INTRODUCTION

Abdominal pregnancies account for approximately 1% of all ectopic pregnancies and are one of the leading causes of maternal morbidity and mortality. Colonic implantation is a very rare form of abdominal pregnancy, with only a few cases reported in the literature. Such cases pose a challenge to the clinician and require a high level of suspicion to avoid potential complications.

The management of abdominal or colonic pregnancy should be individualized based on the implantation site, gestational age, the viability of the fetus, and the hemodynamic status of the patient. It can involve medical or surgical management or a combination of both.

In this article, we report a case of abdominal pregnancy with attachment on the ascending colon. The successful management of the patient included removing the pregnancy product and postoperative administration of methotrexate. To the best of our knowledge, this is the first documented case of abdominal pregnancy on the ascending colon.

CASE HISTORY

A 25-year-old woman presented to the emergency department with lower abdominal pain. The pain started a few days ago, gradually increased in intensity, and was not associated with other symptoms such as nausea or vomiting. Her last menstrual period was 60 days ago, and she denied vaginal bleeding. Her medical, family, and allergic history were unremarkable apart from one previous cesarean section (G5P3L3A2). The patient consumes about 10 cigarettes a day.

On physical examination, the patient was hemodynamically stable with no fever. Her abdominal examination revealed diffuse tenderness in the lower abdomen, which was pronounced in the right iliac fossa. No signs of peritoneal irritation or abdominal guarding were noted. Paravertebral percussion was negative bilaterally. Vaginal examination showed a closed cervix with motion tenderness. No blood or secretions were seen.

On further investigation, transvaginal ultrasonography was performed and showed an empty uterine cavity. Next to the right adnexa, we noted a cystic structure of 4×5 cm with cardiac embryonal activity (Figure 1). The estimated...
gestational age was 6 weeks. The left adnexa was normal, and there was no free fluid in the pouch of Douglas. The level of beta-human chorionic gonadotropin (βHCG) was 12,300 mIU/ml, which was within the expected range for the estimated gestational age. All other blood results were within the normal limit.

3 | OUTCOME AND FOLLOW-UP

Based on the clinical, laboratory, and imaging findings, the diagnosis of abdominal pregnancy was established. After a thorough discussion with the patient and her husband, they opted for surgical therapy. Two units of red blood cells were made available on standby. The laparotomy over a Pfannenstiel incision showed a normal-sized uterus with normal adnexa bilaterally. With further local exploration, the gestational sac was found attached to the ascending colon. The sac was successfully removed from its attachment site (Figure 2A). No significant bleeding or bowel perforation occurred, so we left the attachment site without further manipulation (Figure 2B).

Postoperatively, 50 mg/kg of methotrexate was administered intramuscularly. The patient recovered uneventfully and could be discharged home a few days later. The βHCG values dropped from 43,000 mIU/ml postoperatively to 200 mIU/ml after 1 week and 3 mIU/ml after 2 weeks. Further measurements were negative.

4 | DISCUSSION

First described in 1708 as an autopsy finding,6 ectopic abdominal pregnancy is defined as the implantation of the placenta anywhere in the abdominal cavity, except the fallopian tubes, ovaries, and uterine ligaments. It is considered an extremely rare and serious condition that represents about 1% of all ectopic pregnancies, with maternal mortality rates being seven to eight times greater than tubal ectopic pregnancy and 90 times greater than intrauterine pregnancy.1,8,9 Mortality is related to severe hemorrhage, diffuse intravascular coagulation, or bowel obstruction or perforation.4 In addition, perinatal mortality can reach 40%–95% in advanced gestational ages.10

Differentiating primary and secondary cases of abdominal ectopic pregnancy has always been in debate. The criteria of primary abdominal pregnancy were initially described by Studdiford in 1944: The pregnancy is located on the peritoneal surface with normal tubes and ovaries and no evidence of secondary implantation.11 On the other side, secondary abdominal pregnancy occurs when the pregnancy is expelled from the fallopian tube or other sites of primary development to continue growing

**FIGURE 1** Transvaginal ultrasound examination showing the pregnancy product lateral to the right adnexa. The cystic structure measured about 5 × 4 cm and contained a living fetus. It was not possible to exactly localize the implantation site using ultrasonography alone.

**FIGURE 2** (A) The pregnancy sac after removal from the attachment site and extraction out of the abdomen. (B) The attachment site on the anterior wall of the ascending colon showing the placental remnants with blood clots. The bowel wall was not manipulated to avoid iatrogenic injury.
| No. | Author                  | Year | Site of implantation | Gestational age (weeks) | Management                                                                 | Complications                                                                 | Maternal survival | Fetal survival |
|-----|-------------------------|------|----------------------|-------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------|----------------|
| 1   | Masterson & Baum        | 1956 | Sigmoid              | NA                      | Sigmoid colostomy                                                         | Abdominal dehiscence, infection, gas gangrene                                | No                | Yes            |
| 2   | Babić et al.            | 1976 | Sigmoid              | 39                      | Placenta left in situ due to severe local infiltration                    | None                                                                         | Yes               | Yes            |
| 3   | Bornman et al.          | 1985 | Sigmoid              | 34                      | Resection of the placenta and sigmoid colon, anastomosis, colostomy        | Postoperative pelvic abscess                                                  | Yes               | Yes            |
| 4   | Ganeshselvi et al.      | 2003 | Sigmoid              | 1                       | Biopsy of the already ruptured lesion with serosal repair                 | None                                                                         | Yes               | No             |
| 5   | Biswas et al.           | 2008 | Sigmoid              | 34                      | Delivering of the fetus and attempt to separate the placenta              | Uncontrollable intraoperative bleeding                                        | No                | Yes            |
| 6   | Yildizhan et al.        | 2009 | Sigmoid              | 13                      | Removal of the pregnancy and placenta                                     | None                                                                         | Yes               | No             |
| 7   | Dabiri et al.           | 2014 | Sigmoid              | 33                      | Removal of placenta with hysterecotomy because of massive bleeding        | ICU admission, mechanical ventilation                                         | Yes               | Yes            |
| 8   | Dubey et al.            | 2016 | Sigmoid              | 10                      | Spontaneous separation of the placenta, bleeding ceased without intervention | Presentation with hemorrhagic shock                                          | Yes               | No             |
| 9   | Zhang et al.            | 2017 | Splenic flexure      | 4                       | Removal of the bleeding mass, two doses of methotrexate                   | None                                                                         | Yes               | No             |
| 10  | Trail et al.            | 2018 | Hepatic flexure      | 6                       | Non-bleeding lesion detected at laparoscopy, no resection, two doses of methotrexate | None                                                                         | Yes               | No             |
| 11  | Sar et al.              | 2018 | Sigmoid              | 16                      | Right adnexectomy, appendectomy, colostomy                                | Abdominal dehiscence after 1 week                                            | Yes               | No             |
| 12  | Fessehaye et al.        | 2021 | Sigmoid              | 25                      | Removal of the mass, segmental resection, and anastomosis due to bowel injury | None                                                                         | Yes               | No             |
| 13  | Suleiman et al.         | 2022 | Ascending colon      | 6                       | Removal of the pregnancy, one dose of methotrexate                        | None                                                                         | Yes               | No             |

Abbreviations: ICU, intensive care unit; NA, not available.
in the abdominal cavity. In most cases, it follows the early rupture of a tubal ectopic pregnancy, with an incidence of one in 10,000 live births.\(^3\) Our case is considered a primary abdominal pregnancy because the adnexa was intact bilaterally and the gestational sac was attached to the ascending colon.

The obstetric ultrasound is the primary modality for diagnosing abdominal pregnancy.\(^12\) Allibone et al. outlined the sonographic criteria for diagnosing abdominal pregnancy which include 

1. demonstration of a fetus in a gestational sac outside the uterus, or the depiction of an abdominal or pelvic mass identifiable as the uterus separate from the fetus;
2. failure to see a uterine wall bilaterally and the gestational sac was attached to the ascendency.
3. recognition of a close approximation of the fetus to the maternal abdominal wall; and
4. localization of the placenta outside the confines of the uterine cavity.\(^13\) The preoperative ultrasonography in our case fulfilled the first three criteria. Therefore, the diagnosis of an abdominal pregnancy could be made preoperatively, but without identifying its exact location.

Abdominal ectopic pregnancies occur most commonly adjacent to the uterus in an appropriate site for implantation. This is why the most common sites of abdominal pregnancies are the pouch of Douglas, mesosalpinx, and omentum,\(^14\) with intestinal pregnancies being much less common. We suggest two explanations for the rarity of intestinal pregnancies: mechanical and vascular. Mechanical factors involve the smooth surface of the intestinal serosa which does not provide an optimal environment for implantation compared with the mucosal folds of the fallopian tubes or the relatively rough surface of the omentum. Since the embryo implants where the blood supply is better,\(^2\) vascular factors involve the sparsity of blood vessels on the intestinal surface. Concerning the gastrointestinal tract, structures located in the lower abdomen, such as the sigmoid colon, are more frequently involved than upper abdominal organs, such as the ascending, transverse, or descending colon.\(^2\)

**Table 1** shows the reported cases of ectopic pregnancy with primary colonic implantation. With only two documented cases on the splenic and hepatic flexures of the colon,\(^5,15\) this case is the first one documenting abdominal pregnancy on the ascending colon. Interestingly, implantation on the sigmoid colon was seen in 10 cases (77%), whereas other locations constituted the remaining 23%. According to this review, maternal and fetal survival rates after colonic pregnancy equaled 85% and 38%, respectively. It is worth mentioning that there are 14 reported cases of tubal or abdominal pregnancies that were associated with placental erosion on the gastrointestinal tract with resulting complications. These were not included in the review and we refer the interested reader to the paper of Pichaichanlert et al.\(^2\) Another case was excluded because the ectopic pregnancy appeared preoperatively on the ascending colon but was actually located on the greater omentum.\(^16\)

The optimal management of early abdominal pregnancy has always been controversial. As the table shows, these cases can be treated medically, surgically, or with a combination of both. The management is determined according to the gestational age at diagnosis, the viability of the fetus, and maternal hemodynamic status.\(^4\) Medical management is usually applied in early gestational age and when surgery may be associated with a life-threatening hemorrhage, whereas surgery is reserved for hemodynamic instability or proximity of the pregnancy to the vital organs.\(^4,5\)

The initial findings in our case suggested an abdominal pregnancy on the peritoneal surface next to the adnexa. Therefore, we chose an open approach with a Pfannenstiel incision, although a midline incision may be more appropriate for adequate exploration in advanced-age abdominal pregnancy. Laparoscopy is regarded as a feasible option for managing ectopic pregnancy when the required experience is available.\(^16\) For logistic and organizational reasons in our hospital, laparoscopy is only available for elective cases during the day and is not available for emergency operations or during the night shifts. Resource shortage in the developing countries may alter the surgical approach and necessitate laparotomy as highlighted by Tolefac et al.\(^4\)

Concerning the management of the placenta, this ranges from leaving it in situ to partial or complete removal.\(^17\) The latter may be associated with bowel injury that requires further repair, thus increasing morbidity and mortality.\(^2\) On the contrary, leaving the placenta in situ can be an attractive option: iatrogenic injuries are avoided and, “... βHCG level can regress to a normal value within a month” according to Kun et al.\(^18\) Adjuvant methotrexate can be considered to accelerate placental regression, which leads to faster normalization of βHCG.\(^5\) To avoid colonic injury, we did not manipulate the implantation site and chose to administer methotrexate postoperatively. After successful management, the values of βHCG should be followed closely until it becomes undetectable. Secondary ectopic pregnancy should be suspected in cases of persistent elevation.\(^15\)

**5 | CONCLUSION**

The colon is a rare implantation site of ectopic abdominal pregnancies, with the sigmoid colon being the most
common location. Abdominal pregnancies can be managed conservatively in early and stable cases, or operatively in advanced or complicated cases. Management decisions should consider minimizing bleeding complications and avoiding iatrogenic injuries.

AUTHOR CONTRIBUTIONS
RS operated and followed the patient, gathered the data, researched the literature, and wrote the first draft. DA reviewed the article for scientific adequacy and controlled the references. MFS wrote the figure captions, edited the discussion, and organized the table. All authors reviewed and approved the final manuscript before submission.

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CONFLICT OF INTEREST
The authors declare that there is no conflict of interest to be reported.

DATA AVAILABILITY STATEMENT
All data generated during this study can be accessed through direct communication with the corresponding author and the agreement of all research team members.

CONSENT
Written informed consent was obtained from the patient to publish this report in accordance with the journal’s patient consent policy.

ORCID
Riham Suleiman https://orcid.org/0000-0002-3335-5022
Mhd Firas Safadi https://orcid.org/0000-0002-7386-1640

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