

Case report

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## ACUTE APPENDICITIS IN POSTPARTUM PERIOD: A DIAGNOSTIC CHALLENGE

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Acute appendicitis in pregnancy and puerperium is the most common cause of a nonobstetric condition that requires urgent surgery. Contrary to appendicitis during pregnancy, reports on appendicitis during delivery and early puerperium are sparse. Most common infections of puerperium include puerperal endometritis, infections of the urinary tract, adnexal torsion, tubo ovarian abscess, ovarian vein thrombosis, sepsis, pelvic thrombophlebitis, pyelonephritis, pneumonia and cholecystitis. Correctly diagnosing acute appendicitis in pregnancy and puerperium is difficult because of diminished symptoms and signs due to distension of the abdominal wall, dislocation of abdominal organs and reduced tissue response to inflammation. Main symptoms of appendicitis during pregnancy are vomiting, anorexia, nausea, fever and lower right abdominal pain and flank pain. Appendicitis may cause refractory postpartal sepsis and it must be considered in postpartal septic patients without other obvious cause, which requires multidisciplinary approach and involvement of obstetricians and surgeons.

Key words: appendicitis, pregnancy, puerperium

Prikaz bolesnika

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## AKUTNI APENDICITIS U POSTPARTALNOM PERIODU: DIJAGNOSTIČKI IZAZOV

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Apendicitis u trudnoći i puerperijumu je najčešći uzrok neginekološkog ili akušersko povezanog oboljenja koje zahteva hitnu hirušku intervenciju. Za razliku od apendicitisa u trudnoći, mali broj radova se bavi apendicitisom u porođaju i ranom puerperijumu. Najčešće infekcije u puerperijumu su puerperalni endometritis, infekcije urinarnog trakta, adneksalna torzija, tuboovarijalni abscesi, tromboza ovarijalnih vena, sepsa, pelvični tromboflebitis, pijelonefritis, pneumonija i holecistitis. Teškoće u dijagnostikovanju akutnog apendicitisa u trudnoći i puerperijumu nastaju zbog: oslabljenih simptoma i znakova usled distenzije trbušnog zida, dislokacije intraabdominalnih organa i smanjenog tkivnog odgovora na upalu. Glavni simptomi apendicitisa u trudnoći uključuju povraćanje, anoreksiju, mučninu, povišenu telesnu temperaturu, tahikardiju i bol u donjem desnom kvadrantu ili boku. Apendicitis može biti uzrok neprepoznate refraktorne sepse u postpartalnom periodu, te kod pacijenata posle porođaja bez očiglednog fokusa sepse treba imati na umu upalu slepog creva, te je neophodan timski rad ginekologa i hirurga.

Ključne reči: apendicitis, trudnoća, puerperijum

## Introduction

Acute appendicitis in pregnancy and puerperium is the most common cause of a nonobstetric condition that requires urgent surgery (1). Appendix perforation is more frequent during pregnancy, with an incidence of 55%, compared to 4-19% in the general population (most commonly in children and the elderly, regardless of gender) (1,2). Appendicitis is less common in early puerperium than in pregnancy. Most common infections in puerperium are puerperal endometritis, urinary tract infections, and axial torsion, tuboovarian abscess, ovarian vein thrombosis, sepsis, pelvic thrombophlebitis, pyelonephritis, pneumonia and cholecystitis (3). Appendicitis during pregnancy may take a fulminant course for many reasons: increased vascularisation of the pelvis and appendix displacement may accelerate strangulation, while increased local lymph drainage and decrease in omentum mobility due to the enlarged uterus may favour systemic spreading of inflammation. Signs and symptoms of appendicitis during pregnancy can be absent; anatomic changes may mask classical appendicitis signs and symptoms, reducing the probability of a correct diagnosis (4). Difficulties in diagnosing acute appendicitis in pregnancy occur because of diminished signs and symptoms due to the distension of the abdominal wall, dislocation of abdominal organs, reduced tissue response to inflammation, appendix displacement. Nausea, vomiting and abdominal pain are common during normal pregnancy, especially in the first trimester (5). Main symptoms of appendicitis in pregnancy include: vomiting, anorexia, nausea, fever, tachycardia, lower right quadrant or flank pain (6,7). Appendicitis in pregnancy increases the rate of miscarriages, premature births, "small for date" newborns and neonatal mortality during the first seven days after birth (8). Laparoscopic appendectomy is the treatment of choice (7).

## Case report

First patient was a 30 year old patient in her first pregnancy, who was admitted to the Obstetrics department of General hospital in Pirot, 40 weeks gestation, because of lower abdominal pain and with lower limb oedema, more pronounced on the right leg. Previous course of pregnancy was normal. She underwent clinical, ultrasound and cardiotocographic examinations. Blood test were normal, and urine sample showed proteinuria of 0.15g/l, 10 to 15 erythrocytes, 50 to 60 leukocytes, lots of urine squamous epithelial cells and lots of bacteria. Urine culture was requested and Cefuroxime 1,5g/8h initiated. Labour was stimulated with syntocinon in the expulsion phase and completed vaginally. At the end of the fourth delivery phase she reports dizziness, weakness, headache; she is hypotensive 60/40mmHg, with filiform pulse. She received 1l of crystalloids through two i.v. lines. Bimanual examination and ultrasound examination were normal. No bleeding was apparent, uterus was contracted with the fundus at the umbilical level. Her condition improved, but thirty minutes later she reported dizziness, and headache again. Urgent blood count was performed: Erythrocytes  $2.92 \times 10^{12}/\mu\text{L}$ , haemoglobin 86g/l, hematocrite 25.25%, leukocytes  $27.9 \times 10^9/\mu\text{L}$ , platelets  $247 \times 10^{12}/\mu\text{L}$ , protein 51g/l, albumin 28g/l. Patient then stabilized, with a blood pressure of 115/70mmHg and pulse 90/min. Two units of blood and a 50ml of

20% albumin was ordered. Specialists of internal medicine, neurology and infectology were consulted, and blood sample obtained again, urinary catheter placed and diuresis monitored. Procalcitonin was 0.54 ng/ml, D dimer 6000ng/ml, leucocytes  $23.14 \times 10^9/\text{uL}$ , eritrocytes  $3.05 \times 10^{12}/\text{uL}$ , haemoglobin 85g/l, hematocrit 28.3%, platelets  $227 \times 10^{12}/\text{uL}$ . Infectious disease specialist was consulted because procalcitonin didn't decrease – 0.53ng/ml. Abdominal surgeon found the clinical finding on the abdomen unremarkable and Doppler ultrasound of the lower limbs was also normal. Urine cultures were sterile in both samples taken. Procalcitonin levels remained largely unchanged on the third day – 0.49ng/ml, so Ciprofloxacin 2x500mg was added. General urine examination was now normal. On the fourth postpartal day patient reported a sudden onset abdominal pain in the lower right quadrant, she is nauseous without vomiting, feverish with a temperature of 37.5 °C. Internal medicine specialist and a general surgeon were consulted, ultrasound of the abdomen and of the ileocecal region was performed: a blind ended tubular structure 11mm in diameter and 5.5cm in length with a subserous oedema – a finding consistent with acute appendicitis. Enlarged mesenterial lymph nodes measuring 11x16mm were found. Control laboratory showed leukocytosis with  $21,3 \times 10^9/\text{uL}$  leucocytes and neutrophilia of 87.2%, procalcitonin 0.26ng/ml. Patient was transferred to general surgery department and a surgery was performed on the same day. Altered appendix was found during surgery, with lymphadenopathy in the mesenterium and a small amount of ascites in the Douglas recessus. An antegrade appendectomy was performed with haemostasis and suture and tissue was sent to pathology. Two antibiotics, analgetics, thrombopropylaxis, along with rehydration were administered. Postoperative course was uneventful. Control laboratory studies, gynecologicas and ultrasound examinations were normal, that patient was discharged in a good general condition. Pathohistological examination showed purulent phlegmonogangrenous appendicitis.

Second case is a 21 year old primiparous woman who was admitted because of a postterm pregnancy, an urgent cesarean section was performed due to imminent foetal asphyxia and posterior occipital presentation. She was discharged in a good condition. 14 days after delivery she reported pain in the upper abdomen that spread to the entire abdomen. She is nauseous, anorexic and with a fever of 38,5°C and with diarrhea. She was initially examined by a surgeon and a gynecologist and discharged home. Eight days later she presented in the emergency department of General hospital Pirot, when she is pale, adynamic, with a axillar temperature od 37.7 °C and rectal temperature of 38.5 °C. Blood pressure was 120/70mmHg, heart rate of 100/min. All clinical signs of appendicitis were negative. Following blood tests were performed: Leu-  $16,06 \times 10^9/\text{uL}$ , Er- $3,39 \times 10^{12}$ , Hgb-98 g/l, HCT-29,3%, Tr- $368 \times 10^9/\text{L}$ , PCT-0,07ng/ml, D-dimer 6783,33ng/ml, CRP 215,9mg/L. Abdominal ultrasound discovered interintestinal ascites in the right iliac portion of the abdomen and in the Douglas pouch along with meteorismus. Computed tomography of the abdomen and pelvis showed an irregular hypodense structure in the lower right quadrant, containing cecum and the terminal ileum en bloc, with a possible intraluminal haemorrhage. Liquid was present around the formation. A large number of enlarged lymph nodes was present in the right retroperitoneum and along the branches of the superior mesenteris artery. Ascites is present in the Morison pouch and in the right paracolic gutter. Surgery was performed on the same day. En bloc abscess in the right inguinal fossa, with a size of two male fists which contains ileum,

terminal ileum and cecum. After careful preparation pus is drained out of the abscess cavity, around two deciliters, and it was sent to a microbiological examination. Small intestines were washed and cecum bottom was explored, but only a tip and a coprolite was found, appendix was missing. Location of the base was sutured. Drainage was inserted into the Douglas pouch and retrocecaly. Antibiotics, antisecretory drug, analgetics and crystaloids were administered. She was discharged on the seventh postoperative day stable, and was feeling well on her scheduled ambulatory control.

## Discussion

Evidence is lacking that pregnancy increases the incidence of appendicitis. Incidence of appendicitis in pregnancy is between 1:1200 and 1:1500 of all pregnancies, with a pick of incidence in the second trimester (9). Early puerperal appendicitis is less frequent, with regional differences and a trend of decreasing incidence (3). Contrary to appendicitis during pregnancy, there is very little data on appendicitis around the delivery and in early puerperium. A large cohort study in England in 2015. Showed that incidence of appendicitis in the postpartal period is the same to general population and is IRR, 1.01; 95% CI, 0.81–1.26 in women aged 15 to 34, but is slightly higher in women older than 34 (IRR, 1.84; 95% CI, 1.18–2.86) (10). According to the most probable theory appendicitis is caused by a mechanical obstruction of the appendix lumen, either by stagnant feces, lymphoid hyperplasia or a parasite infection of the appendix wall (11). Diagnosing appendicitis in pregnancy is difficult, especially in second half of pregnancy, during labour and in first days after childbirth (4), because of anatomic and physiologic changes that occur during pregnancy and puerperium and that must be accounted for when interpreting anamnestic data and results of clinical examination. Uterus enlarges twentyfold during pregnancy, stretching ligaments and muscles and pressuring abdominal structures and layers of the abdominal wall, decreasing its tone, even several weeks after childbirth (12). Typical features of an acute surgical condition; tenderness and stiffness of the abdomen, are absent or diminished early after delivery. There is a high concentration of circulating estradiol, progesterone, estriol and glucocorticoids diminish tissue response to inflammation, thus masking early signs of infection and its localization (13). Constant abdominal pain is the most frequent, and pain in the lower right quadrant is the most reliable symptom (present in 84% of patients) (14). Main symptoms of appendicitis during pregnancy include vomiting, anorexia, nausea, fever, tachycardia and lower right quadrant and flank pain (9). Nausea should raise suspicion, because early pregnancy nausea and vomiting is usually self limiting and limited to the first trimester. Appendix returns to its original position ten days after delivery, to the McBurney's point (7). Classical migration of pain strongly suggests appendicitis and is present in 50% of patients (4). Some of the classical signs of appendicitis, such as Roving's, Alder's sign, obturator sign and psoas sign are not highly sensitive, but are specific (15). Mid axillary temperature for proven appendicitis is between 37.2°C and 37.8°C (present in 50% of cases), but can be as high as 39°C in cases of perforation and diffuse peritonitis (16). Increased heart rate is of similar positive predictive value and is not a sensitive sign (9). Average leucocyte count after delivery is  $13.39 \times 10^9$  uL, with significant differences regarding the modality of delivery (vaginal birth, vaginal assisted delivery or cesarean section) (17). White blood cell count of over  $16 \times 10^9$  uL should raise suspicion. C reactive protein values

are increased during pregnancy, mechanism of the increase is unknown, and it persists till after delivery, with a peak on the second day after childbirth (18). We followed procalcitonin levels. Conclusions of a cohort study in Geneva during 2009. Were that a level of 0,25 µg/l should be used during the third trimester and delivery (19). As an uninvasive test, abdominal ultrasound is the diagnostic tool of choice. It has a high level of precision during the first and the second trimester, which decreases in the third trimester. A non-compressible dead ended tubular structure in the lower right quadrant with a diameter greater than 6mm is considered diagnostic (20). Sensitivity is between 75 and 100%, but only 40 to 50% specific (14). Perforative appendicitis is a cause of preterm delivery, and may have initiated the delivery in our case, although the patient didn't report any abdominal pain. There is anecdotal data on conservative antibiotic treatment of perforative appendicitis in pregnancy. Symptoms of appendicitis may have been masked because of antibiotic treatment.

#### Conclusion

Appendicitis may be causative of refractory sepsis in the postpartum period, and should be considered when a cause of sepsis is not evident. Due to changes in physiology, diagnosis of appendicitis in pregnancy and early puerperium is difficult, and should be considered whenever abdominal pain is present. Inadequate and untimely diagnosis and therapy may lead to severe complications for the mother, and a team approach by surgeons and obstetricians is required.

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## References

1. Franca Neto AH, Amorim MM, Nóbrega BM. Acute Appendicitis in Pregnancy: literature review. *Rev Assoc Med Bras* 2015; 61(2): 170-7.
2. Körner H, Söndena K, Söreide J, et al. Incidence of Acute Nonperforated and Perforated Appendicitis: Age-specific and Sex-specific Analysis. *World J. Surg* 1997; 21:313-7.
3. Wadhawan D, Singhal S, Sarda N, Arora R. Appendicitis in Postpartum Period: A Diagnostic Challenge. *J Clin Diagn Res* 2015;9(10):QD10-1.
4. Andersen B, Nielsen T. Appendicitis in Pregnancy:., Diagnosis, Management and Complications. *Acta Obstet Gynecol Scand* 1999;78(9):758-62.
5. Akin T, Birben B, Akkurt G, et al. Acute Appendicitis During Pregnancy: A Case Series of 42 Pregnant Women *Cureus* 2021;13(8):e17627.
6. Tamir IL, Bongard FS, Klein SR. Acute Appendicitis in the Pregnant Patient. *Am J Surg* 1990; 160: 571-6.
7. Pastore P, Loomis DM, Sauret J. Appendicitis in Pregnancy. *The Journal of the American Board of Family Medicine* November 2006; 19 (6): 621-6.
8. Guttman R, Goldman RD, Koren G. Appendicitis During Pregnancy. *Can Fam Physician*. 2004;50:355-7.
9. Brown JS, Wilson C, Coleman S, Joypaul BV. Appendicitis in Pregnancy: an ongoing diagnostic dilemma. *Colorectal Disease* 2009;11(2):116-22.
10. Zingone F, Alyshah A, David J et al. Risk of Acute Appendicitis in and Around Pregnancy: Population-based Cohort Study From England. *Annals of Surgery* 2015: V 261 (2); 332-7
11. Apton Duque G, Oladipo AF, Lotfollahzadeh S. Appendicitis in Pregnancy. StatPearls Publishing; 2024.
12. Stone K. Acute Abdominal Emergencies Associated with Pregnancy. *Clinical Obstetrics and Gynecology* 2002;45(2):553-61.
13. Dionne P, Robinson S, L. Klein. Pregnancy and Pregnancy-associated Hormones Alter Immune Responses and Disease Pathogenesis. *Hormones and Behavior* 2012: V 62 ( 3); 263-71.
14. Zhang Y, Zhao Y, Qiao J. Diagnosis of Appendicitis During Pregnancy and Perinatal Outcome in the Late Pregnancy. *Chinese Medical Journal* 2009. 122(5):p 521-24
15. Yale S, Tekiner H, Yale ES. Physical Examination and Appendiceal Signs During Pregnancy. *Cureus* 2022 ; 13;14(2):e22164.
16. Nunnelee JD, Musselman R, Spaner SD. Appendectomy in Pregnancy and Postpartum: analysis of data from a large private hospital. *Clin Excell Nurse Pract* 1999;3(5):298-301.
17. Arbib N, Aviram A, Gabbay Ben-Ziv R, Sneh O, Yogev Y, Hadar E. The Effect of Labor and Delivery on White Blood Cell Count. *J Matern Fetal Neonatal Med*. 2016 Sep;29(18):2904-8.

18. Mertens K, Muys J, Jacquemyn Y. Postpartum C-Reactive Protein: A Limited Value to Detect infection or inflammation. *Facts Views Vis Obgyn* 2019 ;11(3):243-50.
19. Paccolat C, Harbarth S, Courvoisier D, Irion O, de Tejada BM. Procalcitonin Levels During Pregnancy, Delivery and Postpartum. *J Perinat Med* 2011;39(6):679-83.
20. Mostbeck, G., Adam, E.J., Nielsen, M.B. *et al.* How to Diagnose Acute Appendicitis: Ultrasound First. *Insights Imaging* 2016: 7; 255-63

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