



## Case Report

# Successfully Completed Laparoscopic Splenectomy for Young Woman With Immune Thrombocytopenic Purpura During Pregnancy in Reduced Port Surgery: A Case Study

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**Background:** Immune thrombocytopenic purpura (ITP) during pregnancy is a rare condition; however, it can lead to hemorrhagic complications due to gestational thrombocytopenia during delivery. A splenectomy is the treatment that will result in the highest complete remission rate for ITP and is sometimes required when thrombocytopenia is severe and fails to respond to medical treatment. Herein, we present a case of a patient who underwent a reduced port laparoscopic splenectomy (RPLS) for ITP during pregnancy.

**Case presentation:** A 33-year-old female patient, who had past history of miscarriage at the 12th week of gestation and a stillbirth at the 36th week of gestation, was diagnosed with ITP at the 12th week of gestation. The patient received medical treatment, but the platelet count did not increase enough for spontaneous delivery. Therefore, a 3-port RPLS was scheduled at the 20th week of gestation following treatment with high-dose immunoglobulin therapy for 5 days.

The patient was placed in the right semilateral position. The pneumoperitoneal pressure was set at 8 mmHg, which is lower than that used in a typical operation. The overall procedures were similar to those of a 4-port technique.

**Results:** There was no change in the fetal heart rate during or after the operation. The platelet counts increased and were maintained after the RPLS, and the course of the

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pregnancy was successful. The patient was able to deliver a healthy infant via vaginal delivery at the 37th week of gestation.

**Conclusion:** In our experience, RPLS procedures offer high cosmetic satisfaction and are feasible and safe during the second trimester in pregnant women with ITP that does not respond well to medical treatments.

*Key words:* Reduced port laparoscopic surgery – Laparoscopic splenectomy – Immune thrombocytopenic purpura – Pregnancy

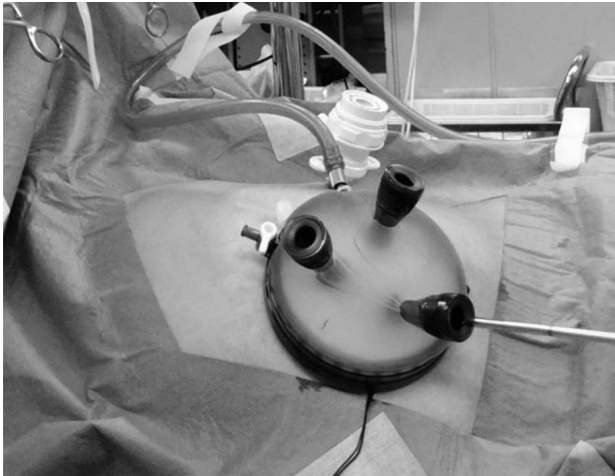
**I**mmune thrombocytopenic purpura (ITP) is an autoimmune disorder characterized by decreased platelet counts due to platelet destruction and the inhibition of platelet production, which is associated with immune mechanisms, such as the production of autoantibodies against platelets. ITP during pregnancy is a rare condition that occurs in 0.1% to 0.2% of all pregnancies.<sup>1</sup> It can lead to hemorrhagic complications due to gestational thrombocytopenia during delivery. Although ITP during pregnancy can usually be managed medically using corticosteroids or an intravenous injection of immunoglobulin,<sup>2</sup> a splenectomy is sometimes required when thrombocytopenia is severe and fails to respond to medical treatment. Patients who have low platelets that cannot be increased with medical treatments must undergo a splenectomy. A splenectomy results in the highest complete remission rate for ITP<sup>3,4</sup>; however, it should be avoided in the first trimester because there is also a high risk of miscarriage. Rather, the splenectomy should be performed during the second trimester.<sup>2,5,6</sup> Herein, we report the case of a pregnant woman with ITP who underwent a reduced port laparoscopic splenectomy (RPLS) with cosmetic benefits at 20 weeks of gestation that resulted in a safe delivery.

### Case Report

A 33-year-old female patient had a decreased platelet count that was detected 10 years earlier during a medical check-up. She had been followed-up, but no treatment had been given. The patient's history included 2 pregnancies that resulted in a miscarriage at the 12th week of gestation and a stillbirth at the 36th week of gestation. No abnormalities were detected during her current pregnancy, which was her third. The patient visited a nearby physician for morning sickness and atypical genital bleeding and was admitted to the hospital for an imminent abortion. According to the blood test results obtained at the initial visit, a significant

decrease in platelet count was observed at 20,000/ $\text{mm}^3$ , and the patient was admitted to the Department of Obstetrics and Gynecology of our hospital on suspicion of ITP complications at the 12th week of gestation. Further tests were performed, and the patient was diagnosed with ITP. Oral prednisolone (PSL; 15 mg/d) was administered at 13 weeks and 1 day of gestation. The dose was increased to 55 mg/d, but the platelet count did not exceed 6000/ $\text{mm}^3$ . Therefore, high-dose immunoglobulin therapy (20 g/d for 5 days) was concomitantly performed. Abdominal computed tomography images showed splenomegaly, and in the spleen volumetry, the estimated weight of the spleen was 199 mL. Considering that the continuation of the high-dose PSL administration was no longer appropriate due to the prospect of adverse drug reactions, the dose was tapered down to 20 mg/d. Subsequently, a laparoscopic splenectomy was scheduled. To prevent septicemia after the splenectomy, the patient received a pneumococcus vaccine 16 days before the operation. The platelet count was 44,000/ $\text{mm}^3$  at 19 weeks and 5 days of gestation. Therefore, high-dose immunoglobulin therapy was performed for 5 days, and a 3-port RPLS was conducted at 20 weeks and 4 days of gestation, resulting in a platelet count of 196,000/ $\text{mm}^3$ .

The patient was placed in the right semilateral position under general anesthesia. The fetal heart rate was 140 beats per minute after general anesthesia, and no change was observed after a change in position. A 2.5-cm incision was made on the lower umbilical fossa, and an enlarged uterus was observed. We planned to perform RPLS with a multichannel port and a 12-mm port; however, there was a possibility that the right-hand forceps would irritate the enlarged uterus. Therefore, we inserted a 5-mm port for the surgeon's right hand into the left costochondral region. The multichannel port was used with a 5-mm flexible laparoscope for the release of pressure at the spleen (Fig. 1). The pneumoperitoneal pressure was set to 8 mmHg, which was



**Fig. 1** Laparoscopic port placement: a multichannel port and a 12-mm port were inserted into the lower umbilical fossa, and a 5-mm port was inserted into the left costochondral region.

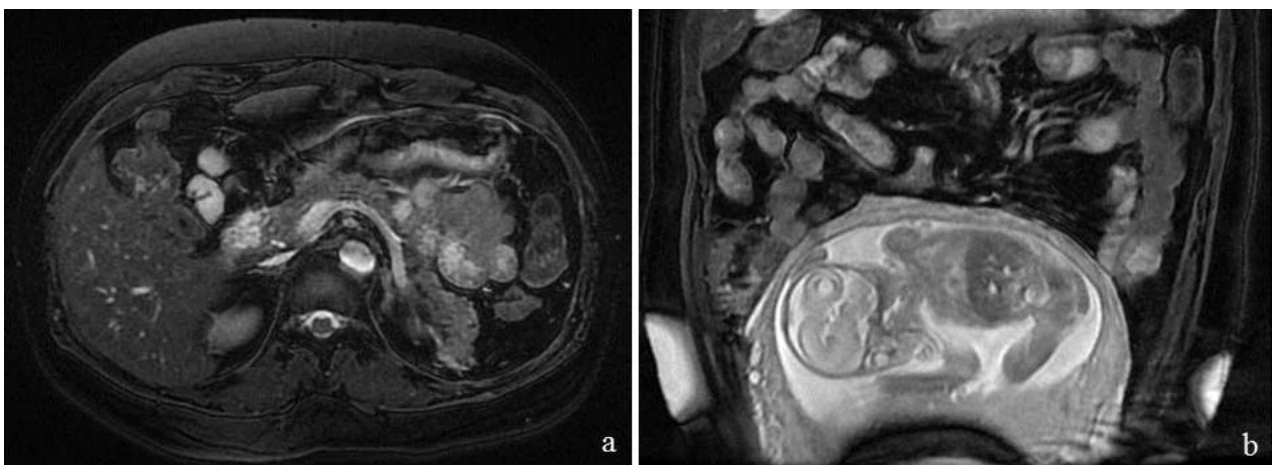
lower than that used for a typical operation. The overall procedures were similar to those performed in a conventional laparoscopic splenectomy using a 4-port technique. The splenocolic ligament and short gastric artery were separated using a vessel-sealing system, and the splenic artery and vein were transected with an endoscopic linear stapler. The excised spleen was placed in a retrieval bag, morcellated with Pean forceps, and removed from the abdomen. The skin was closed with absorbable sutures, and no drains were inserted.

The operation time and blood loss were 104 minutes and 1 mL. The resected splenic weight was 196 g. Splenectomy for ITP often results in tempo-

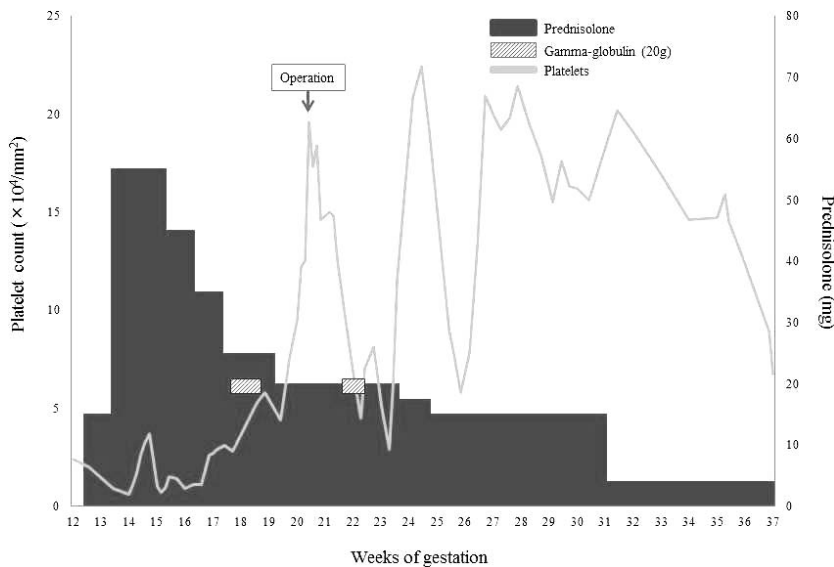
rary postoperative thrombocytopenia. Therefore, a 30-day postoperative hospital stay was required to check platelet counts and provide prompt treatment to the mother and fetus in case of thrombocytopenia. In this case, the patient was also carefully monitored, especially because of the pregnancy. The fetal heart rate was 160 beats per minute at the end of the operation, similar to what was observed before the operation. The postoperative course was uneventful. An intravenous administration of prednisolone sodium succinate was performed at 20 mg/d on the day of the operation and on postoperative day 1. On postoperative day 2, oral PSL was restarted at 20 mg/d. The platelet count on postoperative day 1 was 173,000/mm<sup>3</sup>. After abdominal magnetic resonance imaging was performed on postoperative day 8, no portal-vein thromboses were observed (Fig. 2). A decrease in the platelet count to 29,000/mm<sup>3</sup> was observed on postoperative day 20, and immunoglobulin (20 g/d) was administered for 3 days. The platelet count then increased to 208,000/mm<sup>3</sup>. The PSL was reduced to 15 mg/d, and the patient was discharged on postoperative day 30. The platelet count was sustained after the operation, and the course of the pregnancy was successful. The patient was able to deliver a healthy infant (female, 2238 g) via vaginal delivery at the 37th week of gestation (Fig. 3).

## Discussion

The proportion of highly bioactive fresh platelets is likely to be high in patients with ITP because of the level of platelet production in the bone marrow. This



**Fig. 2** Abdominal magnetic resonance imaging after RPLS. (a) No portal-vein thrombosis was observed. (b) An enlarged uterus and a growing fetus were observed in the second trimester of pregnancy.



**Fig. 3** Platelet count and medical treatment for thrombocytopenia until parturition.

level is increased metabolically due to the facilitation of platelet destruction, and the number of platelets and the tendency to bleed are not always directly related. In the current ITP treatment methodology, there is no need to separate pregnant and nonpregnant women. Our goal was to maintain a platelet count at or above  $30,000/\text{mm}^3$  throughout the pregnancy, and it is recommended to aim for a platelet count of  $50,000/\text{mm}^3$  or above during spontaneous delivery and of  $80,000/\text{mm}^3$  or above during a cesarean delivery or a delivery with epidural anesthesia.<sup>5,6</sup> The prognosis for ITP in pregnancy is satisfactory with corticosteroid therapy or high-dose immunoglobulin therapy, if necessary.<sup>2,6</sup> However, for patients with platelet counts less than  $10,000/\text{mm}^3$  and with some bleeding after corticosteroid therapy or high-dose immunoglobulin therapy during pregnancy, a splenectomy must be considered.<sup>4,7</sup> As for the timing of the splenectomy in pregnant women, the risk of miscarriage is high when the operation is performed during the first trimester, and the operation can be difficult during the last trimester due to the enlarged uterus. Hence, it is recommended that patients undergo the operation during the second trimester.<sup>2,5,6</sup>

Multiport laparoscopic surgery has become a standard method due to its many advantages, such as minimal damage to the abdominal wall compared with open surgery, reduced wound pain and wound complications, short duration of hospitalization, and early social rehabilitation.<sup>8,9</sup> Laparoscopic surgery has been successfully performed in pregnant women due to improvements in surgical skills

and clinical experiences. Its safety and efficacy in pregnant patients have been reported, especially in cases involving appendectomies and cholecystectomies.<sup>10,11</sup> In reported cases, there is no difference between laparoscopic surgery and open surgery in terms of fetal death or fetal malformation.<sup>12</sup> Laparoscopic surgery has also been recommended for splenectomy in pregnant patients with ITP.<sup>2,5</sup>

Recently, single-port surgery (SPS) has rapidly spread in various fields as a treatment method geared toward an aesthetic outcome. The authors introduced SPS in the treatment of cholecystolithiasis and a gastrointestinal stromal tumor in March 2009. Thereafter, they evaluated the outcomes of the Heller-Dor procedure, the Nissen procedure, colectomy, appendectomy, splenectomy, adrenalectomy, and partial hepatectomy.<sup>13–15</sup> Recently, in difficult SPS cases, such as a splenectomy, reduced port surgery (RPS) using a multichannel port as well as a small-diameter device with 1 port have been used. This study was designed in a similar manner because we believed that the same method could be used safely with this patient. However, the use of forceps through a multichannel port inserted from the lower abdomen may stimulate the enlarged uterus during pregnancy. Therefore, the port for the left hand of the surgeon was inserted in the left hypochondriac region, and the method was changed to RPLS with a reduced number of ports (reduced by 1) compared with a conventional laparoscopic splenectomy. Based on our experience with this case, we believe that SPS is not safe in pregnant patients with complications and that a

multiport or reduced port method may be safer. Monclova *et al*<sup>16</sup> reported that RPLS can be performed safely with less blood loss, similar to multiport surgery. In the case of a splenectomy, there was no difference in surgical outcomes between multiport surgery, RPLS, and SPS, except for surgical times; however, satisfaction with the postoperative wound appearance was reported to be equal between RPLS and SPS, and superior to multiport surgery.<sup>16</sup> The advantage of cosmetic appearance in RPS compared with multiport surgery has been reported in other areas of surgery, such as colorectal surgery and gastric surgery.<sup>17–19</sup> Kunisaki *et al*<sup>18</sup> reported that cosmetic satisfaction in the RPS group was significantly superior to that in the multiport surgery group in gastric surgery. Similarly, Liu *et al*<sup>19</sup> reported that RPS has better cosmetic results than multiport surgery, and this could also explain why the self-confidence of colorectal surgery patients in the RPS group improved at 6 months after the operation. Therefore, RPLS with a reduced number of ports would be beneficial to pregnant patients in terms of cosmetic appearance. In the current case, RPLS was safely performed, and the patient was highly satisfied with the cosmetic appearance.

In this case, RPS was performed with a focus on cosmetic satisfaction. The disadvantages of RPS compared with multiple-port surgery include an inadequate field of view and possible difficulties in hemostasis. In this case, we were prepared to add a port at any time in case of intraoperative difficulties, and we were able to perform RPS safely without any intraoperative trouble. We searched the PubMed database using the keywords “splenectomy,” “reduced port surgery,” and “pregnancy,” for the period between 1966 and May 2021, but found no other reports similar to our case. This is the first report of RPLS in a pregnant woman.

Although the effect of the pneumoperitoneum that develops during laparoscopic surgery in pregnant patients with complications is unknown, it can be problematic with respect to CO<sub>2</sub> absorption. Hunter *et al*<sup>20</sup> studied the effects of pneumoperitoneum on CO<sub>2</sub> in pregnant sheep. They found that the decreases in pH in both sheep and fetuses were a temporary phenomenon and concluded that the decreased pH did not cause significant harm to the fetus. Similar results have also been reported in other animal experiments.<sup>21</sup> However, we believe that it is important to set the pneumoperitoneum pressure according to the circulatory dynamics of the fetus during pneumoperitoneum. Hence, in this

case, we performed the operation with the pneumoperitoneum pressure at 8 mmHg. The Society of American Gastrointestinal Endoscopic Surgeons guidelines recommend that, for pregnant women, surgery should be performed at 8 to 12 mmHg in cases of pneumoperitoneum.<sup>22</sup>

## Conclusions

The results of our case suggest that RPLS can be performed safely during the second trimester in pregnant women with ITP that does not respond well to medical treatments, provided there is appropriate perioperative management and surgical skill. This procedure can be one of the most useful methods, as the maternal platelet count can be safely controlled during pregnancy and delivery.

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## References

1. Gill KK, Kelton JG. Management of idiopathic thrombocytopenic purpura in pregnancy. *Semin Hematol* 2000;**37**(3):275–289.
2. Provan D, Stasi R, Newland AC, Blanchette VS, Bolton-Maggs P, Bussell JB *et al*. International consensus report on the investigation and management of primary immune thrombocytopenia. *Blood* 2010;**115**(2):168–186.
3. Kubota K, Kobayashi A, Yokoyama T, Kikuchi N, Kitagawa N, Furusawa N *et al*. Laparoscopic splenectomy using a low-pressure pneumoperitoneum for the treatment of immune thrombocytopenic purpura during pregnancy: a case report. *Shinshu Med J* 2014;**62**(6):441–446.
4. Anglin BV, Rutherford C, Ramus R, Lissner M, Jones DB. Immune thrombocytopenic purpura during pregnancy: laparoscopic treatment. *JLS* 2001;**5**(1):63–67.
5. British Committee for Standards in Haematology, General Haematology Task Force. Guidelines and management of idiopathic thrombocytopenic purpura in adults, children and in pregnancy. *Br J Haematol* 2003;**120**(4):574–596.
6. Neunert C, Lim W, Crowther M, Cohen A, Solberg L Jr, Crowther MA. The American Society of Hematology 2011

- evidence-based practice guideline for immune thrombocytopenia. *Blood* 2001;**117**(16):4190–4207.
7. Ali R, Ozkalemkas F, Ozcelik T, Ozkocaman V, Ozan U, Kimya Y *et al*. Idiopathic thrombocytopenic purpura in pregnancy: a single institutional experience with maternal and neonatal outcomes. *Ann Hematol* 2003;**82**(6):348–352.
  8. McMahon AJ, Russell IT, Baxter JN, Ross S, Anderson JR, Morran CG *et al*. Laparoscopic versus minilaparotomy cholecystectomy: a randomized trial. *Lancet* 1994;**343**(8890):135–138.
  9. Berggren U, Gordh T, Grama D, Haglund U, Rastad J, Arvidsson D. Laparoscopic versus open cholecystectomy: hospitalization, sick leave, analgesia and trauma responses. *Br J Surg* 1994;**81**(9):1362–1365.
  10. Buser KB. Laparoscopic surgery in the pregnant patient: results and recommendations. *JLS* 2009;**13**(1):32–35.
  11. Sadot E, Telem DA, Arora M, Butala P, Nguyen SQ, Divino CM. Laparoscopy: a safe approach to appendicitis during pregnancy. *Surg Endosc* 2010;**24**(2):383–389.
  12. Reedy MB, Kallen B, Kuehl TJ. Laparoscopy during pregnancy: a study of five fetal outcome parameters with the use of the Swedish Health Registry. *Am J Obstet Gynecol* 1997;**177**(3):673–679.
  13. Sasaki A, Ogawa M, Tono C, Obara S, Hosoi N, Wakabayashi G. Single-port versus multi-port laparoscopic cholecystectomy: a prospective randomized clinical trial. *Surg Laparosc Endosc Tech* 2012;**22**(5):396–399.
  14. Sasaki A, Nitta H, Otsuka K, Nishizuka S, Baba S, Umemura A *et al*. Laparoendoscopic single site adrenalectomy: initial results of cosmetic satisfaction and the potential for postoperative pain reduction. *BMC Urology* 2013;**13**:21.
  15. Sasaki A, Nitta H, Otsuka K, Fujiwara H, Takahara T, Wakabayashi G. Single-port versus multiport laparoscopic resection for gastric gastrointestinal stromal tumors: a case-matched comparison. *Surg Today* 2014;**44**(7):1282–1286.
  16. Monclova JL, Targarona EM, Vidal P, Peraza Y, Garcia F, Otero CR *et al*. Single incision versus reduced port splenectomy—searching for the best alternative to conventional laparoscopic splenectomy. *Surg Endosc* 2013;**27**(3):895–902.
  17. Takahashi H, Hamabe A, Hata T, Nishizawa Y, Nishimura A, Ito M *et al*. Prospective multicenter study of reduced port surgery combined with transvaginal specimen extraction for colorectal cancer resection. *Surg Today* 2020;**50**(7):734–742
  18. Kunisaki C, Ono HA, Oshima T, Makino H, Akiyama H, Endo I. Relevance of reduced-port laparoscopic distal gastrectomy for gastric cancer: a pilot study. *Dig Surg* 2012;**29**(3):261–268
  19. Liu R, Wang Y, Zhang Z, Li T, Liu H, Zhao L *et al*. Assessment of treatment options for rectosigmoid cancer: single-incision plus one port laparoscopic surgery, single-incision laparoscopic surgery, and conventional laparoscopic surgery. *Surg Endosc* 2017;**31**(6):2437–2450
  20. Hunter JG, Swanstrom L, Thornberg K. Carbon dioxide pneumoperitoneum induces fetal acidosis in a pregnant ewe model. *Surg Endosc* 1995;**9**(3):272–279.
  21. Curet MJ, Voqt DA, Schob O, Qualls C, Izquierdo LA, Zucker KA. Effects of CO<sub>2</sub> pneumoperitoneum in pregnant ewes. *J Surg Res* 1996;**63**(1):339–344.
  22. Guidelines for laparoscopic surgery during pregnancy. Society of American Gastrointestinal Endoscopic Surgeons (SAGES). *Surg Endosc* 1998;**12**(2):180–190.