Role of laparoscopy in diagnosis of acute nonspecific abdominal pain

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Background
Acute nonspecific abdominal pain (NSAP) is frequently encountered in the daily medical practice. This prospective study was performed to elucidate the role of early laparoscopy in the management of NSAP and to compare it with active clinical observation in such cases.
Patients and methods
A total of 100 cases with acute NSAP were randomly divided into two groups: early diagnostic laparoscopy (EDL) group included 50 cases who underwent EDL, and observational group included the remaining 50 cases who were closely observed. Outcome measures included the definitive diagnosis, operative time, duration of hospitalization, and postoperative morbidity.
Results
No statistically significant difference was noticed between the study groups regarding demographics. However, the duration of symptoms showed significant prolongation in the observation group. Regarding the final definitive diagnosis, no significant difference was noticed between the two groups ($P<0.001$). No definite diagnosis was reached in 12 and 52% of cases in the EDL and observation groups, respectively. In the observation group, 18 cases underwent laparoscopic assessment after admission (36%). The duration of hospitalization was significantly prolonged in the observational group. In addition, both recurrence and readmission were more reported in the same group during 15-day and 6-month follow-up visits.
Conclusion
Diagnostic laparoscopy appears to be a reliable tool to reach a definite diagnosis in patients with NSAP because of its superior diagnostic ability, better visualization, low complications, and the ability to manage the pathology in the same setting.

Keywords:
acute nonspecific abdominal pain, laparoscopy, observation

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Introduction

Abdominal pain is a common clinical entity that is frequently encountered in the daily practice. It is estimated that cases with abdominal pain represent ~1% of patients requiring hospital admission and ~6% of emergency department attendants. Although proper history taking, head-to-toe clinical examination, together with laboratory and radiological investigations can narrow the diagnosis, some cases still remain undiagnosed despite the recent improvements in diagnostic modalities [1].

Acute nonspecific abdominal pain (NSAP) is defined as acute abdominal pain lasting for 6 h up to 7 days, for which no specific cause determined after history, examination, and beside routine investigations. NSAP is a common problem for general surgeons, as it accounts for 13–40% of admissions in the emergency surgical department [2].

Hospital admission together with 'wait and see' policy is the traditional management for these cases. Although it spares the decision of laparotomy that might be unnecessary, the delay in surgical intervention might increase the incidence of complications like hemorrhage, peritonitis, and infertility [3].

In the modern era, laparoscopy is usually used in different general surgical procedures with documented safety and efficacy [4]. Laparoscopy is considered the optimal method that could efficiently fill the gap between 'wait and see' and laparotomy in cases with NSAP. The application of laparoscopy is associated with better patient recovery, shorter hospitalization, and better cosmetic results compared with the open approach. Despite these advantages, there is still a great debate in the literature regarding whether to apply laparoscopy or active clinical observation for NSAP cases [5].

Herein, we conducted this study to elucidate the role of early laparoscopy in management of NSAP and to compare it with clinical observation in such cases.

Patients and methods

This is a prospective comparative randomized study that was conducted starting from October 2018 till December 2020. The study included cases diagnosed with acute NSAP, whose age ranged between 16 and 65 years, and who presented to our emergency department within more than 6 h or within 7 days of onset of symptoms. The definite diagnosis was not established in these cases by routine hematological, biochemical, and radiological investigations.

On the contrary, cases reporting acute on top of chronic abdominal pain, pregnancy, malignancy, bleeding diathesis, hemodynamic instability, uncontrolled systemic comorbidities, or having contraindication for laparoscopy were excluded.

We included 100 cases during the study period. All cases were subjected to detailed history taking along with complete clinical examination. Laboratory investigations included complete blood count, liver function tests, erythrocyte sedimentation rate, urinalysis, urinary beta human chorionic gonadotropin (in females in the child bearing age), and serum amylase (if pancreatitis was suspected). Pelviabdominal ultrasound was ordered for all cases, whereas pelviabdominal computed tomography was done in selected cases.

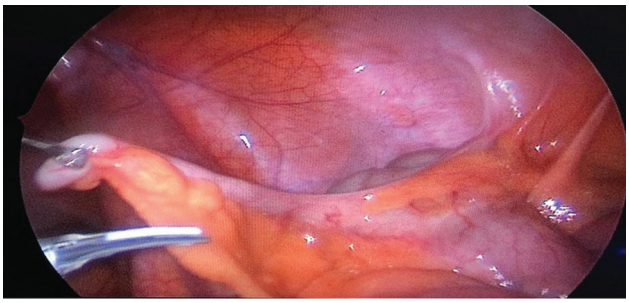
The included cases were randomly divided into two equal groups: the early diagnostic laparoscopy (EDL) group (50 cases), which was subjected to diagnostic laparoscopy within 24 h of admission, and observations group (50 cases), which was subjected to active clinical observation.

After complete explanation of the pros and cons of every approach, an informed written consent was gathered from all cases. Moreover, our study was approved by the local ethical committee of Al-Azhar University.

In the EDL group, pneumoperitoneum was established via either open or the closed techniques. Additional ports were inserted according to the pathology found and therapeutic intervention required. Abdominal exploration was performed starting with left liver lobe, falciform ligament, right liver lobe, gall bladder, stomach, right colon, appendix, ileocecal junction terminal ileum, transverse colon, sigmoid colon, internal female genitalia, and cul-de-sac.

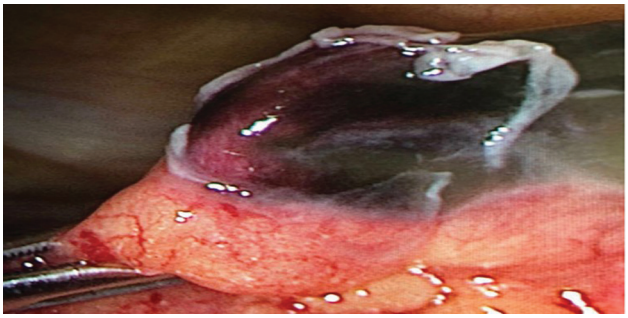
When a pathologic finding was detected and needed surgical intervention then it was dealt with accordingly. Appendectomy was performed for appendicitis (Fig. 1), whereas excision was done for appendagitis, omental infraction (Fig. 2), Meckel's diverticulum, and intraperitoneal lipoma (Fig. 3). Moreover, division of the adhesive bands was done in cases of adhesive obstruction, whereas cystectomy was done for complicated ovarian cysts. In addition, salpingotomy was done for ectopic pregnancy.

Figure 1



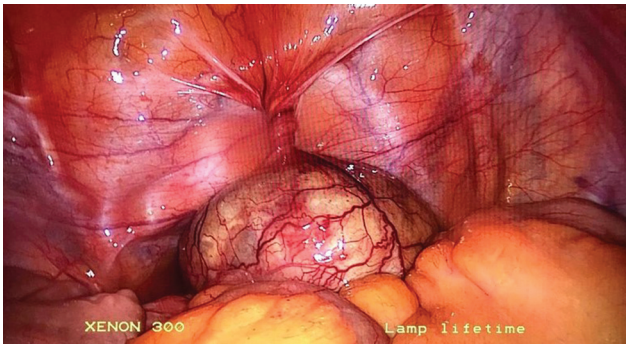
Early appendicitis that was removed laparoscopically.

Figure 2



Omental infarction that was excised.

Figure 3



Twisted peritoneal lipoma that was excised laparoscopically.

Biopsy specimen obtained were sent for histopathology to confirm the diagnosis. If no pathology was found, then completion of the diagnostic laparoscopy and appendectomy was done as macroscopic healthy appendix does not rule out appendicitis. After surgery, all cases were transferred to the recovery room and then to the internal ward. If clinical examination was unremarkable, patients were allowed to start oral fluids on the first postoperative day. However, oral intake was delayed if the patient had significant ileus or distension on examination.

The patients randomized to the observational group were admitted to the surgical ward, where clinical examination was performed twice daily. Additionally, baseline hematological investigations were repeated at 24 and 48 h from admission. Besides, complementary laboratory and/or radiological investigations were ordered based on patient's clinical evaluation and progress. The appropriate medical or surgical intervention was done if the clinical diagnosis was defined.

However, if pain persisted or worsened at 48 h from admission, diagnostic laparoscopy was performed even in the absence of a diagnosis. Conversely, if the clinical condiction improved even eithout a definitive diagnosis, they were discahrged undiagnosed.

Scheduled follow-up visits were arranged for all cases after 2 weeks, 3 months, and then 6 months. Postoperative complications and duration of hospitalization were recored. Furthermore, the recurrence of symptoms and need for readmission were also recorded and managed, either conservatively or surgically.

Our primary outcome was the ability to reach a definite diagnosis, while secondary outcomes included duration of operation, duration of hospitalization, and postoperative complications.

The statistical tests were performed via IBM SPSS software (version 26.0). Statistical analysis was done using IBM SPSS statistics for windows, Version 25.0. Armonk, NY: IBM Corp. Qualitative data were described using number and percent, whereas quantitative data were described as median and range (for nonparametric data) or mean and SD (for parametric data). To compare between the two groups, χ^2 test was used for comparison of the two groups, whereas qualitative data was compared via either Student t test or Mann–Whitney U test. For all the performed tests, a P value less than 0.05 was statistically significant.

Results

The mean age of the included cases was 30.78 and 33.10 years in the EDL and observation groups, respectively. Females represented 66 and 56% of cases in the EDL and observation groups, respectively. No statistically significant difference was noted between the two study groups regarding demographic variables ($P>0.05$). Nevertheless, the duration of symptoms showed a significant prolongation in the observation group (3 vs. 2 days in the EDL group – $P=0.001$). Table 1 illustrates these data.

In the EDL group, most cases underwent the operation at the same day of admission (within 12–24 h). The mean operative time was 45.6 min, and one (2%) cases underwent conversion to the open approach. A clinical macroscopic diagnosis was reached in 44 (88%) patients. Laparoscopic appendectomy was done for 21 patients. Regarding postoperative complications, it was not encountered in 76% of cases, whereas the remaining cases developed chest infection and fever (8%), port site infection (4%), port site hernia (2%), and urinary tract infection (2%). These data are summarized in Table 2.

In the observation group, a clinical diagnosis was achieved in 24 (48%) cases of 50 patients; 18 (36%) cases underwent laparoscopic assessment after admission either to reach the diagnosis or owing to clinical deterioration or development of sepsis signs. These operations were performed within 1–4 days after

Table 1 Demographic data of the cases in the two study groups

	Groups [n (%)]		Test of significance
	EDL group (N=50)	Observation group (N=50)	
Age (years)	30.78±10.47	33.10±13.14	t=–0.976 P=0.331
Sex			
Males	17 (34)	22 (44)	χ^2=1.051 P=0.305
Females	33 (66)	28 (56)	
Duration of symptoms (days)	2 (1–5)	3 (2–6)	z=–3.274 P=0.001*

EDL, early diagnostic laparoscopy. *P value < .001.

Table 2 Operative data in the early diagnostic laparoscopy group

Items	EDL group (*N*=50)
Operative time since admission (days)	0 (0–1)
Conversion to open [*n* (%)]	
No	49 (98)
Yes	1 (2)
Duration of the operation (mins)	
Mean±SD	45.6±12.2
Median (minimum–maximum)	45 (35–90)
Complications [*n* (%)]	
No	38 (76)
Chest infection and fever	4 (8)
Port site infection	2 (4)
Port site hernia	1(2)
UTI	1 (2)

EDL, early diagnostic laparoscopy; UTI, urinary tract infection.

Table 3 Operative data in the observation group

Items	Observation group (*N*=50)
Fate after observation [*n* (%)]	
Observation and conserve	32 (64)
Observation and DL	18 (36)
Operative time since admission (days)	1 (1–5)
Conversion to open after DL [*n* (%)]	
No	15 (83.3)
Yes	3 (16.7)
Duration of operation (min)	
Mean±SD	57±17.51
Median (minimum–maximum)	45 (40–80)
Complications [*n* (%)]	
No	47 (94)
Fever	3 (6)

DL, diagnostic laparoscopy.

admission, and three (16.7%) out of 18 cases underwent conversion to the open approach. Operative time had mean value of 57 min. Regarding complications in that group, fever was only encountered in 6% of cases, whereas other cases were free from complications. Table 3 summarizes these data.

When it comes to the final definitive diagnosis, a significant difference was reporeted between the two groups ($P<0.001$). No definite diagnosis was reached in 12 and 52% of cases in the EDL and observation groups, respectively. The most common pathology encountered in the EDL group was appendicitis (42%). Other diagnoses are discussed in details in Table 4.

The duration of hospital stay was significantly prolonged in the observational group (4.22 vs. 2.96 days in the EDL group – $P<0.001$). At 15-day follow-up, seven (14%) cases experienced pain but did not need admission from the observational group, whereas six (12%) cases were readmitted in the same group, but no cases were readmitted from EDL group. Furthermore, six (12%) cases of the observation group referred to a gynecologist within the same 15 days and three (6%) cases referred to a gastroenterologist, whereas two (6%) cases only from the other EDL group referred to a gastroenterologist.

At 3-month follow-up, sseven (14%) patients were lost to follow-up from the EDL group and four (8%) patients from the observation one. Recurrent symptoms were experienced in 8 and 18% of cases in the EDL and observational groups, respectively (P=0.04). Three patients out of nine of the observational group were readmitted and two (4%) of them underwent laparoscopic assessment during the follow-up period outside our hospital. Generally, no significant difference was reporetd between the two groups concerning this follow-up period (P=0.164).

At 6-month follow-up, 11 (22%) patients and 14 (28%) patients were missed from the EDL and observational groups, respectively. Only one (2%) patient from EDL group developed pain recurrence and five (10%) from observational one, where only two of them needed readmission for further evaluation, but they were discharged asymptomatic with no definite diagnosis. Recurrence and admission were more encountered in the observation group compared with the laparoscopy group (P=0.046). The previous data are summarized in Table 5.

Discussion

Some cases presenting with acute abdominal pain are not definitely diagnosed, despite performance of all of the related investigations, and laparotomy may be needeed in such cases before reaching the definite diagnosis. Diagnostic assessment would be a better option in these cases. Laparoscopy has may advantages including the following: it allows direct visualization of the abdominal cavity with minimal complications and excellent postoperative recovery [6].

This study was conducted to evaluate the role of early laparoscopy in the management of acute NSAP and to compare early laparoscopic assessment with active clinical observation in such cases. To the best of our knowledge, there is a paucity of studies comparing early laparoscopy versus clinical observation in NSAP in the existing literature.

In the current study, the included cases had mean age of 30.78 and 33.10 years in the EDL and observation

Table 4 Final diagnosis in the two study groups

	Groups [*n*/*N* (%)]		Test of significance
	EDL group (*N*=50)	Observation group (*N*=50)	
Acute appendicitis	21/50 (42)	6/50 (12)	
Appendigitis	0/50	1/50 (2)	
Benign ovarian cyst	5/50 (10)	3/50 (6)	
Adhesive bands	2/50 (4)	1/50 (2)	
Constipation/IBD	0/50	2/50 (4)	
Endometriosis	1/50 (2)	1/50 (2)	
Torsion epiploica, omental infarction	2/50 (4)	0/50	
Ectopic pregnancy	1/50 (2)	0/50	χ^2=91.125
Isolated Fallopian tubal torsion	1/50 (2)	0/50	$P<0.001^*$
Meckel's diverticulitis	1/50 (2)	0/50	
No definite diagnosis	6/50 (12)	26/50 (52)	
Twisted peritoneal lipoma	1/50 (2)	0/50	
PID/salpingitis e adhesions	6/50 (12)	5/50 (10)	
Postovulational changes	0/50	3/50 (6)	
Torsion ovary	1/50 (2)	1/50 (2)	
Localized enterocolitis	1/50	0/50	
Mesentric lymphadenitis	1/50 (2)	1/50 (2)	

EDL, early diagnostic laparoscopy. *$P < .001$ both significant.

Table 5 Final outcome of the cases in the two study groups

	Groups		Test of significance
	EDL group (*N*=50)	Observation group (*N*=50)	
Hospital stay	2.96±0.88	4.22±1.09	t=−6.349 $P<0.001^*$
Follow-up at 15 days [*n* (%)]			
Recurrent pain	0	7 (14)	
Recurrent pain leading to readmission	0	6 (12)	
Referred to gastroenterology	2 (4)	3 (6)	
Referred to gynecology	0	6 (12)	
Follow-up at 3 months [*n* (%)]			
Recurrent symptoms	4 (8)	9 (18)	
Readmission	1 (2)	3 (6)	
Missed patients	7 (14)	4 (8)	
Follow-up at 6 months [*n* (%)]			
Recurrent symptoms	1 (2)	5 (10)	
Readmission	0	2 (4)	
Missed patients	11 (22)	14 (28)	

EDL, early diagnostic laparoscopy.

groups, respectively. No significant difference was detected between the two groups concerning that parameter (*P*=0.331). Sharma *et al.* [7] reported that the mean age of the included cases was 30.83 years. Moreover, Al-Bareeq and Dayna [8] reported that the included cases had an average age of 31 years. Both of the previous studies reported mean age similar to our findings.

In our study, females represented 66 and 56% of cases in the EDL and observation groups, respectively. Sex did not constitute a significant difference between the two study groups (*P*=0.305). Likewise, a previous Egyptian study evaluating the role of laparoscopy in NSAP reported higher female predominance like our study. That study included 100 cases, where 65% of them were females [9]. In the study conducted by Ahmad *et al.* [6], more than half (59 out of 88) of included cases were females. This strengthens the observation that NSAP was common diagnostic problem associated with female sex.

When it comes to laparoscopic intervention in the current study, it was performed in 50 cases in the EDL group, where one (2%) case underwent conversion to the open approach. We reported a low conversion rates owing to increased surgical experience along with the simplicity of laparoscopic procedures in the current study (appendectomy, ovarian cystectomy, and excision of fat necrosis). However, in the

observational group, the conversion rate was high (16.7%), as delay in surgical intervention in inflammatory cases made adhesions more friable with increased vascularity, which in turn increased the operative difficulty.

In a retrospective review of 514 patients who underwent laparoscopy for acute abdominal pain, the conversion rate was 2.2% [10]. On the contrary, a previously mentioned Egyptian study reported that the conversion rate of laparoscopy in acute abdominal pain cases was 32% [9]. This denotes the variability in conversion rates in the existing literature, and this usually depends on surgical expertise, available technology, and disease condition [11].

In our study, 18 (36%) cases underwent diagnostic laparoscopy in the observational group as they showed clinical deterioration in the form of increased pain or altered hemodynamics. In another study, 39.2% of the included cases underwent laparoscopic assessment owing to worsening of symptoms [2]. This rate was near to our rate in the observational group.

In our study, the mean operative time was 45.6 and 57 min in the EDL and observational groups, respectively. The increased operative time with conservation could be attributed to increased inflammation and formation of adhesions owing to delayed intervention, which in turn needed more operative time to deal with. Another study also reported longer operative time in the observational group (69.1 vs. 60.1 min in the laparoscopic group) [2], which confirm our findings.

Furthermore, Abdullah *et al.* [12] reported that the average duration of laparoscopic procedures in such cases cases was 73 min. The difference in operative time could be explained by different surgical procedures and surgeon experience between the different studies.

In the current study, the most common pathology encountered in the EDL group was appendicitis (42%). Other diagnoses included P PELVIC I Inflammatory D Disease (PID) salpingitis with adhesions (12%), ovarian cyst (10%), adhesive bands (4%), endometriosis (2%), torsion epiploica and omental infarction (4%), ectopic pregnancy (2%), isolated tubal torsion (2%), Meckel's diverticulitis (2%), twisted peritoneal lipoma (2%), mesentric lymphadenitis (2%), ovarian torsion (2%), and localized enterocolitis (2%).

In the explored cases in the observational group, laparoscopic assessment revealed appendicitis (12%), PID salpingitis with adhesions (10%), ovarian cysts (6%), appendagitis (2%), adhesive bands (2%), mesenteric lymphadenitis (2%), and ovarian torsion (2%), no definite diagnosis was achieved in 12 and 52% of cases in the EDL and observational groups, respectively.

In a study by Onders and Mittendorf [13], appendicular pathology was found in only 16% cases whereas in a study by Al-Bareeq and Dayna [8], it was 73%. In another study, laparoscopic results showed inflamed appendix (17%), appendicular fecoliths (10.2%), enlarged mesenteric lymph nodes (10.2%), salpingitis (7.9%), omentum at deep ring (3.4%), pelvic adhesions (12.5%), fluid in cul-de-sac and ovarian cyst (6.8%), and diverticulitis (1.1%). Laparoscopy failed to reach a definitive diagnosis in 13 (14.7%) cases [6].

In an additional study, laparoscopic findings were as follows: appendicitis (51.6%), appendicitis together with ovarian cyst (1.7%), suspected tuberculosis (6.7%), endometriosis with adhesions (5%), PID (8.3%), PID with adhesions (5%), and adhesions (20%). However, 1.7% were negative on laparoscopy [7].

Our results revealed that laparoscopy was successful in achieving diagnosis in 24 (48%) patients of observational group cases, whereas 18 (36%) cases in the same group needed laparoscopy in the same admission. However, 26 (52%) observational cases were discharged from hospital after improvement with no definite diagnosis.

The existing literatuare reports conflicting studies handling the role of laparoscopy in patients with NSAP. Ahmad *et al.* [6] reported that overall success of laparoscopy in such cases was 87.3%, which could validate the use of this diagnostic modality in these cases.

In the 1990s, two randomized trials compared early laparoscopy with clinical observation, and both studies reported the superiority of laparoscopy to reach the diagnosis with the availability of intervention in the same setting (28 and 36% after clinical observation compared with 97 and 81% after early laparoscopy). On the contrary, most cases in the observationsl group left the hospital with no definitive diagnosis [14,15].

Our findings are similar to the study conducted by Ou and Rowbotham [16] in which diagnostic laparoscopy was able to provide a definitive diagnosis in the

majority of the included cases (76 of 77 cases – 98.7%). In the study conducted by Sharaf *et al.* [9], laparoscopy was a beneficial diagnostic tool in 32 (97%) of 33 cases that had no definitive diagnosis before intervention.

In addition, accurate diagnosis was established in 98.3% of the cases included in the study conducted by Sharma *et al.* [7]. Besides, another study reported that final diagnosis was achieved in 92.3% of cases that had laparoscopy [12]. In another study, a definitive diagnosis was reached in 85.7% of cases that were subjected to diagnostic laparoscopy, and 90.6% of these were also managed by laparoscopy in the same setting [17].

Gaitán *et al.* [18] reported that EDL is recommended in women presenting with NSAP, especially those in the reproductive age, as it is a reliable and cost-effective tool.

Some other studies were not as supportive [19]. Morino *et al.* [2] reported that early laparoscopy did not provide a clear benefit over active clinical observation in women with NSAP. This contradicts with our findings. However, the previous study reported that no diagnosis was achieved in 55.2% of cases in the observational group, whereas fit was 20.7% for the laparoscopic group ($P<0.001$), but that study considered that there was clinically insignificant difference between the groups, as recurrence of symptoms was similar on the long-term follow-up.

Another advantage of laparoscopy that should be kept in mind that it also provides the advantage of simultaneous management of the detected pathology at the same operative setting, such as ovarian cysts, which could be properly managed by laparoscopy [20]. Additionally, abdominal collections could be drained, adhesions could be safely dissected, and inflammed appendix could be excised. Furthermore, early identification of certain pathologies like PID enables early treatment, which decreases the rates of future infertility [21].

In our study, we performed appendectomy for appendicitis, cystectomy for ovarian cysts, excision for epiploic fat necrosis, and intraabdominal lipomas. Moreover, Meckel's diverticulitis was managed by resection anastomosis.

In our study, the duration of hospital stay was significantly longer in the observational group (4.22 vs. 2.96 days in the laparoscopic group – $P<0.001$). The time needed for observation is the reason behind the significant increase in the duration of hospital stay. In accordance with our findings, Domínguez *et al.* [5] reported a significantly shorter hospital stay in the laparoscopic group compared with the observational group (3.7 vs. 4.7 days – $P=0.004$).Regarding complications encountered in our study, fever was only encountered in three (6%) cases in the observational group, whereas in the laparoscopic group, complications were as follows: chest infection and fever (4%), port site infection (4%), port site hernia (2%), and urinary tract infection (2%). Although complications were more common in the laparoscopic group, they were all managed by conservative treatment, with no reported mortality.

Udwadia [22] reported a 0.09% complication rate. Another study reported that five (5.4%) cases had chest infection and fever, four (4.3%) patients developed surgical site infection, and two (2.2%) cases had fever alone [12].

Among the postoperative complications reported in a previous study, seven (7.9%) patients developed surgical site infection, six (6.8%) cases develoepd chest infection with fever, and four (4.5%) cases had fever alone [6]. Sharma *et al.* [7] reported that only one (1.6%) case developed umbilical port site infection. No other complications were reported.

When it comes to follow-up of the study cases, both symptom recurrence and readmission were more significantly encountered in the observational group compared with laparoscopy at 15-day and 6-month follow-up visits.

In the study conducted by Ahmad *et al.* [6], only four (4.5%) patients came back after laparoscopy with recurrent pain, and they were subjected to further investigations including computed tomography, MRI, and magnetic resonance cholangiopancreatography to reach the definive diagnosis diagnosis. The follow-up period in that study was 4 months. Di Lorenzo *et al.* [23] has reported pain relief, pain reduction, and no improvement in 60.2, 23.1, and 16.7% of cases, respectively, after diagnostic laparoscopy. Both of the previous studies showed that laparoscopic intervention was associated with a marked imrovement in patient condition.

On the contrary, another study reported that laparoscopy did not have a predominance over conservation, as recurrence of symptoms at 1-year follow up did not show any significant difference between the two groups (15.9 vs. 25% – $P=0.4$) [2].

Other limitations included that it was a single-center study. Therefore, more studies from different centers should be conducted in the near future. Moreover, the health care cost of both approaches should have been estimated. This point should be covered in the upcoming studies.

To summarize, laparoscopic intervention for NSAP is safe, feasible, and effective. It results in minor trauma, avoidance of extensive preoperative investigations or delays in operative intervention, rapid postoperative recovery, and less morbidity. Moreover, it helps to avoid unnecessary nontherapeutic laparotomies. Even if the case could not be completed by laparoscopy, it can help the surgeons for choosing the proper targeted incision in such cases. Active clinical observation alone is not sufficient to get a definitive diagnosis in cases with NSAP; other noninvasive investigation must be used during the period of observation within a limited period to decrease the hospitalization period, decrease the morbidity rates, and improve the diagnostic accuracy.

Conclusion

Diagnostic laparoscopy appears to be a reliable tool to reach a definite diagnosis in patients with NSAP because of its superior diagnostic ability, better visualization, low complications, and the ability to manage the pathology in the same setting.

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Conflicts of interest

There are no conflicts of interest.

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