites around the tumor and peritoneal deposits (Figs. 1 and 2), Three out of ten assessed patients were spared unnecessary laparotomy.

Fig. (1): Satellites and peritoneal deposits

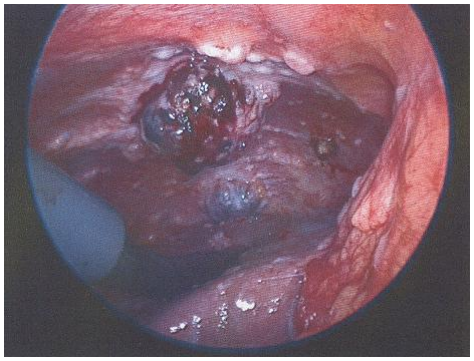

Fig. (2): Satellites and peritoneal deposits

B- Laparoscopic assessment of pancreatic tumors:

Ten patients with carcinoma of the pancreas (7 in the head, 2 in the body and one in the tail) who were scheduled for the appropriate curative surgery (Whipple procedure, subtotal pancreatectomy or distal pancreatectomy); these patients were submitted to laparoscopic assessment before coeliotomy. It is noteworthy to mention that preoperative radiological assessment (Spiral CT and MRCP) had concluded operability for these ten patients. Laparoscopic assessment revealed peritoneal nodules in one patient, in another patient laparoscopic US detected liver metastases that were not detected by the used radiological investigations, while in the 3rd patient laparoscopy revealed portal vein invasion. For all assessed patients, the portal vein and the hilar portion of the liver were approached using the 30 degree scope via the foramen of Winslow. Hence 3 out of 10 patients were spared coeliotomy. Moreover, laparoscopic US detected the site and the size of the pancreatic tumors in the 7 patients who were subjected to curative resections as proved by the pathological examination of the postsurgical specimens.

2- Laparoscopic radiofrequency ablation (LRFA) for hepatic tumors (10 patients)

Ten patients with primary hepatocellular carcinoma (HCC) on top of liver cirrhosis, who were scheduled for open ultrasound guided RFA, were submitted to ultrasound guided LRFA (Fig. 3), (Fig. 4), (Fig. 5) and (Fig. 6). Four patients were having a single tumor and 6 patients were having two tumors. All treated tumors were less than 5 cm in greatest dimension. In 9 patients the tumors were deep. All patients underwent complete ablation of their tumors. The mean operative time was 78 (58 - 98) minutes and there was no blood loss. Two patients developed postoperative ascites and deterioration of liver functions which improved by medical treatment. Eight patients passed uneventful postoperative course. Post-treatment triphasic CT after one month revealed complete ablation of the tumors with 100% necrosis in 9 patients, while in one patient a residual tumor was present (evidenced by residual enhancement in the CT and elevated alpha feto-protien). This patient was submitted to reablation which was successful.

Fig. (3): Laparoscopic US

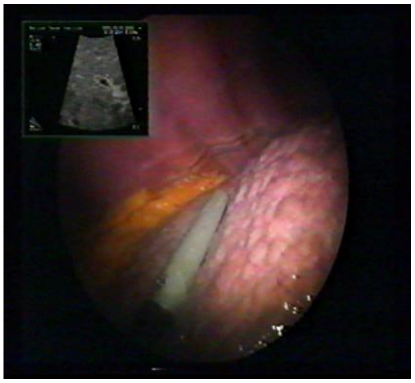

Fig. (4): Laparoscopic RFA

Fig. (5): Laparoscopic RFA

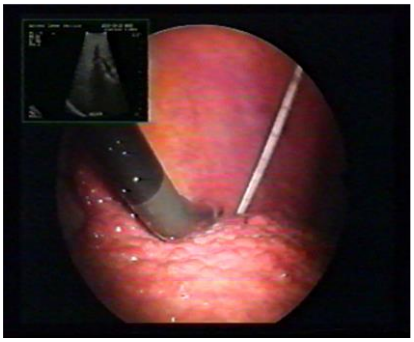

Fig. (6): Laparoscopic RFA

3- Laparoscopic resectional procedures with intentive cure (20 patients)

Twenty patients were submitted to laparoscopic resectional surgery for intentive cure. From whom 10 patients underwent adrenalectomy for cure of benign (7 patients) and malignant (3 patients) adrenal tumors. Another 10 patients were subjected to laparoscopic splenectomy in the prospect of staging for their Hodgkin's disease.

A- Laparoscopic adrenalectomy:

Ten patients, who were diagnosed preoperatively to have an adrenal mass less than 5cm in diameter, were subjected to laparoscopic adrenalectomy (Fig. 7), (Fig. 8), (Fig. 9) and (Fig. 10). For these 10 patients, the preoperative radiological diagnosis (CT and MRI) detected an adrenal mass less than 5 cm in diameter, well encapsulated and without any radiographic evidence of lymphadenopathy or periadrenal involvement.

The mean operative time was 150 (120-180) minutes and the mean blood loss was 200 (150-350) ml. The mean hospital stay was 4 (2-5) days. The postoperative pathological diagnosis revealed that the mean tumor size was 3(2-6) cm. Two patients were diagnosed histologically to have a malignant adrenocortical tumor and one patient proved to have pheochromocytoma. In the other 7 patients, tumors showed benign pathologic features.

Fig (7): Laparoscopic adrenlectomy

Fig (8): Laparoscopic adrenlectomy

Fig (9): Laparoscopic adrenalectomy

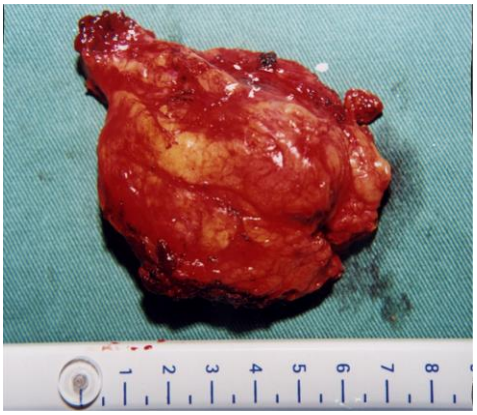

Fig (10): Post-resection specimen

B- Laparoscopic splenectomy:

Nine patients with Hodgkin's disease were submitted to laparoscopic splenectomy (Fig. 11), (Fig. 12), (Fig. 13) and (Fig. 14); and other steps (liver and nodal biopsy) as a part of staging of the disease. For these 9 patients, extraction of the resected spleen was done utilizing a Pfannenstiel incision 5 (up to 7) cm.

For the 10th patient, with a myeloid spleen, the extraction wound incision was 10 cm utilizing a Pfannenstiel incision. The mean operative time (without calculating time needed for liver and other biopsies) was 140 (60-200) minutes. The mean blood loss was 200 (150-1000) ml. The mean time of hospital stay was 4 (3-7) days. For the ten patients, the pathological examination revealed preservation of histological architecture of the removed spleens.

Fig. (11): Laparoscopic splenectomy

Fig. (12): Laparoscopic splenectomy

Fig. (13): Laparoscopic splenectomy

Fig. (14): Post-resection specimen

4- Laparoscopic Palliative procedures (10 patients):

Laparoscopic gastrostomy (with fixation of anterior gastric wall to parietal peritoneum) was performed in 5 patients. The 5 patients were suffering from severe dysphagea due to locally advanced hypopharyngeal carcinoma (3 patients) and advanced oesophgeal carcinoma (2 patients). The mean operative time was 30 (20-50) minutes; there was no blood loss or post-operative complications. The patients stayed in hospital until learning the attendant relatives how to help the patients as regard feeding through the gastrostomy tubes.

Laparoscopic loop colostomy were performed in 5 patients, 4 patients were having obstruction due to locally advanced rectal carcinoma and the 5th patient was a female suffering from locally advanced irradiated cervical cancer with recto-vaginal fistula, after prior proper identification of stoma site while the patient is standing. There were no history of laparotomy in all patients. Laparoscopic colostomy was done without intraoperative or post-operative morbidity or mortality, the mean operative time was 30 minutes, and the mean hospital stay was 5 days.

5- Adjuvant laparoscopic procedure (10 patients):

A- Laparoscopic oophrectomy:

Laparoscopic oophrectomy were performed in 5 patients, in all patients laparoscopic bilateral oophrectomy were done as a sort of hormonal treatment for breast cancer in patients with strongly positive ER and PR assay. The mean operative time was 60 minutes (40-100), the mean time of hospital stay was 1 day and there were no blood loss.

B- Laparoscopic oophropexy:

Laparoscopic oophropexy were performed in 5 patients, 3 patients were young and suffering from stage I cervical cancer and were treated by radical radiotherapy after laparoscopic oophropexy, 2 patients were having Hodgkin's disease to which laparoscopic oophropexy were performed at the same sitting with staging laparoscopy. We always fix a metal marker in the new ovarian site. Apart from patients with combined procedures, the mean operative time was 30 minutes (20-60), mean time of hospital stay was 1 day and there were no blood loss.

DISCUSSION

In this work, 10 patients with primary hepatocellular carcinoma who were scheduled for open hepatic resection on basis of preoperative imaging (US and triphasic CT), underwent assessment laparoscopy, 3 out of 10 patients showed to have newly discovered hepatic focal lesions or satellites with the use of LUS, from whom 2 patients showed multiple focal hepatic lesions outside the confines of the proposed segments planned for resection.

Hoekstra and his colleagues[13] performed staging laparoscopy for 56 patients with HCC, they described that for 2 patients the procedure was unsuccessful because of intraabdominal adhesions, and for 4 (7%) out 56 patients the tumor proved to be unresectable.

Laparoscopic radiofrequency ablation were performed in 10 patients with HCC (tumor size < 5 cm), 8 patients passed uneventful post-operative coure while 2 patients developed postoperative ascites and impairment of liver functions which improved by medical treatment. Post-treatment triphasic CT after one month revealed complete ablation of the tumors in 9 patients and a residual tumor in one patient who was submitted to a successful reablation.

Topal and his colleagues[14] concluded that laparoscopic RFA is a safe and feasible treatment modality in selected patients, Breber and his colleagues[15] stated that the postoperative rise in liver function tests is expected reflecting the liver injury response to RFA.

Abdalla[16] debated the results of Buel and his colleagues[17] as regard their results after RFA of only 6% local recurrence and Abdalla reinforced the opinion of Mazzaferro and his colleagues[18]

that liver explant pathology of ablated HCC when RFA is performed as a bridge to liver transplantation, demonstrated viable tumor residual in many patients after RFA despite apparent radiologic complete treatment, and so rigorous follow-up is mandated. Multiple new technologies are already competing including microwave ablation and irreversible electroporation[16].

In this work 10 patients with carcinoma of the pancreas who were scheduled for the appropriate curative surgery underwent laparoscopic assessment before laparotomy. Laparoscopic assessment revealed peritoneal nodules in one patient, in another patient LUS detected liver metastases that were not detected by the used radiological investigations, while in the 3rd patient, laparoscopy revealed portal vein invasion. Hence 3 out of 10 patients were spared laparotomy, this result is consistent with the results of Shoup and his colleagues[19].

Schnelldorfer and his colleagues[20] stated that open exploration is superior to laparoscopic staging in pancreatic tumors because occult peritoneal metastases are located in areas that standard staging laparoscopy does not assess, such as posterior liver surface, the lesser sac and the proximal jejunal mesentry. Laparoscopy not only provides a minimal invasive means for staging, but it is also a very suitable vehicle for upcoming image-enhanced optical techniques, which in the future will enhance diagnostic capabilities for detection of surface micrometastases[20].

In the present work 10 patients underwent laparoscopic adrenalectomy. The mean tumor size 3 (2-6) cm (postoperative pathology report), the mean operative time for the procedure was 150 (120-180) minutes, the mean blood loss was 200 (150-250) ml and the mean hospital stay was 4 (2-5) days.

The benefits of a minimally invasive approach to adrenal resections such as decreased hospital stay, shorter recovery time and improved patient satisfaction are widely accepted. The most common indication is a unilateral benign adrenal lesion. This includes incidentalomas, pheochromocytomas, aldosteronomas and Cushing's syndrome[21].

Naya and his colleagues[21] have done laparoscopic adrenalectomy for 23 patients in whom the mean tumor size was ranging from 2.6 to 4.9 cm, in their series the mean operative time was 192.7 ± 68 minutes, the mean blood loss was 130 ± 15 ml and mean hospital stay was 2 ± 1 days. While Adler and his colleagues[22] reported 9 laparoscopic adrenalectomy for tumors which ranged from 3 to 5 cm in whom the mean operative time was 165 ± 34 minuts and mean blood loss was 63 ± 8 ml and the mean hospital stay was 2.4±1 days. A limitation of laparoscopic approach for adrenal giant masses is the increased risk to treat an adrenal cortical carcinoma[23]. The rise in the number of adrenalectomies performed in the United States has paralleled the adoption of the laparoscopic technique to surgically manage appropriately selected masses[24]. Increased age and patient co-morbidities, including obesity, tumor size, and malignancy, are all potential risk factors for inferior perioperative outcomes following laparoscopic adrenalectomy[25].

In the present work, 10 patients underwent laparoscopic splenectomy, the operation time was 140 (60-200) minutes, the mean blood loss was 200 (150-1000) ml and the mean time of hospital stay was 4(3-7) days. Uranues and Alimoglu[26] reported the result of laparoscopic splenectomy for 135 patients as follow: the mean operation time was 130 (108-239) minutes, the mean blood loss was 100 (90-200) ml and the mean hospital stay was 5 (3-10) days. While Patel and his colleagues[27] reported a mean operation time of 145 (55-420) minutes, a mean blood loss of 160 (25-500) ml, and a mean hospital stay of 2.4 (1-17) days for 143 patients who underwent laparoscopic splenectomy.

Laparoscopic surgery plays today an important role in the diagnosis and staging of abdominal lymphomas[12].

The staging of lymphomas can be difficult due to the intra-abdominal site of the disease that makes fairly difficult both the biopsy and the retrieval of specimens adequate for pathological examination. Laparoscopy allow to sample lymph nodes located in areas difficult to access such as the retroperitoneum[28].

Gareer[29] described laparoscopic gastrostomy which is a new technique in the hands of laparoscopic surgeons to provide entral nutrition for patients with severe dysphagia. The procedure is done after full assessment of the abdominal cavity for further staging particularly in oesophageal cancer. In this work laparoscopic gastrostomy were performed in 5 patients, the

mean operative time was 30(20-50 minutes), there was no blood loss or post-operative complication. The patient started tube feeding after a mean of 10 (6-24) hours but the patient stayed in hospital until learning the attendant relatives how to help the patient as regard feeding through the gastostomy tube.

Percutaneous endoscopic gastrostomy (PEG) is considered the standard procedure for ensuring safe feeding access. In case of advanced hypopharyngeal and oesophageal carcinomas, it may not be feasible to pass an existing stenosis by endoscopy, in such patients a palliative laparoscopic gastrostomy is considered. It is either insertion of the catheter system according to Stamm or the formation of an outgoing stomach tube according to Janeway[30].

In the present work laparoscopic colostomy were performed in 5 patients with different indications, there were neither intra or post-operative complications, the mean operative time were 30 minutes, the mean hospital stay was 5 days and stoma function started after a mean of 3 days.

Sabbagh and his colleagues[31] described a single port at the stoma site and used a penrose drain to retract the sigmoid loop which make this procedure unique.

Laparoscopic oophropexy were performed in 5 patients prior to their treatment with radial radiotherapy from whom 2 patients were having Hodjkin's disease and ovarian transposition were performed at the same sitting with staging laparotomy.

Barahmeh and his colleagues[32] described that laparoscopic ovarian transposition is an effective procedure for preservation of ovarian function before the start of pelvic radiotherapy.

Conclusion:

It can be concluded that laparoscopic staging or resectional or palliative procedures are safe and feasible with the least morbidity.

REFERENCES

1. **Peters JH, Ellison C, Innes JT et al:** Safety and efficacy of laparoscopic cholecystectomy. Ann Surg. 1991; 213:3-12.
2. **Hoekstra LT, Bieze M, Busch ORC, Gouma DJ and Guilk TMV:** Staging laparoscopy in patients with hepatocellular carcinoma: is it useful? Surg Endosc. 2013; 27:826-31.
3. **El-Bolkainy N, Nouh MA, Farahat IG, El-Bolkainy TN and Badawy OM:** Hepatobiliary and pancreatic tumors. In: Pathology of cancer. 4th ed. Cairo Press. Cairo. 2013; pp231-44.
4. **Chung MH, Wood TF, Tsioulias GJ, et al:** Laparoscopic radiofrequency ablation of unresectable hepatic malignancies, a phase II trial. Surg Endoc. 2001; 15(9):1020-6.
5. **Mayo SC, Austin DF, Sheppard BC, et al:** Evolving pre-operative evaluation in patients with pancreatic cancer: Does laparoscopy have a role in the current era. J Am Coll Surg. 2009; 208:87-95.
6. **Toomey P, Childs C, Luberice K, et al:** Non-therapeutic celiotomy incidence is not affected by volume of pancreaticoduodenectomy for pancreatic adenocarcinoma. Am Surg. 2013; 79:781-5.
7. **Sancho JJ, Triponez F, Montet X, Sitges-Serra A:** Surgical mangement of adrenal metastases. Langenbecks Arch Srug. 2012; 397:179-194.
8. **Greco F, Hoda MR, Rassweiler J, et al:** Laparoscopic adrenalectomy in urological centres—The experience of the German Laparoscopic Working Group. BJU Int. 2011; 108:1646-1651.
9. **Adler JT, Mack E, Chen H:** Equal oncologic results for laparoscopic and open resection of adrenal metastases. J Surg Res. 2007; 140:159-164.
10. **Al-Otaibi KM.** Laparoscopic adrenalectomy: 10 years experience. Ann Urol. 2012; 4:94-97.
11. **Rodriguez A, Pow-Sang JM:** Laparoscopic surgery in urologic oncology. Cancer Control. 2006; 13:169-178.
12. **Zanghi G, Arena M, Stefano GD, Benfertto F and Basile F:** The role of laparoscpy and intraoperative ultrasound in the diagnosis and staging of lymphomas. G Chir. 2012; 33(3):71-3 (published in English).
13. **Hoekstra LT, Bieze M, Busch ORC, Gouma DJ and Gulik TMV:** Staging laparoscopy in patients with hepatocellular carcinoma: is it useful? Surg Endosc. 2013; 27:826-31.

14. **Topal B, Aerts R, Penninckx F:** Laparoscopic radiofrequency ablation of unresectable liver malignancies: feasibility and clinical outcomes. Surg Laparosc Endosc Peruct Tech. 2003; 13(1):11-5.
15. **Berber E and Siperstein AE:** Perioeraptive outcom after laparoscopic radiofrequency ablation of liver tumors: an analysis of 521 cases. Surg Endosc. 2007; 21(4):613-8.
16. **Abdalla EK:** The truth about radiofrequency ablation and laparoscopic liver resection. Ann Surg. 2011; 253(4):841-5.
17. **Buel JF, Thomas MT, Rudisch S et al:** Experience with more than 500 minimally invasive hepatic procedures. Ann Surg. 2008; 248:475-86.
18. **Mazaferro V, Battiston C, Perrone S:** Radiofrequency ablation of small hepatocellular carcinoma in cirrhotic patients awaiting liver transplantation: a prospective study. Ann Surg. 2004; 240:900-9.
19. **Shoup M, Winsto C, Brennan MF et al.** Is there is a role for staging laparoscopy in patients with locally advanced, unresectable pancreatic adenocarcinoma? J Gastrointest Surg. 2004; 8(8):1068-71.
20. **Schnelldorfer T, Ganon A, Birkett R, Murphy KM and Jenkins RL.** Staging laparoscopy in pancreatic cancer: A potential role for advanced laparoscopic techniques. J Am Coll Surg. 2014; 218(6):1201-6.
21. **Naya Y, Nagata M, Ichikaw T:** Laparoscopic adrenalectomy: comparison of transperitoneal and tretroperitoneal approaches. BJU Int. 2002; 90:1-11.
22. **Adler JT, Mack E and Chen H:** Equal oncologic results for laparoscopic and open resection of adrenal metastases. J Surg Research. 2007; 140:159-64.
23. **Maestroni U, Ferretti S, Ziglioli F, Lampobasso D, Cersi D and Cortellini P.** Laparoscopic adrenalectomy in giant massess. Urologica. 2011; 78(18): 54-8.
24. **Gupta PK, Natarajan B, Pallati PK, Gupta H, Sainath J, Fitzgibbons RJ Jr.:** Outcomes after laparoscopic adrenalectomy. Surg Endosc. 2011; 25:784-794.
25. **Aksoy E, Taskin HE, Aliyev S, Mitchell J, Siperstein A, Berber E.** Robotic versus laparoscopic adrenalectomy in obese patients. Surg Endosc. 2013; 27:1233-1236.
26. **Uranues S and Alimoglu O:** Laparoscopic surgery of the spleen. Surg Clin N Am. 2005; 85:75-90.
27. **Patel AG, Parker JE, Wallwork B et al.** Massive splenomegaly is associated with significant morbidity after laparoscopic splenectomy. Ann Surg. 2003; 238(2): 235-40.
28. **Casaccia M, Torelli P, Cavaliere D, Panaro F, Rossi E, Spirano M et al:** Laparoscopic lymph node biopsy in intra-abdominal lymphoma: high diagnostic accuracy achieved with minimally invasive procedure. Surg Laparosc Endosc Percutan Tech. 2007; 13(3):175-8.
29. **Gareer W:** Laparoscopic gastrostomy new minimally invasive technique. J Egypt Nati Cancer Inst. 1992; 5(3):493-6.
30. **Raakow R, Hintze R, Schmidt S, Adler A and Neuhaus P:** The laparoscopic Janway gastostomy an alternative technique when percutaneous endoscopic gastrostomy is impractical. Endoscop. 2001; 33(7):610-3.
31. **Sabbagh R, Rafia A, Familu O and Donalson B:** Laparoscopic loop colostomy using an oesophageal retractor and a penrose drain: Surgical technique. Surg Laparosc Endosc Percutan Tech. 2013; 23(5):187-81.
32. **Barahmeh S, Almasri M, Badran O, Masarweh M, El-Ghanem M, Jardat I and Lataifeh I:** Ovarian transposition before pelvic irradiation indications and functional outcome. J Obtet Gynecol Res. 2013; 39(11):1533-7.