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LAPAROSCOPIC SURGICAL TREATMENT OUTCOMES OF ACUTE APPENDICITIS IN PREGNANT WOMEN AT HA DONG GENERAL HOSPITAL

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ABSTRACT

Objective: Thís research aiming to describe and comprehensively evaluate the laparoscopic surgical (LS) treatment outcomes of acute appendicitis (AA) in pregnant women at Ha Dong General Hospital.

Research Method: A retrospective, descriptive study was conducted on 34 pregnant patients diagnosed with AA and treated with LS at Ha Dong General Hospital from January 1, 2021, to Dêcember 31, 2024. Data on patient characteristics, clinical and subclinical progression, detailed surgical techniques, complications, recovery time, and final treatment outcomes were collected and analyzed.

Results: The average patient age was 30.6 ± 6.6 years, and the average gestational age was 15.1 ± 7.9 weeks. All patients (100%) underwent successful LS. The mean operative time was 42.5 ± 13.6 minutes; the group with AA complicated by peritonitis had a longer operative time (57.7 ± 7.5 minutes) compared to the uncomplicated AA group (37.2 ± 10.3 minutes) ($p<0.05$). The main intraoperative diagnoses were purulent appendicitis (73.5%) and peritonitis due to AA (23.6%). The postoperative complication rate was low (5.8%), including one case (2.9%) of threatened miscarriage and one case (2.9%) of fever of unknown origin; both were managed successfully. The average postoperative hospital stay was 5.2 ± 1.3 days. Overall treatment outcome assessment: 97% of patients achieved good results, 3% achieved fair results, and no poor outcomes were recorded.

Conclusion: LS is a highly safe and effective treatment method for AA in pregnant women at Ha Dong General Hospital. Treatment outcomes are compromising by reasonable operative times, low complication rates, rapid recovery, and high treatment success rates, even in cases of AA complicated by peritonitis.

Keywords: Acute appendicitis; Pregnancy; Laparoscopic surgery; Treatment outcomes; Ha Dong General Hospital.

1. INTRODUCTION

Acute appendicitis (AA) is one of the most common operational treatments for abdominal emergencies. In pregnant women, AA presents significant challenges in both diagnosis and treatment due to physiological and anatomical changes during pregnancy. Symptoms can be easily confused with morning sickness, and changes in the appendix's position hinder accurate diagnosis or even make it harder to dissect the damaged organ. Delayed diagnosis and late treatment can lead to dangerous complications for both mother and fetus, including ruptured appendix, peritonitis, miscarriage, and preterm birth.

Laparoscopic surgery (LS) is increasingly accepted as a preferred treatment method for AA in pregnant women due to its advantages such as minimal invasiveness, reduced postoperative pain, rapid recovery, and cosmetic benefits. At Ha Dong General Hospital, LS has been applied to treat AA in pregnant women for many years. However, a systematic and detailed evaluation of the treatment outcomes of this method at the hospital is necessary to confirm its efficacy, safety, and to make appropriate recommendations. This study was conducted to focus on two main objectives: To evaluate the outcomes of laparoscopic surgery for

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acute appendicitis in pregnant women at Ha Dong General Hospital and to describe related clinical and paraclinical characteristics.

2. SUBJECTS AND METHODS

2.1. Study Design: Retrospective, descriptive study.

2.2. Study Location and Period: Ha Dong General Hospital, from January 1, 2021, to December 31, 2024.

2.3. Study Subjects: 34 pregnant patients diagnosed with acute appendicitis who have been treated with laparoscopic appendectomy at Ha Dong General Hospital.

- *Inclusion Criteria:* Medical records with complete information necessary for the study.

- *Exclusion Criteria:* Medical records with incomplete critical information.

2.4. Sample Size and Sampling: 34 cases meeting the inclusion criteria during the study period were selected.

2.5. Study Variables/Indicators:

- General characteristics: Maternal age, occupation, gestational age.

- Clinical and paraclinical characteristics: Reason for admission, starting of pain, pain location, pain nature, physical symptoms, blood test results, ultrasound, MRI (if any).

-Detailed surgical treatment outcomes:

+ Anesthesia method, conversion to open surgery rate.

+ Trocar placement.

+ Intraoperative appendiceal status (hyperemic, purulent, necrotic), appendiceal position.

+ Intra-abdominal fluid status and management.

+ Definitive intraoperative and postoperative diagnosis.

+ Procedures performed (appendectomy, peritoneal lavage, drainage).

+ Surgical time (overall, by gestational age, by AA severity).

+ Intraoperative complications.

- Post-treatment results:

+ Histopathological results.

+ Time to flatus, time to oral intake.

+ Postoperative complications (rate, type, severity, management, impact on mother and fetus).

+ Postoperative hospital stay.

+ Overall treatment outcome assessment (good, fair, poor) based on a set of criteria.

2.6. Data Collection Techniques, Tools, and Procedures: Information was collected from medical records using a standardized research case form.

2.7. Data Processing and Analysis: SPSS software was used. Calculations included mean, standard deviation, frequency, and percentage. Group comparisons were made using Chi-square or Fisher's exact test for qualitative variables, and t-test or Mann-Whitney U test for quantitative variables. Statistical significance was set at $p < 0.05$.

2.8. Ethical Considerations: The study adhered to medical ethics regulations, and patient information was kept confidential.

3. RESULTS

3.1. General, Clinical, and Paraclinical Characteristics

The mean age of the 34 patients was 30.6 ± 6.6 years. The mean gestational age at surgery was 15.1 ± 7.9 weeks, with the highest rates in the first and second trimesters. The most common reason for admission was abdominal pain (61.8%), with the right iliac fossa (RIF) being the usual pain location (68%). The predominant pain characteristic was continuous dull pain (91.2%). Fifty-five percent of patients experienced a mild fever. Blood tests showed that 82.3% had a white blood cell count > 10 G/L and increased neutrophils. Ultrasound detected appendiceal images in 58.8% of cases. MRI was ordered for 5 cases with unclear ultrasound findings, diagnosing AA in 4/5 cases.

Table 1. Reason for Admission of Patients

Condition			
1st Trimester (n=16)	2nd Trimester (n=12)	3rd Trimester (n=6)	Total (n=34)
n (%)	n (%)	n (%)	n (%)
Abdominal pain			
10 (62.5)	8 (66.6)	3 (50.0)	21 (61.8)
Abdominal pain + fever			
4 (25.0)	2 (16.6)	2 (33.3)	8 (23.5)
Abdominal pain + GI upset			
2 (12.5)	1 (8.3)	1 (16.6)	4 (11.8)
Abdominal pain + fever + GI upset			
0 (0.0)	1 (8.3)	0 (0.0)	1 (2.9)
Total			
16 (100.0)	12 (100.0)	6 (100.0)	34 (100.0)

3.2. Laparoscopic Surgical Treatment Outcomes

3.2.1. Surgical Characteristics

All 34 patients in the study underwent successful laparoscopic appendectomy without any conversions to open surgery, utilizing endotracheal general anesthesia uniformly. Trocar placement primarily involved sites at the umbilicus, hypogastrium, and left iliac fossa (64.7%), a pattern consistently used during the first trimester. Adjustments in trocar placement became necessary with advancing gestational age, incorporating the right iliac fossa and either the left iliac fossa or right flank, each constituting 17.6% of cases.

Intraoperatively, purulent appendicitis was the most prevalent diagnosis, occurring in 76.5% of patients, followed by necrotic appendicitis with peritonitis in 20.6%, and hyperemic appendicitis in 2.9%. Anatomically, the appendix predominantly occupied the right iliac fossa (79.4%), with displacement superiorly or retrocecally becoming more common as pregnancy advanced. Various intra-abdominal fluid conditions were observed, including absence of fluid (44.1%), yellow exudate (23.5%), turbid fluid (14.7%), and significant purulent fluid with pseudo-membranes (17.6%).

The mean surgical time was 42.5 ± 13.6 minutes for most of the times, longer during the first trimester (44 ± 15.8 minutes) compared to the second and third trimesters (38.5 ± 12.1 minutes). The presence of peritonitis notably increased operative duration (57.7 ± 7.5 minutes) compared to uncomplicated cases (37.2 ± 10.3 minutes, $p<0.05$). Appendectomy was universal, with peritoneal lavage performed in 29.4% of patients. Only one patient required drainage placement due to severe peritonitis, subsequently complicated by a threatened miscarriage. Importantly, no intraoperative laparoscopic complications were observed.

Table 2. Comparison of Surgical Time by Peritonitis Status

Diagnosis				
No. (n)	Mean Surgical Time (min) ± SD	Min (min)	Max (min)	p-value
AA without peritonitis				<0.05
26	37.2 ± 10.3	25	60	
AA with peritonitis				
8	57.7 ± 7.5	40	100	
Total				
34	42.5 ± 13.6	25	100	

3.2.2. Postoperative Outcomes and Complications

Histopathological analysis closely matched intraoperative diagnoses, confirming 25 cases of purulent appendicitis, eight cases of necrotic appendicitis, and a single case of hyperemic appendicitis. This high correlation underscores the accuracy of intraoperative assessments and reinforces the reliability of laparoscopic surgery as an effective approach for managing acute appendicitis during pregnancy.

Table 3. Postoperative Histopathological Results

1st Trimester		2nd Trimester		3rd Trimester		Total	
n	%	n	%	n	%	n	%
Hyperemic appendicitis							
1	8,3	0	0	0	0	1	2,9
Purulent appendicitis							
8	66,7	13	81,25	5	83,3	26	76,5
Necrotic appendicitis							
3	25	3	18,75	1	16,7	7	20,6
Total							
12	100	16	100	6	100	34	100

Postoperatively, patients showed rapid recovery, with an average time to first flatus of 10.5 ± 4.1 hours. Oral intake was resumed shortly thereafter. Complications occurred infrequently, affecting just two patients (5.8%): one experienced a threatened miscarriage characterized by vaginal bleeding, fever, and uterine contractions at 20 weeks gestation, successfully managed with antibiotics and tocolytics; another had an isolated fever episode at 18 weeks gestation, resolving spontaneously without intervention.

The mean postoperative hospital stay was 5.2 ± 1.3 days, varying notably depending on complication severity. Patients without peritonitis had shorter stays averaging 4.9 ± 1.2 days, whereas those with peritonitis required longer hospitalization averaging 6.1 ± 1.3 days. This difference was statistically significant ($p < 0.05$), highlighting the impact of peritonitis on postoperative recovery duration.

Importantly, no severe postoperative complications such as surgical site infections, intra-abdominal abscesses, or intestinal obstructions were observed, emphasizing the overall safety of laparoscopic appendectomy during pregnancy.

3.2.3. Overall Treatment Outcome Assessment

Treatment outcomes were assessed comprehensively based on criteria such as maternal and fetal health, complication management, and recovery speed. The results demonstrated excellent overall efficacy, with 97.0% (33 cases) classified as having good outcomes. Only one case (3.0%), involving a threatened miscarriage, was rated as fair, yet this patient also experienced successful clinical resolution. Importantly, no poor outcomes were

recorded, reinforcing the reliability and safety of laparoscopic appendectomy in pregnant patients.

4. DISCUSSION

4.1. Surgical Technique and Intraoperative Diagnosis

Regarding technique, 100% of patients underwent LS, with no conversions to open surgery. Trocar placement was flexibly adjusted according to gestational age, similar to studies by Tran Phung Dung Tien [1] and Nguyen Tan Cuong [2]. Specifically, in the first trimester, the common placement was umbilical, hypogastric, and LIF (64.7%). In later trimesters, trocar positions were elevated (umbilical, RIF, LIF or umbilical, RIF, suprapubic midline) to accommodate uterine size and ensure an optimal surgical field. International studies, such as by Machado et al., also describe adjusting trocar placement higher with increasing gestational age, emphasizing the necessity of this technique to access the appendix and minimize risk to the uterus [3]. SAGES guidelines also recommend adjusting trocar position according to fundal height and maintaining intra-abdominal pressure between 10-15 mmHg [4].

Table 5. Comparison of Key Indicators in Laparoscopic Surgery for AA in Pregnant Women: Study at Ha Dong General Hospital and Domestic Studies

Characteristic		
Ha Dong GH (Current Study)	**Tran Phung Dung Tien**	**Phan Tuan Dat (Thai Binh GH)**
Sample Size (N)		
34	Not specified (NR)	35
Mean Operative Time (min)		
42.5 ± 13.6	51.46 ± 22.97	50.7 ± 13.6
AA without peritonitis (min)		
37.2 ± 10.3	NR	44.3 ± 14.6 (p<0.05 vs Ha Dong)
AA with peritonitis (min)		
57.7 ± 7.5	NR	56.7 ± 8.0 (comparable to Ha Dong)
Peritonitis Rate (%)		
23.6 (Peritonitis due to AA)	NR	NR initial peritonitis rate, but operative time compared between groups with/without peritonitis
Maternal Complications (%)		
5.8	2 cases	8.6 (3 cases transferred)
Threatened Miscarriage/Preterm (%)		
2.9 (1 threatened miscarriage)	NR	Present in 3 transferred cases (NR %)
Surgical Site Infection (SSI) (%)		
0	1 case	NR
Postoperative Bowel Obstruction (%)		
0	1 case	NR
Fetal Loss Rate (%)		
0	NR	0
Negative Appendectomy Rate (%)		
0	NR	NR
Good Outcome (%)		
97	NR	91.4

Intraoperatively, the rates of purulent (76.5%) and necrotic (20.6%) appendicitis in our study were quite high, with only 2.9% being hyperemic. This reflects the reality that patients often present late, a common issue in diagnosing AA in pregnant women due to symptoms being easily mistaken for common discomforts of pregnancy [5]. This rate of severe AA is also comparable to some domestic studies, such as by Phan Tuan Dat [6]. Nevertheless, a notable point is that 100% of surgical cases in our study had AA confirmed by histopathology, with no negative appendectomies among the operated cases. This rate is superior to many international studies, where the rate of non-appendiceal laparotomy in pregnant women can range from 16% to over 30% [3, 7, 8]. This suggests good diagnostic experience and surgical indication at our institution, possibly due to close interdepartmental collaboration and prioritization of imaging modalities when necessary, although the original document does not detail the imaging diagnostic process.

Table 6. Comparison of Key Indicators in Laparoscopic Surgery for AA in Pregnant Women: Study at Ha Dong General Hospital and Selected International Studies/Reviews.

Characteristic						
Ha Dong GH (Current Study)	Machado N.O. (2009) [3]	Lemieux P. et al. (2009) [7]	Laustsen L.C. et al. (2016)[8]	Al-Mulhim A.A. (1996) [10]	Wilasrusmee C. et al. (2012) (Meta-analysis) [11]	Rountis A. et al. (2022) (Meta-analysis) [12]
Study Type						
Retro. Cohort	Retro. Cohort	Retro. Cohort	Retro. Cohort	Retro. Cohort	Meta-analysis	Meta-analysis
Sample Size (N) (LS)						
34	20	45	19	52 (open)	11 studies	15 studies (1103 LA, 1656 OA)
Mean Operative Time (min)						
42.5 ± 13.6	45 (25-90)	49 ± 19	69	NR	No diff. open vs lap	NR
Maternal Complications (%)						
5.8 (1 threat. miscar., 1 fever)	0 (excl. 1 fetal loss)	8 (4% major, 4% minor)	Less than OA	9.6 (SSI)	NR	NR
Threatened Miscarriage/Preterm (%)						
2.9 (threat. miscar.)	0 (excl. 1 fetal loss)	18.1% birth <37w; 8.1% <35w	11% preterm (both groups)	NR	Open 1.44x (NS) for preterm vs lap	10.7% preterm birth
Surgical Site Infection (SSI) (%)						
0	0	NR	NR	9.6	No diff. open vs lap	Lap lower than open
Fetal Loss Rate (%)						
0	5 (1/20)	0	0	17% (path. AA), 9% (neg. lap)	LA RR 1.91 vs OA (low qual. evidence)	LA 2.44% vs OA 2.89%
Negative Appendectomy Rate (%)						
0	25 (5/20)	33	16	44 (23/52 neg. lap)	NR	NR

In order to minimize the effect on the fetus, we minimized abdominal drainage, even in cases with peritonitis. Only 1/34 cases (with peritonitis and threatened miscarriage) had a drain placed. This decision was based on practical experience in the department and appears consistent with current literature. A Cochrane review (2018) showed no clear evidence of benefit for routine drainage after a complicated appendectomy, and it might even be associated with undesirable outcomes in open surgery, with a lack of RCTs for LS [9].

4.2. Surgical Time

The mean LS time in our study was 42.5 ± 13.6 minutes, which is faster than some domestic authors like Tran Phung Dung Tien (51.46 ± 22.97 minutes) [1] and Phan Tuan Dat (50.7 ± 13.6 minutes) [6]. Compared internationally, this time is also comparable or shorter (Machado: 45 minutes [3]; Lemieux: 49 minutes [7]). With peritonitis, the mean operative time was 57.7 ± 7.5 minutes, comparable to Phan Tuan Dat's study (56.7 ± 8.0 minutes) [6], indicating that peritonitis increases complexity and intervention time.

4.3. Complications and Treatment Outcomes

The overall complication rate in our study was low (5.8%, including 1 case of threatened miscarriage and 1 case of self-limiting fever of unknown origin). There were no maternal or fetal deaths. This outcome is similar to other studies. For example, Tran Phung Dung Tien's study reported 1 case of SSI and 1 of bowel obstruction [2]. Al-Mulhim's open surgery study showed an SSI rate of 9.6% and fetal loss of 17% in the AA group [10]. Recent systematic reviews tend to show that LS is safer or equivalent to open surgery regarding fetal outcomes, with potentially lower risks of fetal loss and preterm birth with LS [11].

The case of threatened miscarriage (20 weeks gestation, appendiceal peritonitis) in our study was successfully managed with obstetric consultation and tocolytic medication, preserving the pregnancy. This emphasizes the importance of multidisciplinary coordination. The cause of threatened miscarriage could be due to severe infection, surgical manipulation, or drainage (this was the only case with a drain). The fact that subsequent peritonitis cases were not drained and did not experience further threatened miscarriages suggests that the role of drainage needs careful consideration.

4.4. Study Limitations

Our study has certain limitations. The retrospective, single-center design may introduce selection and outcome assessment biases. The sample size is relatively small (N=34). The inability to access the original studies of some cited domestic authors is also a point to note.

5. CONCLUSION

From the study of 34 pregnant women with acute appendicitis treated by laparoscopic surgery at Ha Dong General Hospital, we draw the following conclusions:

The results clearly demonstrate that laparoscopic surgery (LS) serves as an effective primary treatment for acute appendicitis in pregnant women, achieving a 100% success rate without requiring conversion to open surgery. The average duration of surgery was notably brief at 42.5 ± 13.6 minutes. Most intraoperative diagnoses were purulent appendicitis (73.5%), with a significant minority presenting with peritonitis (23.6%).

Postoperatively, outcomes were favorable, highlighted by a low complication rate of only 5.8%. These complications—one threatened miscarriage and one case of unexplained fever—were carefully and successfully managed, posing no lasting risk to the mother or fetus. Patients generally experienced rapid recovery, reflected in the short average hospital stay of 5.2 ± 1.3 days, which was even shorter (4.9 ± 1.2 days) for uncomplicated cases.

Overall, the high success rate of 97% achieving good outcomes and only 3% fair underscores the safety, efficacy, and superiority of laparoscopic surgery. This minimally invasive approach is affirmed as the optimal choice for managing acute appendicitis in pregnancy at Ha Dong General Hospital, facilitating quick recovery and minimizing patient risk.

6. RECOMMENDATIONS

Based on the research, the act of prioritization and wider application of laparoscopic surgery (LS) in pregnant women with acute appendicitis is strongly recommended. Furthermore, enhancing patient communication and counseling regarding the early symptoms of appendicitis is crucial to promote timely diagnosis, reduce complication rates, and improve patient outcomes. Finally, future prospective, multicenter research with larger patient cohorts should be encouraged to generate more robust evidence supporting this surgical approach.

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