



## Case report

## Successful laparoscopic cholecystectomy at 32 weeks of pregnancy - A case report

Danielle Ward<sup>a,\*</sup>, Danielle LaSalle Hashmi<sup>a</sup>, Sergey Zhitnikov<sup>b</sup><sup>a</sup> Philadelphia College of Osteopathic Medicine, Department of Graduate Medical Education, 4190 City Ave, Suite 409, Philadelphia, PA 19131, United States of America<sup>b</sup> Crozer-Chester Medical Center, Center for Minimally Invasive and Bariatric Surgery, 1 Medical Center Blvd. POB 11, Suite 220, Upland, PA 19013, United States of America

## ARTICLE INFO

## Keywords:

Laparoscopic cholecystectomy  
Laparoscopic surgery pregnancy  
Third trimester cholecystectomy  
Cholelithiasis  
Case report

## ABSTRACT

**Introduction and importance:** During gestation, laparoscopic procedures, if needed, are generally considered most ideal within the second trimester. There are less reports of successful laparoscopic procedures in the third trimester of pregnancy due to performance hesitancy with concerns of preterm labor and/or other complications. While it is rare for laparoscopic cholecystectomy to be performed within the third trimester, it should not be delayed if needed, and excellent outcomes can be achieved with proper port placement and procedure.

**Case presentation:** We present the case of a 22-year-old female thirty-two weeks and six days into gestation who underwent a laparoscopic cholecystectomy with intraoperative cholangiogram after presenting with acute-on-chronic cholecystitis. The procedure was without complications, and both the patient and fetus remained stable following surgery, and were discharged on postoperative day 2.

**Clinical discussion:** The long-established belief is laparoscopic procedures should ideally be attempted in the second trimester to decrease the risk of preterm labor or spontaneous abortion in obstetric patients. Per SAGES guidelines, when clearly indicated, laparoscopic cholecystectomy should not be avoided in any trimester.

**Conclusion:** This case highlights the relative safety of a laparoscopic cholecystectomy in the third trimester of pregnancy with emphasis on standard technique and proper port placement based on uterus size.

## 1. Introduction and importance

Pregnancy in itself is a risk factor for gallbladder issues such as cholecystitis, biliary sludge, and symptomatic cholelithiasis [1]. When these issues present in the third trimester, the general consensus is to delay surgical procedures until after delivery out of possible harm to the unborn fetus. Our patient was a 32-week and 4 day pregnant female presenting with acute on chronic cholecystitis who successfully underwent a laparoscopic cholecystectomy without complications. She had a previous history of symptomatic cholelithiasis and experienced an episode of acute cholecystitis five years prior during her first pregnancy. She was advised by her OB/GYN physician to follow up with a surgeon for a cholecystectomy at that time, however, the patient did not follow the recommendation. During this admission, the patient was admitted to the OB/GYN service. The surgery service was consulted for worsening leukocytosis and right upper quadrant abdominal pain. Following positive physical examination, ultrasound, and magnetic resonance cholangiopancreatography (MRCP) findings, the patient underwent a

laparoscopic cholecystectomy with an intraoperative cholangiogram. While the majority of the literature states laparoscopic procedures, if needed, are most ideal in the second trimester, there are less reports of successful laparoscopic procedures in the third trimester of pregnancy due to hesitancy to perform these procedures over concerns of preterm labor and/or other complications. Laparoscopic cholecystectomy without complications is possible in the third trimester of pregnancy with modifications taking into account the size of the gravid uterus in regards to port placement and procedure. This case highlights the relative safety of a laparoscopic cholecystectomy in the third trimester of pregnancy with emphasis on proper port placement based on uterus size and has been reported in line with the 2020 SCARE criteria [2].

## 2. Case presentation

Our patient was 22 years old and of 32 weeks and 4 days gestation (with history of two previous uneventful vaginal deliveries) upon arrival to the emergency department presenting with complaints of constant

\* Corresponding author at: Philadelphia College of Osteopathic Medicine, 4170 City Ave, Philadelphia, PA 19131, United States of America.

E-mail addresses: [daniellewa@pcom.edu](mailto:daniellewa@pcom.edu) (D. Ward), [daniellela@pcom.edu](mailto:daniellela@pcom.edu) (D.L. Hashmi), [Sergey.zhitnikov@crozer.org](mailto:Sergey.zhitnikov@crozer.org) (S. Zhitnikov).

<https://doi.org/10.1016/j.ijscr.2021.106119>

Received 17 May 2021; Received in revised form 11 June 2021; Accepted 17 June 2021

Available online 18 June 2021

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right upper quadrant abdominal pain. She was able to tolerate a diet without nausea or vomiting, but did have an increase in postprandial pain. There were no signs of fetal distress with continuous fetal monitoring. There was no significant drug, social, allergy, or family history, but the patient did have similar symptoms several years prior during her previous pregnancy and was diagnosed with cholelithiasis. At that time, she was advised to follow up with a surgeon after delivery, but with the abatement of her symptoms she did not schedule an appointment. At time of admission, patient was placed on nil per os (NPO) diet and administered the antibiotic Zosyn and normal saline intravenously. Her workup for this presentation again included an ultrasound of the abdomen. As seen in [Fig. 1](#), ultrasound findings were concerning for impending, if not definitive, acute cholecystitis, with a 14 mm nonmobile stone present in the neck of the gallbladder and a positive sonographic Murphy sign. However, she did not have pericholecystic fluid noted on this exam and her gallbladder wall was 4 mm. Her common bile duct (CBD) was dilated at 1.1 cm without a noted filling defect.

The patient continued to have pain with a slight leukocytosis as her white blood cell count increased from 13.9 on admission to 16. She therefore underwent MRCP (Fig. 2) the following day for further diagnostic clarification and to rule out choledocholithiasis. MRCP confirmed a dilated CBD at 10 mm but no choledocholithiasis. Again, cholelithiasis was seen with 2 gallstones measuring 14 mm and 16 mm. Again, no wall thickening or pericholecystic fluid were noted.

The patient was observed overnight as she was very hesitant to pursue surgery in her pregnant state. Clinically, she appeared to have acute cholecystitis, and her white blood cell count elevated to 16.4 with liver function tests revealing elevated alkaline phosphatase. There was concern that as she became further advanced in her pregnancy laparoscopic surgery would not be feasible, as she faced the risk of developing gangrenous cholecystitis. Her family presented to bedside and after several lengthy discussions about the benefits and risks of surgery, the patient provided informed consent to proceed with a laparoscopic, possible open, cholecystectomy.

The patient was positioned in a standard fashion in the operating room, and the procedure was performed by an attending physician and two surgical resident physicians. After induction of general anesthesia, the fundus of the uterus was marked. The anterior abdominal wall was prepped and draped in standard surgical fashion. The abdomen was accessed using an open Hasson technique superior to the uterine fundus. Insufflation was achieved without hemodynamic changes and was maintained at 12–15 mmHg (maximal pressure of insufflation at 15 mmHg) for the duration of the case to limit adverse effects to uterine blood flow. In the subxiphoid area, slightly to the right side, a 5 mm working port was placed through a transverse skin incision. Two additional 5 mm ports were placed in the right subcostal area. All ports were

placed without difficulty (Fig. 3).

Evaluation of the abdominal cavity revealed significant inflammatory changes in the right upper quadrant of the abdomen with duodenum, greater omentum, and a small loop of bowel attached to the gallbladder. The gallbladder appeared to be distended with a thickened wall consistent with chronic and acute inflammatory changes. In addition to the acute inflammatory changes and old adhesions of gallbladder to the hepatoduodenal ligament and duodenum, there was the presence of hydrops of the gallbladder. Instrumental palpation of the cystic duct revealed no presence of gallstones within the cystic duct. The common bile duct appeared to be enlarged at more than 1 cm in diameter and corresponded with previous ultrasonography and MRI findings (Fig. 4).

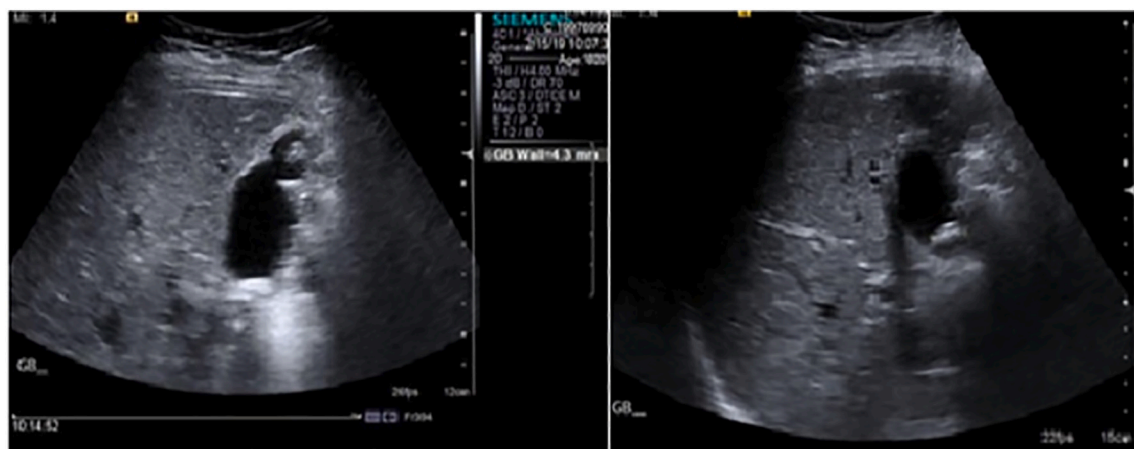
Taking the difficult anatomy and enlarged common bile duct into consideration, the decision was made to perform a cholangiogram. This revealed dilation of the intrahepatic and extrahepatic bile ducts, however, without evidence of filling defects or stricture. There was also noted brisk good passage of contrast into the duodenum. The cholangiogram was performed quickly with minimal exposure to radiation.

Following cholangiogram, the gallbladder was removed from the liver using Bovie electrocautery, and the right subhepatic space was copiously irrigated with normal saline and suctioned. The abdominal cavity was desufflated following removal of the gallbladder, and evaluation revealed no evidence of injury to close organs, bile leak or bleeding. All ports were removed and the incisions were closed using subcutaneous 3-0 vicryl sutures for subcutaneous tissues and 4-0 monocryl sutures at the level of the skin, with surgical glue applied to all incisions following suturing. Dissection of the gallbladder post-removal revealed large gallstones in the Hartmann's Pouch causing obstruction of the cystic duct (Fig. 4d).

The final pathology report confirmed the diagnosis of acute cholecystitis with cholelithiasis. The patient remained hemodynamically stable after surgery with continuous fetal monitoring and with no signs of fetal distress. She was discharged home on postoperative day 2 and had an uneventful vaginal delivery two months after surgery at the same hospital with the absence of postoperative complications.

### 3. Clinical discussion

Pregnancy is a risk for biliary disease, as physiologic changes propend the formation of biliary sludge [3]. Approximately 1 in 500 women will require non-obstetric abdominal surgery during their pregnancy, with the most common causes being acute appendicitis and cholecystitis [1]. The work up of abdominal pain and subsequent treatment is complicated by concerns for fetal radiation exposure and risks of laparoscopic surgery. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) published a set of guidelines in 2017 on the use



**Fig. 1.** Ultrasound findings of 14 mm nonmobile stone in gallbladder neck and 4 mm gallbladder wall.

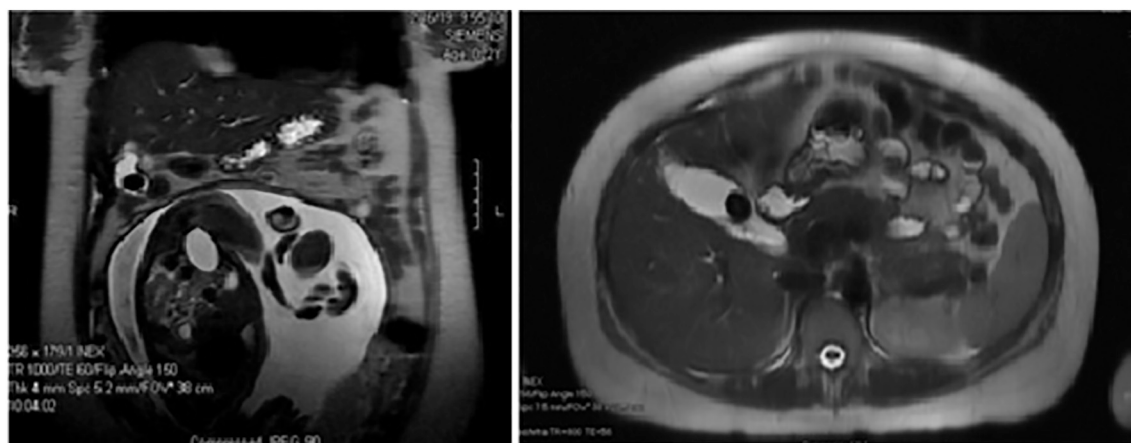


Fig. 2. MRCP transverse and sagittal views with 10 mm dilated CBD, stones, and visible fetus noted.

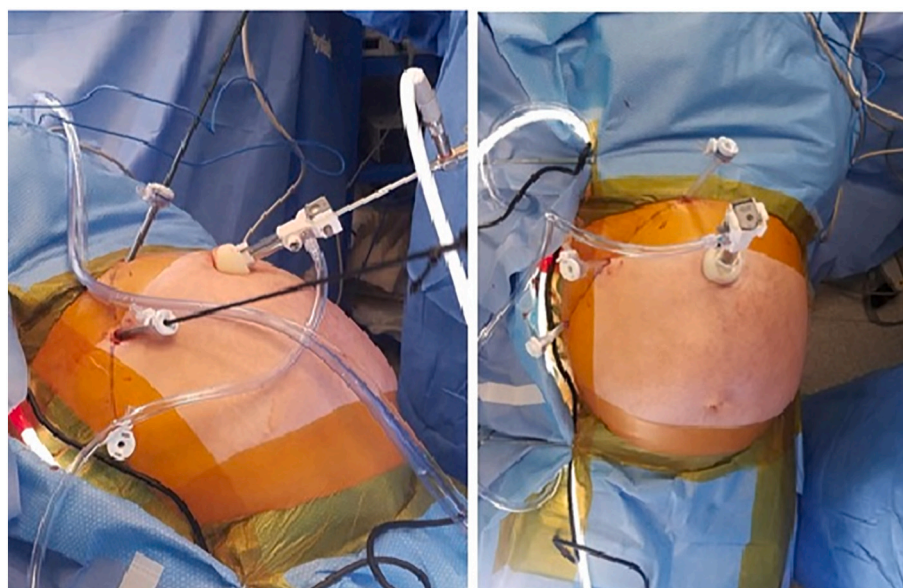


Fig. 3. Laparoscopic port placement noting superior placement of 10 mm Hasson trocar and 5 mm working port.

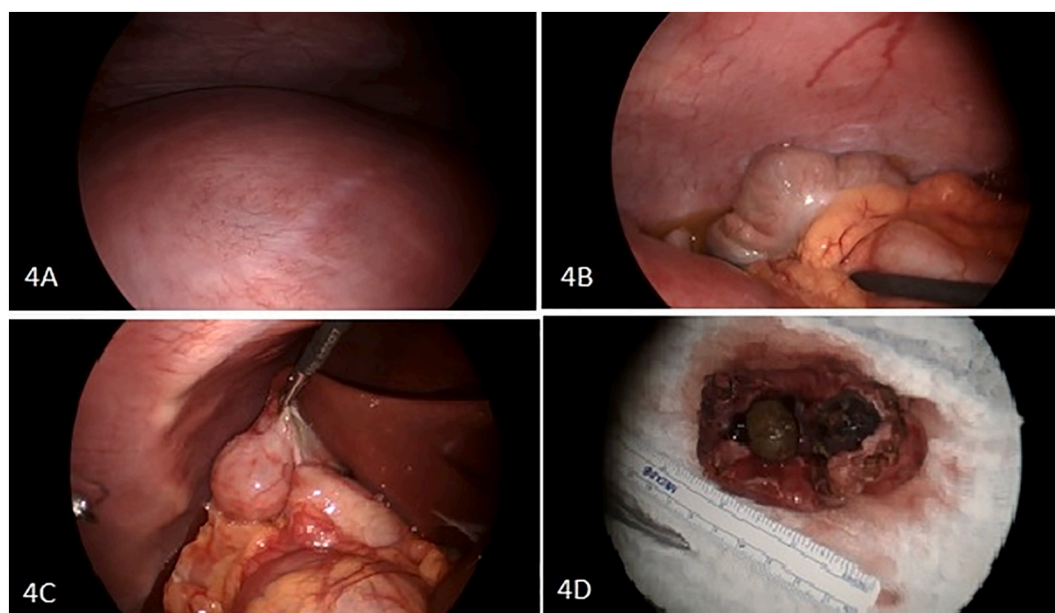
of laparoscopy in pregnancy. These recommendations were based on a literature review of 186 articles published January 2011 through March 2016. For the workup of abdominal pain, the initial imaging of choice is ultrasound. Guideline 2 endorses the radiation risk of imaging in the pregnant patient, recommending a limit of 50–100 milligray in gravid patients to minimize the risk of teratogenesis and development of childhood leukemia [1]. Plain abdominal Xray averages 1–3 milligray, while a CT of the pelvis is around 30 milligray. The risk of teratogenesis is highest during weeks 10–17 of gestation. The risk of childhood leukemia increases with exposure later in pregnancy. As such, CT is recommended only in emergency situations and was avoided in our patient. MRI is considered safe to use, although intravenous gadolinium does cross the placenta and could be teratogenic. Radiation exposure is 20–50 milligrays during cholangiography, and as such, is generally considered safe if exposure to the fetus is minimized with a pelvic shield if possible.

The SAGES guidelines state a strong recommendation for laparoscopic cholecystectomy during any trimester when indicated, which diverges from the traditional thought to operate in the second trimester to avoid risk of spontaneous abortion or preterm labor. In April of 2019, Fong and colleagues published a study in the *Journal of the American College of Surgeons* comparing laparoscopic cholecystectomy in the third trimester versus early postpartum [3]. This study excluded patients

who had previously presented with biliary symptoms and only included postpartum patients who had first presented with biliary symptoms during their pregnancy. This circumvented including pregnant patients in whom cholecystectomy likely could not be avoided in addition to those who developed biliary symptoms unrelated to pregnancy. This study concluded that laparoscopic cholecystectomy should be avoided in the third trimester, as these patients had longer hospital stays and rates of readmission which were unrelated to their pregnancy, a higher rate of conversion to an open procedure (13% versus 2%) and because of the risk of preterm labor (odds ratio 2.05) [3]. A study by Hong and colleagues using data from New York also echoed these findings [4].

A 2016 review article by Nasioudis, looked at Medline and Cochrane databases to study a total of 590 pregnant patients who underwent laparoscopic cholecystectomy from 51 studies. Preterm delivery rates were 5.7%. Conversion to open procedure rate was 2.2%. However, 70% of cases were performed in the second trimester [5]. The available literature does include other case reports of laparoscopic cholecystectomy in the third trimester, including a report of three cases published in 2009. Similar to our case, all three had a two-day hospital stay without complications [6].





**Fig. 4.** Intraoperative findings - 4a Gravid uterus as seen on laparoscopy, 4b omental adhesions and fluid in the right upper quadrant, 4c inflamed edematous gallbladder, 4d gallstones as seen on open specimen.

#### 4. Conclusion

Pregnancy in itself is a risk factor for biliary pathology such as cholecystitis, biliary sludge, and symptomatic cholelithiasis [1]. While laparoscopy has been proven to be a safe operative approach for surgical disease in the pregnant patient, controversy and uncertainty remains regarding the applicability and timing of laparoscopic surgery in this patient population. This case report illustrates a successful laparoscopic cholecystectomy in a pregnant patient of 32 weeks gestation. The patient did require an overnight hospital stay for monitoring on the medical/surgical floor and was maintained on a fetal monitor during this time with an overall uncomplicated course, stable discharge, and an uncomplicated vaginal delivery two months later.

#### Funding

None. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

#### Ethical approval

None.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### Provenance and peer review

Not commissioned, externally peer-reviewed.

#### Registration of research studies

None.

#### Guarantor

Danielle Ward, DO, MS.

#### CRediT authorship contribution statement

Danielle Ward, DO, MS - literature review, writing and editing paper, image collection.

Danielle Lasalle Hashmi DO, MS - literature review, writing and editing paper.

Sergey Zhitnikov, MD, FACS – Supervision and paper edits.

#### Declaration of competing interest

None.

#### References

- [1] SAGES, Guidelines for the Use of Laparoscopy during Pregnancy. <https://www.sages.org/publications/guidelines/guidelines-for-diagnosis-treatment-and-use-of-laparoscopy-for-surgical-problems-during-pregnancy/>.
- [2] Agha RA, Franchi T, Sohrabi C, Mathew G, for the SCARE Group, The SCARE 2020 guideline: updating consensus surgical case report (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230.
- [3] Z.V. Fong, H.A. Pitt, S.M. Strasberg, R.L. Molina, N.P. Perez, C.M. Kelleher, A. P. Loehrer, J.K. Sicklick, M.A. Talamini, K.D. Lillemoe, D.C. Chang, California cholecystectomy group. Cholecystectomy during the third trimester of pregnancy: proceed or delay? *J. Am. Coll. Surg.* 228 (4) (2019 Apr) 494–502, e1, <https://doi.org/10.1016/j.jamcollsurg.2018.12.024> (Epub 2019 Feb 12).
- [4] J. Hong, J. Yang, X. Zhang, J. Su, A. Tumati, D. Garry, S. Docimo, A.T. Bates, K. Spaniolas, M.A. Talamini, A.D. Pryor, Considering delay of cholecystectomy in the third trimester of pregnancy, *Surg. Endosc.* (2020 Sep 1), <https://doi.org/10.1007/s00464-020-07910-z>. Epub ahead of print. PMID: 32875420.
- [5] D. Nasioudis, D. Tsilimigras, K.P. Economopoulos, Laparoscopic cholecystectomy during pregnancy: a systematic review of 590 patients, *IJS* 27 (2016) 165–175, <https://doi.org/10.1016/j.ijsu.2016.01.070>.
- [6] N.O. Machado, L.S. Machado, Laparoscopic cholecystectomy in the third trimester of pregnancy: report of 3 cases, *Surg. Laparosc. Endosc. Percutan. Tech.* 19 (6) (2009) 439–441, <https://doi.org/10.1097/SLE.0b013e3181c30fed>. Dec.