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Evaluation of the results of diagnostic laparoscopy in Baghdad Teaching Hospital

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Abstract: Introduction: In face of uncertain diagnosis after utilizing all available laboratory and non-invasive diagnostic modalities. Diagnostic laparoscopy may help in avoiding unnecessary laparotomy, provide accurate diagnosis and to planning optimal therapy. Aim: This study details the experience of diagnostic laparoscopy at Baghdad Teaching Hospital and its outcome. Patients and methods: Analysis of the data of a 100 patient submitted to diagnostic laparoscopy between May 2008 and Jan. 2011 according to age, gender, indication for the procedure, whether therapeutic intervention was taken and the type of intervention done at time of laparoscopy or later. Results: In selected cases diagnostic laparoscopy helped avoid a formal exploration in 73% with a high diagnostic yield of 99% and operative intervention 44%. Abdominal pain and infertility comprised 59% of the indications for diagnostic laparoscopy. Diagnoses found included ovarian cysts 11%, cholecystitis 10%, patent tubes 10%, blocked tubes 9%, appendicitis 9%, abdominal TB 6%, and other miscellaneous diagnoses. Conclusion: Diagnostic laparoscopy proved to be very useful and safe in establishing diagnosis in selected cases, performing operative laparoscopic procedures and avoiding laparotomies, with no specific complications encountered.

Keywords: Laparoscopy, diagnostic laparoscopy.

INTRODUCTION

For centuries people have been trying to look inside the abdomen but it is only relatively recently that the technology has been available to make this a meaningful possibility.(Gordon, A. G. *et al*., 1989) In 1901 Kelling, a surgeon from Dresden, performed the first successful laparoscopy in a dog before the Seventy-third Congress of German Naturalists and Physicians. He anesthetized an area of the abdominal wall and introduced a puncture needle through which room air (filtered by sterile cotton) was injected into the peritoneal cavity to produce a pneumoperitoneum. He then introduced a larger trocar and introduced a Nitze cystoscope through it. Through a second trocar site, he inserted a probe to manipulate the contents of the abdominal cavity.

Later, in 1910, Jacobaeus described the technique in humans afflicted with ascites.(McMahon, R. L, 2004)

But the gynecologists were the first to adopt diagnostic laparoscopy in a `whole sale` manner outside experimenting' and used it to evaluate pelvic pathology.(McMahon, R. L, 2004)

It took many years for the technology to gain acceptance and opens up outside the arena of the gynecologists when laparoscopic cholecystectomy suits became widespread and available to the general surgeon. Then the other possibilities inherent to laparoscopy were exploited and the first was diagnostic laparoscopy and the use of the technology to diagnose or probably diagnose and treat at the same time.

Laparoscopy was born into controversy. Some would even say that the majority of laparoscopy is still controversial. By challenging established concepts in surgery, laparoscopy was very often met with skepticism and even fierce objection.(Gentileschi, C. *et al*., 2006)

Despite the many preoperative radiologic diagnostic modalities available such as computed tomography (CT), magnetic resonance imaging (MRI) etc.., there often exists a small but significant margin of error between preoperative diagnosis and surgical findings at laparotomy. It has been proposed that the use of minimal access surgery (MAS) techniques has provided an ideal tool to bridge this diagnostic gap.(Soper, N. J. *et al*., 2005)

The entire peritoneal cavity can be visualized by the laparoscope, and diagnostic laparoscopy is an effective modality for determining pathology within the abdominal cavity. The decision to perform diagnostic laparoscopy is based on clinical judgment, weighing the sensitivities and specificities of other modalities (CT) scan, ultrasound, diagnostic peritoneal lavage (DPL), mesenteric arteriography) versus the relative morbidity of minimally invasive laparoscopy. Although some centers have experience in performing laparoscopy in the emergency room or

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intensive care unit, most surgeons have reserved laparoscopy for the operating room.

Indications for DL:
Acute:
• Abdominal pain (diagnosis and fluid sampling) as in suspected appendicitis, tubo-ovarian pathology, diverticulitis, ischemic bowel, perforation and obstruction.
• Trauma (diagnosis, assessment of severity and whether requires a definitive procedure) as in blunt injury, stab wound and air rifle injury.

Elective:
• Hepatobiliary disease (assessment, cholangiography, angiography, staging, biopsy) as in biliary atresia, cirrhosis, hepatitis, primary or secondary liver lesions, benign neoplasia, cyst or vascular lesions and portal hypertension.
• Malignant conditions (operable or inoperable lesions, peritoneal deposits, lymph node or distant metastases, staging biopsy) as in esophageal, gastric, intestinal or pancreatic cancer, Hodgkin's disease, gynecological, prostatic or bladder cancer.
• Ascites (assessment, associated lesions, cytology) as in malignant or inflammatory disease, or cirrhosis of liver.
• Recurrent or chronic abdominal pain as in inflammatory appendix, pelvic or intestinal conditions, adhesions, Meckel's diverticulum.
• Infertility
• Second-look surgery.(Soper, N. J. *et al*., 2005)
• Impalpable testes (present or absent).
• Intersex (assessment, biopsy).(Najaldin, A. *et al*., 2006)

Once a surgical diagnosis has been made, laparoscopic therapeutic options are based upon the expertise of the surgeon. Equally important is the ability to exclude disease processes requiring surgical intervention, sparing the patient the potential morbidity of a negative celiotomy.(Stain, S. C. *et al*., 2006)

Laparoscopic evaluation of the peritoneal cavity enables magnified visualization of the peritoneum and intra-abdominal organs with less tissue trauma than with laparotomy.

Laparoscopy detects the presence of pus, feces, bile, or blood (facilitating the detection of the source of intra-abdominal pathology and estimates its severity).

Whether the therapeutic procedure is laparoscopic or conventional depends on the findings, the patient's condition, the complexity of the planned procedure and the experience of the acting surgeon.

Advantages of laparoscopy compared to laparotomy are reduced perioperative pain, shorter hospital stay, quicker recovery, and decreased wound complications such as wound infection and incisional hernia. In addition, laparoscopic procedures result in improved cosmesis and greater patient satisfaction.(Schein, M. *et al*., 2010)

So physicians and surgeons might have to face patients in whom the diagnosis remains uncertain despite utilizing all available laboratory and non-invasive diagnostic modalities. Diagnostic laparoscopy here may help in avoiding unnecessary laparotomy, provide accurate diagnosis and help in planning the optimal therapy in these selected patients.(Al-Akeely, M. H. *et al*., 2006) This study details the experience of diagnostic laparoscopy at Baghdad Teaching Hospital and its outcome.

PATIENT AND METHODS

A study was designed to analyze the data of a 100 patient submitted to diagnostic laparoscopy and to determine the efficacy of diagnostic laparoscopy in establishing or excluding a diagnosis in the selected patients and to compare the results attained with the results obtained through other diagnostic modalities - mainly non-invasive and the effectiveness of diagnostic laparoscopy in sparing formal exploration.

The study was conducted on 133 patients registered as patients who had diagnostic laparoscopy between May 2008 and January 2011 at Baghdad Teaching Hospital-Medical City, Department of General Surgery.

Inclusion criteria were based upon the operative and anesthesia registration of the diagnosis (diagnostic laparoscopy). Those listed as patients with an operative procedure of diagnostic laparoscopy on any of the two registries were selected for the study over the aforementioned interval. The medical records of these patients were retrieved and reviewed on the basis of already prepared study criteria. The variables selected included:

- Patient Demography
- The indication for diagnostic laparoscopy
- Whether the procedure was an emergency or as an elective one + Method of access.
- Number of ports used

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- Video documentation
- Therapeutic intervention and whether it was performed at time of the diagnostic laparoscopy or later
- The therapeutic procedure done
- Conversion to an open procedure and the procedure performed
- Ancillary methods for diagnosis, e.g.: fluid aspiration, biopsy → If a diagnosis was established or excluded by the diagnostic laparoscopy
- Compare the results obtained with the results obtained from other diagnostic modalities including biochemical studies, endoscopy, ultrasonography and other imaging techniques
- Find out if formal exploration was avoided
- Define the use of drains in diagnostic laparoscopy
- Assess the complication rate and whether the complications were general or specific to DL
- Tell about the duration of patients hospital stay

Exclusion criteria included patients whose medical records could not be found, or those with missing details or missing details about biopsy or cytology examination results.

Diagnostic laparoscopy was conducted on elective background in 83 patients and as an emergency procedure in 17 patients. Access into the abdominal cavity was established by the closed method in 93 patients and the open access technique in 7 patients. In 43 patients access was achieved by primary trocar insertion (direct trocar access) with no previous Veress needle insufflation. One port was used in 11 patients, 2 ports in 26 patients, 3 ports in 53 patients and 4 ports in 10 patients.

Video documentation of the procedure took place in 14 patients. All diagnostic laparoscopy procedures were conducted in operative theatres under general anesthesia. Three devices were used two of them were by Storz and one by Wolf.

RESULTS

One-hundred patients included in the study, 23 males, 76 females and 1 indeterminate sex. Their age distribution was between 2 - 62 years with a mean of 33.2 year.

The indications for diagnostic laparoscopy of the patients included in the study were distributed as in table 1:

Table 1: Indications for diagnostic laparoscopy

Indication for diagnostic laparoscopy	No. of patients
Abdominal pain	36
Infertility	23
Ascites	11
Liver mass/ disease	7
Undescended testis	6
Evaluation of abdominal mass	4
Tumor staging	4
Second look post-treatment evaluation	3
Intestinal obstruction with history of multiple surgeries	3
Lost IUCD	1
Trauma	1
Ambiguous genitalia	1

There were 14 patients with aspirations of intra-abdominal fluid for cytology and/or biochemistry. In 20 patients biopsy was taken for histopathological evaluation ranging from omental, liver, peritoneal, lymph node or a spleen.

The three patients who had a second look post-treatment evaluation DL were already treated with appendectomy, Laparoscopic cholecystectomy, and surgery for pancreatic cancer. The first was suspected to have a missed pack in abdomen, the second suspected to have a thickened GIT segment in RUQ and the third suspected to have liver metastasis.

Diagnosis was established or excluded in 99 patients with the use of diagnostic laparoscopy. The diagnoses of the patients submitted to diagnostic laparoscopy were as in table 2:

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Table 2: Diagnosis in patients undergoing diagnostic laparoscopy

Diagnosis	No.	Diagnosis	No.
Cholecystitis	10	Appendicitis	9
Non-Hodgkin lymphoma	3	Unresectable stomach carcinoma	2
Resectable stomach carcinoma	1	Appendicular abscess	1
Intra-abdominal tuberculosis	6	Foreign body	2
Atrophic intra-abdominal testis	4	Intra-abdominal adhesion	3
Renal cell carcinoma	1	No gross abnormality	3
Liver hemangioma	4	Liver adenoma	1
Hepatocellular carcinoma	1	Liver sarcoma	1
Liver cirrhosis	2	Multiple liver secondaries	2
Liver fatty changes	1	Ovarian cyst	11
Ovarian dermoid	3	Recurrent ovarian cancer	2
Patent fallopian tubes	10	Single fallopian tube	1
Blocked fallopian tubes	9	Pelvic inflammatory disease	2
Polycystic ovaries	1	Broad ligament fibroid	1
Testicular feminization syndrome	1		

There was one patient with CT scan of abdomen suggestive of GIST tumor, by diagnostic laparoscopy the picture went more with a hemangioma but later on a planned explorative laparotomy and histopathological study of the specimen excised and CD 117 marker proved the mass to be a GIST tumor.

In 23 patients the diagnosis could not be attained other than by diagnostic laparoscopy as other diagnostic modalities did not guide us to the true nature of the ailment:

Table 3: Diagnostic comparisons between DL and other modalities

Pre-DL investigations	Diagnosis with DL(+/- Bx)	No.
U/S liver tumor or metastasis	Hemangioma	3
U/S clear RIF	Acute appendicitis	2
U/S hydatid liver or hemangioma	Hemangioma	1
OGD gastritis	Thick wall stomach carcinoma	1
U/S mild to moderate ascites, ovarian cyst or carcinoma	Infected dermoid cyst	1
U/S cecal tumor or TB	Non-Hodgkin`s lymphoma	1
U/S suspicious liver mass	Liver fatty changes	1
U/S & CT liver mass	Liver adenoma	1
U/S ascites of unknown etiology	TB	2
U/S ascites of unknown etiology	Cirrhosis	1
U/S, OGD, colonoscope: inconclusive	Cirrhosis	1
Sub-acute intestinal obstruction	Non-Hodgkin`s lymphoma of terminal ilium	1
U/S suspicion of pack after operation	No pack	1
U/S thickened GIT segment in RUQ	Non-obstructing adhesions after cholecystectomy	1
U/S liver secondaries	No gross pathology	1
O/E UTI or acute appendicitis (left sided)	Left sided PID	1
HSG bilateral tubal occlusion	Edematous inflammation	1
HSG bilateral tubal occlusion	Patent tubes bilaterally	1
U/S right ovarian cyst	Bilateral polycystic ovaries	1

With diagnostic laparoscopy 44 patients in the study had their definitive operative procedure performed laparoscopically, 43 of them had it at the same session and one acute cholecystitis with dense adhesions was treated conservatively and had a second laparoscopy to perform cholecystectomy. The procedures are outlined in Table 4:

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Table 4: Operative procedures performed laparoscopically

Procedure	No. of patients
Ovarian cystectomy	11
Cholecystectomy	10
Appendectomy	9
Adhesionlysis	3
Deroofing of tubo-ovarian abscess and drainage	2
Bilateral ovarian fenestration	2
Appendicular abscess drainage	1
Splenectomy	1
Resection of terminal ileal mass and ileostomy	1
Excision of broad ligament mass	1
Removal of IUCD in abdomen	1
Removal of corrigate drain in abdomen	1
Right orchidectomy of atrophic testis	1

There were 3 patients who had their diagnostic laparoscopy procedure converted into an open exploration. Two of these patients had large dermoid cysts; each of them had a Pfannenstiel's incision, one patient with a left cyst, the other with bilateral dermoid and a sliver of one ovary was kept to try and conserve ovarian function. The third patient had a suspected abdominal testis, by laparoscopy the vas and vessel were seen reaching the internal inguinal ring and a groin incision was done to look for an undescended testis but no testis was found.

Three patients had another procedure scheduled one laparoscopic cholecystectomy above; the second patient had total gastrectomy for respectable gastric cancer and the third had an abdominal mass excised that proved to be a peritoneal GIST tumor.

In this study diagnostic laparoscopy helped to avoid formal exploration in 73 patients.

The complications to diagnostic laparoscopy reported were:
Fever: 3
Vomiting: 3
Fluid leak from port wound: 1
Atelectasis: 1

Only fluid leak from port wound might be considered as specific to the procedures and no other serious complications specific to diagnostic laparoscopy were reported.

The mean average hospital stay for the patients included in the study was 4.4 days with a range from 1 day to 21 days.

DISCUSSION

Diagnostic laparoscopy, also known as the Electronic eye inside the abdomen, is a minimal access surgical procedure that allows the visual examination and documentation of intra-abdominal organs in order to detect pathology.(Mishra, R. K, 2009) The limitations related to lack of direct tactile sensation are more than compensated by the advances in technology including magnified videoscopes which allow for enhanced visualization and ability to maneuver throughout the abdomen and pelvis.(Weiser, M. R. *et al*., 2006)

Selection plays a part in the process of those who are chosen for DL. As we can see in our study 76% of the patients were females.

DL was not only limited to elective basis but included emergency cases as well 17%.

In our study the majority of penetrations were done by the closed method 93%. And in 43% it was by direct trocar insertion. It seems that DT entry is a safe alternative to the VN entry technique for the creation of pneumoperitoneum. Such an approach has further advantages such as less instrumentation and rapid creation of pneumoperitoneum (Zakherah, M. S, 2010).

Retrospective studies suggest that major vascular and bowel injuries occur in 0.04% to 0.18% of cases (Graham, J. A. & Jackson, P. G. 2009). But for some open method still the preferred method of access 7% as open laparoscopy can virtually eliminate the risk of major vascular injuries.(Gentileschi, C. *et al*., 2006)

A large proportion of the patients in the study had their DL performed through 2 or 3 ports 79% but 3 ports was the more predominant alternative 53%, that is probably because of the use of therapeutic

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interventions (operative laparoscopy) and the use of `extended diagnostic laparoscopy` which involves not merely inspection, but dissection, peritoneal lavage and biopsy.(Gentileschi, C. *et al*., 2006)

Video documentation of DL at our center is still unfortunately in its infancy at (14%) and depends on individual initiatives and the recording of interesting procedures.

All the cases in the study were performed in theater under general anesthesia, since general anesthesia with good muscle relaxation is ideal in laparoscopic surgery. (Mishra, R. K, 2009)

Two similar studies were published in the American journal of surgery by Shrenk and Nagy about DL in a single general surgical institute.

Table 5: Comparing our results with those of Shrenk and Nagy

Indication of DL	**No. of patients & (percent)**		
	Baghdad	**Shrenk**	**Nagy**
To ensure or exclude intra-abdominal malignancy or staging	30 (30%)	33 (36%)	21 (27%)
Chronic abdominal pain	20 (20%)	31 (34%)	11 (14%)
Acute abdominal pain	16 (16%)	15 (16%)	31 (40%)
Trauma	1 (1%)	9 (10%)	11 (14%)
Infertility	23 (23%)		
Miscellaneous	10 (10%)	4 (4%)	3 (4%)
Diagnosis reached	99 (99%)	80 (87%)	64 (83%)
Formal exploration avoided	73 (73%)	78 (85%)	41 (53%)
Laparoscopic operative treatment	44 (44%)	65 (71%)	

We have comparable results to the two studies, except with regard to two things. First, our use of DL in the trauma arm of acute indications is modest with only one case keeping in mind that studies have shown laparoscopy to be highly accurate in the diagnosis of peritoneal penetration3 or to confirm intact peritoneal lining.(Cuschieri, A. *et al*., 2002) Laparoscopy helps to reduce the risk of open and close laparotomy.(Cuschieri, A. *et al*., 2003) A wider range of indications was noticed in our study probably related to performance of infertility and other gynecological procedures in our unit.

Another study at the Riyadh Medical Complex on elective diagnostic laparoscopy in chronic abdominal disorders, published in the Saudi Journal of Gastroenterology 2006 is discussed here. The study reviewed 35 patients between 1999-2004.(Al-Akeely, M. H. *et al*., 2006)

In the Saudi study, females also dominated the picture, but the mean age was higher than ours at 45 years with 85% over 60 years of age in comparison to only one patient 1% in our study older than 60 years and that truly affected the results of their DL showing a higher TB and malignancy rates.

The diagnoses in comparison to our 53 patients with elective DL for chronic abdominal disorders are shown in table 6.

Table 6: Comparison of diagnoses in chronic abdominal pain patients with the Riyadh study

The diagnosis	**No. of patients (percent)**	
	Baghdad	**Riyadh**
Chronic abdominal complaint	53 (100%)	35 (100%)
TB	6 (11%)	16 (46%)
Malignancy	10 (19%)	13 (37%)
Lymphoma	3 (6%)	3 (9%)
No gross pathology	3 (6%)	2 (6%)
Others	31 (58%)	1 (3%)

Regarding acute abdominal pain patients, we compare our results with a study by Morino published in Ann Surg. 2006, he studied 53 patients that were managed by laparoscopic intervention between Jan 2001-Feb 2004 with an age range of 13-45 years and their mean hospital stay was 3.7 days.

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Table 7: Comparison of diagnoses in acute abdominal pain patients with Morino study

Diagnosis	No. of patients (percent)	
	Baghdad	**Morino**
Appendicitis	10 (62.5%)	16 (30.1%)
PID	2 (12.5%)	7 (13.2%)
Carcinoid		1 (1.9%)
Others	4 (25%)	18 (22.9%)
Total	**16**	**53**

Our overall patients' hospital stay of 4.4 days probably is higher but we are including elective patients who generally are admitted a day before their surgery or query emergency patients that are kept for next list DL and all this gives a spuriously higher figure of hospital stay.

For those with the indication of ascites we compare their results with a popular study done by Chu, *et al*., in Taiwan.

Table 8: Comparison of diagnoses in ascitic patients with Chu *et al* study

Diagnosis	No. of patients (percent)	
	Baghdad	**Taiwan**
Carcinomatosis peritonei	3 (27.3%)	78 (60.5%)
TB	6 (54.5%)	26 (20.2%)
Cirrhosis	1 (9.1%)	7 (5.4%)
Infected dermoid cyst	1 (9.1%)	
No gross abnormality		18 (14%)
Cause established	11 (100%)	111 (86%)
Total	**11**	**129**

We have an inverse ratio comparing to Chu's study with a higher TB to carcinomatosis in the abdominal cavity, although they included a much larger number of patients with ascites but this difference in diagnoses might be due to a lower threshold for using DL in ascites of unknown etiology and probably a higher prevalence of abdominal TB in our country.

In a Turkish study at Department of Surgery, University of Harran on 11 patients with abdominal TB between January 1996 and October 2003 (Uzunkoy, A. *et al*., 2004), they found that all these patients had ascites, yet they had performed laparotomy on 6 of them and laparoscopy on 4 in order to establish the diagnosis and one was diagnosed by percutaneous fluid aspiration.

We did not include cases diagnosed by laparotomy in our institute as this is outside the scope of our study. But we share with the Turk the fact that all our abdominal TB patients had ascites.

We encountered a leak of ascetic fluid post-operatively from a port site in one patient that stopped after 2 days.

To note that at the conclusion of the laparoscopic evaluation for abdominal TB, careful closure of abdominal trocar sites is mandatory.

Fascial and subcutaneous approximation as well as secure skin closure should be performed routinely in order to reduce leakage of peritoneal fluid.(Eubanks, S. *et al*., 1999)

On the other hand the usefulness of laparoscopy in diagnosing cirrhosis is that laparoscopic biopsy reduces the false-negative rate for diagnosing cirrhosis as compared with the blind biopsy techniques.(Townsend, C. *et al*., 2007) And as we have shown the patients in our series were not diagnosed by any other mean than DL.

Staging laparoscopy has proved to be highly relevant to the evaluation of patients with gastric cancer. In a study from the Memorial Sloan-Kettering Cancer Center (MSKCC), the investigators performed laparoscopic exploration on 110 of 111 patients with newly diagnosed gastric cancer. Of these 110 patients, 94% were accurately staged, with a sensitivity of 84% and a specificity of 100%, and 37% were found to have subclinical metastatic disease (Souba, W. W. *et al*., 2006) and they did not have any further intervention as occult distant spread precluded any curative resection.(Zollinger, R. M. *et al*., 2011) In

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our meager number of 3 patients with staging laparoscopy for gastric cancer 2 (67%) had metastases diagnosed by laparoscopy.

There is an application of DL on the retroperitoneal structures such as we had for nonpalpable testes 5% or 1% for renal cell carcinoma. One of those with nonpalpable testes had testicular feminization syndrome with abdominal testes, the other four with impalpable testis or testes were children.

so laparoscopy is considered to be a safe effective and economical diagnostic procedure in the pediatric patients.(Leape, L. L. *et al*., 1977)

CONCLUSION

1. Diagnostic laparoscopy is a useful tool in the surgeons both diagnostic and therapeutic armamentarium.
2. A wide range of indications for diagnostic laparoscopy is applicable in general surgery both in the acute and elective conditions.
3. In selected cases both emergency and elective, it helped avoid a formal exploration in 73% with a high diagnostic yield of 99% and operative intervention in 44%.
4. Not infrequently, 23% the diagnosis remained far elusive to reach and DL drew a light inside the black box of the abdomen, aspirated and took a biopsy under vision from variable sites inside the abdomen and established the diagnosis.
5. There is a special role for DL in the work up for a number of patients that cannot be underestimated.
6. Closed penetration and direct trocar penetration were as safe as open access in our study, yet the number of cases in the study is not large enough to recommend closed penetration. Rather it was a trend in our institution.
7. Even when the case was converted to an open procedure, a midline laparotomy was not required, and only a Pfannenstiel's or a groin incision, both more conservative and dedicated to the pathology.
8. No serious complications specific to diagnostic laparoscopy were reported.

RECOMMENDATIONS

The need for progress is deeply engraved in civil human beings. And to progress in DL at our institute the following is found to be required:

- Video recording equipment for documentation of DL.
- Laparoscopic equipment access around-the-clock for better use on emergency patients and trauma cases.
- Laparoscopic ultrasound: Standard diagnostic laparoscopy is a two-dimensional modality. The lack of tactile sensation and the inability to "see" below the surface are considered by some to limit the utility of laparoscopic staging. Direct palpation of the liver is limited and relationship of a primary tumor to adjacent structures such as major vessels is often difficult to define. Laparoscopic ultrasonography can, to an extent, overcome this deficiency.
- Laparoscopic equipment supply in ICU units for minimal intervention and rapid diagnosis.

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