

Original Research Article

A Study of Exploratory Laparotomies for Various Reasons from 2012 -2016 at Basaveshwar Teaching and General Hospital, Kalaburagi

Dr. Suresh Patil¹, Dr Rinaldo M²

¹Associate Professor, Department of Surgery, M R Medical College, Kalaburagi-585105, Karnataka, India

²Post Graduate, Department of Surgery, M R Medical College, Kalaburagi-585105, Karnataka, India

***Corresponding author**

Dr. Suresh Patil

Email: drinaldostanly@gmail.com

Abstract: There are very clear-cut indications for exploratory laparotomy. With all of the diagnostic aids in use at present and even with the maximum amount of skill on the part of the surgeon, conditions arise which are not possible of diagnosis without exploratory laparotomy. This study was done to look for the various indications of exploratory laparotomy, their presentation and outcome. This retrospective study of exploratory laparotomies was conducted in patients who were admitted and treated in surgical wards from January 2012 to May 2016. Patients were evaluated thoroughly with history, physical examination, routine investigations, ultrasonography, erect x-ray abdomen and then subjected to exploratory laparotomy after obtaining written and informed grave risk consent. Patients were subjected to emergency or elective exploratory laparotomy depending on the presentation of symptoms and clinical diagnosis. In this study a total of 205 cases who underwent exploratory laparotomy for various reasons were studied which showed that age group between 31-40 years had highest incidence of exploratory laparotomies and the majority of them were diagnosed with hollow viscous perforation and presented with abdominal pain as the chief complaint. This study depicts that exploratory laparotomy has to be done as an inevitable procedure in case of hollow viscous perforation, with grave risk being explained as it carries the highest mortality with laparotomies. Lifestyle changes like avoidance of alcohol and smoking is a must to decrease the incidence of hollow viscous perforation, as these habits are strongly associated with perforation.

Keywords: Exploratory laparotomy, hollow viscous perforation, grave risk, mortality, alcohol, smoking.

INTRODUCTION

Exploratory laparotomy is a procedure performed with the objective of obtaining information that is not available via clinical diagnostic methods. It is usually performed in patients with acute or unexplained abdominal pain, in patients who have sustained abdominal trauma, and occasionally for staging in patients with malignancy

The acute surgical abdomen and all that is comprised under this title is of such a nature that exact diagnosis cannot be made in time to save the patient's life. Early exploration should be the rule. Any penetrating wound of the abdomen should be explored immediately. Any other abdominal injury which fails to improve after six hours should be subjected to exploration. In the chronic cases, all of the evidence available otherwise must be obtained. Such a case is usually not urgent and there should never be haste in deciding to explore.

No exploratory laparotomy should ever be done merely for the sake of making the diagnosis or of confirming a hopeless one. The reason for the performance of the operation must always be for the benefit of the patient.

Once the underlying pathology has been determined, an exploratory laparotomy may continue as a therapeutic procedure; sometimes, it may serve as a means of confirming a diagnosis (as in the case of laparotomy and biopsy for intra-abdominal masses that are considered inoperable). These applications are distinct from laparotomy performed for specific treatment, in which the surgeon plans and executes a therapeutic procedure.

With the increasing availability of sophisticated imaging modalities and other investigative techniques, the indications for and scope of exploratory

laparotomy have shrunk over time. The increasing availability of laparoscopy as a minimally invasive means of inspecting the abdomen has further reduced the applications of exploratory laparotomy [1]. Nevertheless, the importance of exploratory laparotomy as a rapid and cost-effective means of managing acute abdominal conditions and trauma cannot be overemphasized.

Indications

Primary indications for an exploratory laparotomy are as follows.

- 1) *Acute-onset abdominal pain and clinical findings suggestive of intra-abdominal pathology necessitating emergency surgery.*
- 2) *Abdominal trauma with hemoperitoneum and hemodynamic instability*
 - 1) *Chronic abdominal pain.*
 - 2) *Obscure gastrointestinal bleeding.*

Contraindications

The primary contraindication for exploratory laparotomy is unfit for general anesthesia. Peritonitis with severe sepsis, advanced malignancy, and other comorbid conditions may render patients unfit for general anesthesia.

Preprocedural planning

The patient's physiologic status at laparotomy is an important determinant of outcome. Accordingly, whenever possible, efforts should be made to optimize the patient's general condition. This includes correction of fluid and electrolyte imbalances, blood transfusions, and bronchodilator nebulizations as required.

Before the procedure, a nasogastric tube and an indwelling urinary catheter are inserted to decompress the stomach and the urinary bladder. Decompression of the stomach reduces the risk of aspiration of gastric contents during induction of anaesthesia [2]. The risk of such aspiration is high in these patients because of the emergency nature of the procedure and because of paralytic ileus. Decompression of the bladder reduces the risk that the bladder may be injured as the midline incision is extended inferiorly for better exposure

Procedure

After appropriate preparation, exploratory laparotomy is performed as follows.

Midline incision and opening of peritoneum

A vertical midline incision is the best choice: it affords a rapid entry into the peritoneum and is relatively bloodless and safe [3]. The incision may be made in the upper, middle, or lower midline, depending on the anticipated pathology, and may be extended in either direction if necessary.

The skin is incised with a surgical knife. Electrocautery can be used instead of the traditional scalpel for making the incision, as skin incisions made by cutting diathermy are quicker, associated with less blood loss, and demonstrate no significant difference in the rate of wound complications, scar cosmesis, or postoperative pain [4, 5]. The incision is then deepened through the subcutaneous fat (see the image below). Electrodiathermy in coagulation mode provides a bloodless access through this layer. The linea alba is identified as a glistening layer deep to the subcutaneous tissues.

The orientation of the fibers on the linea alba is appreciated; these fibers are directed medially and inferiorly from either side, and the midline is identified as the axis where they criss-cross. This is opened carefully by means of electrodiathermy or heavy Mayo scissors (see the images below).

Every effort must be made to avoid injury to the intraperitoneal contents. This can be done by lifting the peritoneum in two straight artery forceps placed close to each other at right angles to the incision. Use careful palpation to ensure that no bowel or omentum is picked up in the artery forceps.



Fig-1: Upper midline incision. Incision is deepened through subcutaneous tissue to expose linea alba



Fig-2: Linea alba is divided to reveal preperitoneal fat

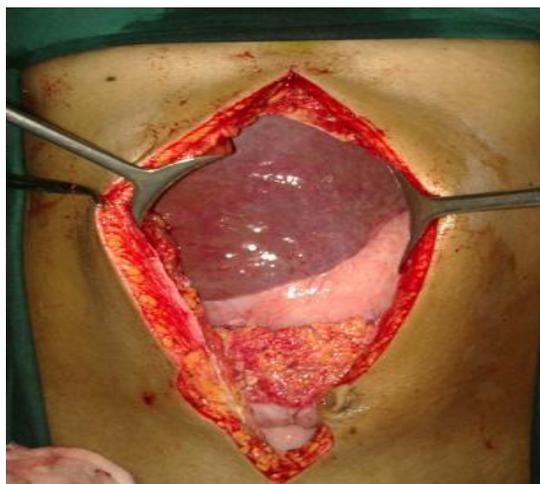


Fig-3: Abdominal incision is completed to reveal intra-abdominal organs

Exploration of abdominal cavity

Massive hemoperitoneum suggests two things. First, the patient may have a major source of bleeding. Second, the presence of blood within the peritoneum interferes with adequate exploration. The ideal strategy is to lift the small bowel and its mesentery out of the peritoneal cavity, to rapidly suction the blood within the peritoneum, and to place laparotomy pads in the four quadrants of the peritoneum. Once this is done, each pad is carefully removed to allow inspection of each quadrant.

Identification of the source of bleeding is much easier in the absence of massive hemoperitoneum. Common sources include injuries to the liver (see the image below) or spleen, ruptured ectopic pregnancies, mesenteric tears, hollow visceral injuries, aortic aneurysms, and splenic or hepatic artery aneurysms. Once the source of bleeding is identified, necessary corrective measures must be taken.

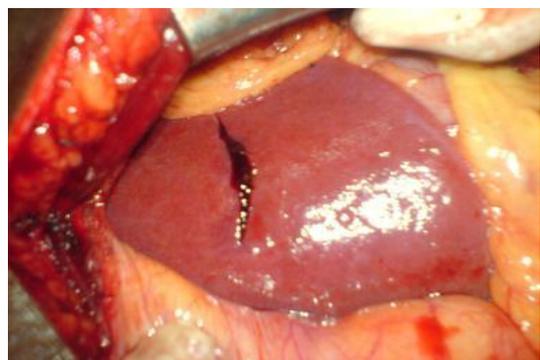


Fig-4: Liver laceration in traffic accident victim who presented with hemoperitoneum

If enteric contents are the finding, they are suctioned out with a sump suction catheter, and the source of the enteric contamination is sought. This

search must be performed systematically, starting from the stomach. The anterior aspect of the stomach is inspected for a perforation, followed by the duodenum.

Subsequently, the small bowel is inspected carefully, starting from the duodenojejunal flexure. Each segment of the intestine is held up by the surgeon, and all surfaces are inspected. Any slough on the serosal surface is gently separated to allow identification of an underlying perforation (see the image below).



Fig-5: Laparotomy in patient with peritonitis. Image shows perforated duodenal ulcer

Any perforation found in the intestine is controlled. Methods of controlling the source include direct repair, buttressed repair, resection and anastomosis or exteriorization of the perforation with stoma formation. The choice between the different options depends on the site of perforation, the suspected pathology, the extent of the disease, and the patient's physiologic status.

In patients with intestinal obstruction, possible findings on exploratory laparotomy include adhesive intestinal obstruction, a single intraperitoneal band with intestinal compression or torsion, and tumors.



Fig-6: Laparotomy in patient with intestinal obstruction. Intraoperatively, single peritoneal band causing intestinal obstruction was found



Fig-7: Laparotomy in patient with acute intestinal obstruction. Sigmoid volvulus with gangrene was found intraoperatively



Fig-8: Multiple metastatic deposits over small bowel in patient with colonic malignancy

Completion and closure

Placement of drains after an exploratory laparotomy is still a subject of debate. The evidence currently available is inadequate to support routine drain placement. Patients with extensive contamination may benefit from drains in the subhepatic space and the pelvis [6]. Closure is carried out with either nonabsorbable suture material or a delayed absorbable suture material (eg, polydioxanone) in either a continuous suture or interrupted sutures [7, 8].

MATERIALS AND METHODS USED

A retrospective study of all patients subjected to exploratory laparotomy including all emergency and elective surgeries from January 2012 to May 2016 are

included in the study. Patients database including thorough history, general physical and systemic examination were collected. Routine investigations such as complete blood counts, renal function tests, urine routine, liver function tests, ultrasonography and erect x-ray abdomen were done in all cases. CT abdomen was done in selected cases. Patients were subjected to exploratory laparotomy after taking written and informed grave risk consent.

Elective exploratory laparotomy was done most commonly for mass per abdomen, under spinal anaesthesia. Emergency exploratory laparotomy was carried out commonly for hollow viscous perforation, under general anaesthesia.

Other indications for which emergency exploratory laparotomy was carried out were appendicular abscess, blunt abdominal trauma, intestinal obstruction, peritonitis, intussusception, hydatid cyst rupture, bladder rupture.

OBSERVATIONS AND RESULTS

In this study a total of 205 cases who underwent exploratory laparotomies for various reasons were studied which showed that age group between 31 to 40 years (45 cases, 21.9%) had highest incidence of exploratory laparotomies and the majority of the patients who underwent exploratory laparotomies were diagnosed with hollow viscous perforation (62 cases, 30.2%) and abdominal pain was the most common presenting complaint. It was performed electively for mass per abdomen (44 cases, 21.4%), which was the second most common reason. Other causes were appendicular abscess (26 cases, 12.6%), intestinal obstruction, blunt abdominal trauma, peritonitis, intussusception, tuberculosis of abdomen, hydatid cyst rupture, bladder rupture, gastric eventration, and gastroschisis.

It was noted that most common reason for exploratory laparotomy in males was perforation (47 cases, 45.6%) and in females, it was mass per abdomen (44 cases, 43.1%). The average duration of stay was maximum for blunt abdominal trauma (22 days) followed by intestinal obstruction (19 days). Alcohol and smoking were most commonly associated with hollow viscous perforation (86%) followed by appendicular abscess (14%). The mortality was again maximum for hollow viscous perforation (8 cases, 57%) followed by intestinal obstruction (2 cases).

Table 1: Causes of Exploratory Laparotomy

Sl. No	Causes of Exploratory Laparotomy	No of Cases
1	Hollow viscous perforation	62
2	Mass per abdomen	44
3	Appendicular abscess	26
4	Intestinal obstruction	22
5	Blunt abdominal trauma	17
6	Peritonitis	16
7	Intussusception	11
8	Tuberculosis of abdomen	02
9	Hydatid cyst rupture	02
10	Bladder rupture	01
11	Gastric eventration	01
12	Gastroschisis	01
	TOTAL	205

Table 2: Causes of Exploratory Laparotomy

SI No	Causes of Exploratory Laparotomy	Number of Cases
	EMERGENCY	
1	Hollow viscous perforation	62
2	Appendicular abscess	26
3	Intestinal obstruction	22
4	Blunt abdominal trauma	17
5	Peritonitis	16
6	Intussusception	11
7	Hydatid cyst rupture	02
8	Bladder rupture	01
9	Gastric eventration	01
10	Gastroschisis	01
	ELECTIVE	
1	Mass per abdomen	44
2	Tuberculosis of abdomen	02

Table 3: age wise distribution of number of cases who underwent exploratory laparotomy

Age Distribution	Number of Exploratory Laparotomies
< 11 years	25
11- 20 years	23
21- 30 years	37
31- 40 years	45
41- 50 years	37
51- 60 years	25
61- 70 years	10
>70 years	03
TOTAL	205

Table 4: sex wise distribution of number of cases who underwent exploratory laparotomy

SI No	Causes of Exploratory Laparotomy	Males	Females
1	Hollow viscous perforation	47	15
2	Mass per abdomen	00	44
3	Appendicular abscess	13	13
4	Intestinal obstruction	10	12
5	Blunt abdominal trauma	13	04
6	Peritonitis	09	07
7	Intussusception	07	04
8	TB abdomen	02	00
9	Hydatid cyst rupture	01	01
10	Bladder rupture	01	00
11	Gastric eventration	00	01
12	Gastroschisis	00	01
	TOTAL	103	102

DISCUSSION

Exploratory laparotomy is a method of abdominal exploration, a diagnostic tool that allows surgeons to examine the abdominal organs. Exploratory laparotomy has been performed as an elective or emergency procedure, depending on the diagnosis. The various indications for laparotomy in our institute varied from hollow viscous perforation, appendicular abscess, intestinal obstruction and others.

INDICATIONS

Primary indications for an exploratory laparotomy are as follows;

1) *Acute-onset abdominal pain and clinical findings suggestive of intra-abdominal pathology necessitating emergency surgery*

Patients with clinical features of peritonitis may have pneumoperitoneum on erect x-ray abdomen. They usually have a perforated viscous, most commonly the duodenum, stomach, small intestine, caecum, or sigmoid colon. In the absence of pneumoperitoneum, appendicular perforation and intestinal ischemia are possible diagnoses; a high index of suspicion for possible intestinal ischemia should be maintained.

In our study, hollow viscous perforation was the most common cause of laparotomy. Among them, duodenal and ileal perforation were more common. Six patients presented with jejunal perforation, all of which were traumatic. Abdominal pain was the most common complaint.

Patients with vomiting, obstipation, and abdominal distention are likely to have intestinal obstruction. Abdominal radiographs in these patients may reveal dilated intestinal loops and air-fluid levels.

In our study, 10 patients presented with subacute intestinal obstruction, which on laparotomy was found to be most commonly due to bands and adhesions. Release of bands and adhesiolysis was done. Patients presenting with gangrenous small bowel obstruction were subjected to resection and anastomosis. 5 patients presented with intestinal stricture, in which stricturoplasty was done.

2) *Abdominal trauma with hemoperitoneum and hemodynamic instability*

Hemodynamically unstable trauma patients with hemoperitoneum should undergo exploratory laparotomy without any delay. They are likely to have intraperitoneal bleeding after injury to the liver, spleen, or mesentery. They may also have associated intestinal perforations that call for emergency repair.

In patients with penetrating abdominal trauma (PAT), exploratory laparotomy was conventionally carried out to rule out intra-abdominal injury. However, Kevric *et al* found that peritoneal breach does not necessarily equate to visceral injury mandating surgery; they suggested sequential examination when the CT scan is normal [9]. Sanie *et al* reported similar findings [10]. The role of laparoscopy was highlighted in a systematic review in patients with PAT [11]. Laparoscopy has been found to be useful in identifying diaphragmatic injury but has been found less sensitive for detecting hollow visceral injuries. It is, however, very good for identifying the need for exploratory laparotomy.

In our study, among blunt abdominal injury patients, spleen was commonly involved which was matching with the literature.

3) *Chronic abdominal pain*

Availability of good imaging facilities have restricted the use of exploratory laparotomy in these conditions; however, when limited facilities are available, exploratory laparotomy becomes an important diagnostic tool. These patients may have intra-abdominal adhesions, tuberculosis or tubo-ovarian pathology [12].

In our study, 2 patients presented with tubercular abdomen with adhesions. Adhesiolysis was done. Mass per abdomen was the 2nd most common cause of exploratory laparotomy, which was done electively. All the patients recovered uneventfully.

CONCLUSIONS

This study shows that exploratory laparotomy has to be done as an emergency procedure most commonly in case of hollow viscous perforation. Also, alcohol and smoking has the strongest association with perforation. So lifestyle changes (i. e to avoid alcohol and smoking) is a must to prevent this dreaded consequence, thus decreasing the incidence of emergency exploratory laparotomy.

The mortality was highest with with GI perforation, which had the strongest association with smoking and alcohol, suggesting increased mortality among smokers. So patients should be explained the grave risk and risk-benefit before taking up for surgery.

Blunt injury abdomen had highest hospital stay suggesting the need of increased time to heal and recover and having more complications. So increased postoperative care need to be given in order to avoid the dreaded complications.

Exploratory laparotomy, when undertaken by the ethical surgeon, remains a valuable means of

diagnosing and treating intra-abdominal disease, when other methods of diagnosis have failed.

REFERENCES

1. Mallat AF, Mancini ML, Daley BJ, Enderson BL; The role of laparoscopy in trauma: a ten-year review of diagnosis and therapeutics. *Am Surg.*, 2008; 74(12):1166-70.
2. El-Orbany M, Connolly LA; Rapid sequence induction and intubation: current controversy. *Anesth Analg.*, 2010; 110(5):1318-25.
3. Ellis H; The anatomy of abdominal incisions. *Clinical Anatomy: A Revision and Applied Anatomy for Clinical Students*. 10th ed. Oxford, UK: Blackwell Publishing, 2002; 64-66.
4. Ly J, Mittal A, Windsor J; Systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision. *Br J Surg.*, 2012; 99(5):613-20.
5. Aird LN, Brown CJ; Systematic review and meta-analysis of electrocautery versus scalpel for surgical skin incisions. *Am J Surg.*, 2012; 204(2):216-21.
6. O'Connor TW, Hugh TB; Abdominal drainage: a clinical review. *Aust N Z J Surg.*, 1979; 49(2):253-60.
7. Sivam NS, Suresh S, Hadke MS, Kate V, Ananthkrishnan N; Results of the Smead-Jones technique of closure of vertical midline incisions for emergency laparotomies--a prospective study of 403 patients. *Trop Gastroenterol.*, 1995; 16(4):62-7.
8. Kirshtein B, Roy-Shapira A, Lantsberg L, Mizrahi S; Use of the Bogota bag for temporary abdominal closure in patients with secondary peritonitis. *Am Surg.*, 2007; 73(3):249-52.
9. Kevric J, Aguirre V, Martin K, Varma D, Fitzgerald M, Pilgrim C; Peritoneal Breach as an Indication for Exploratory Laparotomy in Penetrating Abdominal Stab Injury: Operative Findings in Haemodynamically Stable Patients. *Emerg Med Int.*, 2015; 2015: 407173.
10. Sanei B, Mahmoudieh M, Talebzadeh H, Shahabi Shahmiri S, Aghaei Z; Do patients with penetrating abdominal stab wounds require laparotomy?. *Arch Trauma Res.*, 2013; 2(1):21-5.
11. O'Malley E, Boyle E, O'Callaghan A, Coffey JC, Walsh SR; Role of laparoscopy in penetrating abdominal trauma: a systematic review. *World J Surg.*, 2013; 37(1):113-22
12. Khan IA, Khattak IU, Asif S, Nasir M, Zia-ur-Rehman; Abdominal tuberculosis an experience at Ayub Teaching Hospital Abbottabad. *J Ayub Med Coll Abbottabad*, 2008; 20(4):115-8.