Research Article

Role of Tourniquet in management of placenta Previa and possible Accreta

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Abstract

Background: This study evaluates the safety and efficacy of the Tourniquet Maneuver in preventing excessive bleeding during cesarean sections for placenta previa and placenta previa accreta (PAS), conditions linked to high maternal morbidity and mortality. With rising cesarean rates and limited standardized guidelines, effective management strategies are critical. **Methods**: A prospective study was conducted on 40 patients aged >18 years with ultrasound-confirmed major placenta previa and prior cesarean deliveries at Minia University Hospitals. The Tourniquet Maneuver involved bladder dissection, placental incision, cervical elevation, and Foley catheter application as a tourniquet. Outcomes, including blood loss, transfusion needs, complications, and hospital stay, were analyzed using SPSS version 21 (p < 0.05). **Results**: Results showed a mean age of 31.81 ± 4.27 years and gestational age of 37.22 ± 0.70 weeks. The maneuver was successfully applied in 27 cases, with average blood loss of 966.67 ± 983.42 ml and transfusion volume of 1016.67 ± 989.76 ml. Complications included bladder injury (18.52%) and cesarean hysterectomy (7.31%). Postoperative hemoglobin and platelet counts decreased significantly, but 74.07% of patients had no complications. The median hospital stay was 2 days (range: 1–14). **Conclusion**: The Tourniquet Maneuver is a safe and effective method for managing bleeding in placenta previa and PAS during cesarean sections. While promising, larger studies are needed to confirm its efficacy and refine its use in high-risk obstetric cases.

Keywords: Placenta previa, placenta accreta spectrum, Tourniquet Maneuver, cesarean section, postpartum hemorrhage.

Introduction

One of the primary goals of a transabdominal obstetric ultrasound performed routinely between 18+6 and 21+6 weeks of gestation is to identify the exact position of the placenta. Based on the relationship and/or distance between the lower placental edge and the internal os of the uterine cervix, placenta previa was originally characterized using a transabdominal scan (TAS) as a placenta developing within the lower uterine segment and graded accordingly [1].

A lower edge that reaches the internal os is classified as grade II, grade III, partial previa, or minor previa. When the placenta partially covers the cervix, it is called grade IV, and when it completely covers the cervix, it is called complete previa. Placenta previa grades I and II are also known as "minor" grades, [2]. On the other hand, grades III and IV are called "major" grades.

In the 1980s, transvaginal scanning (TVS) became standard practice in obstetrics, allowing for a more accurate measurement of the space between the internal os and the placental edge. The labels "partial" and "marginal" should be retired, according to a recent AIUM multidisciplinary workshop. Instead, the term "placenta previa" should be used when the placenta is directly above the internal os [3].

The obstetric care of placenta previa may be improved with the use of this new categorization, which may better characterize the risks of perinatal problems such antepartum hemorrhage and substantial postpartum hemorrhage (PPH). The AIUM categorization is cited in recent studies that were reviewed for this recommendation [4].

According to the original definition provided by histopathologists, placenta accreta is "abnormal adherence of the afterbirth in whole or in parts to the underlying uterine wall in the partial or complete absence of decidua." Only improperly adherent placentas were described. Placenta accreta was later classified by contemporary pathologists according to the extent to which the villous tissue invaded the uterine myometrium. This was done by looking at whether the villi adhered superfi-cially to the myometrium without interposing decidua, the depth to which the villi penetrated, and whether the villous tissue perforated the entire uterine wall or invaded other pelvic organs like the bladder [5].

Varying cases of placenta accreta can be categorized as total, partial, or focal based on the amount of placental tissue involved. It's also possible to find cases with varying depths of accreta placentation coexisting. [6], placenta accreta can be described as a spectrum disorder that affects placental tissue in varying degrees of invasiveness.

Significant maternal and foetal morbidity and mortality can be caused by Pl. Previa and placenta accreta. Fonseca et al., (2021) [7] detail multiple methods for managing excessive hemorrhage after placenta previa cesarean sections.

Due to rising rates of cesarean section and older mothers, placenta previa and placenta accreta are becoming much more common throughout pregnancy. Significant maternal and fetal morbidity and mortality can be caused by placenta previa and placenta accrete. [8], The maternal mortality rate in women with PA might reach 7-10%.

Aim of the study
The purpose of this research is to determine whether the Tourniquet maneuver is safe and effective in preventing excessive bleeding caused by placenta previa and placenta previa accreta.

Patients and Methods
Patients were recruited from the obstetrics clinics at Minia University Hospitals for this prospective study, which comprised cases of placenta previa and PAS.

Both the study's protocol and the participants' written informed consents were cleared by the local ethics committee.

Quantity of participants
From February 2024 through January 2025, participants in this study were seen by medical professionals at Minia University Hospital.
To be eligible, you must be at least 18 years old.
• Ultrasound confirmed the presence of a major placenta previa and one or more prior caesarean sections.

Reasons for exclusion:
• Lack of placenta previa.
Refusal to participate, major medical conditions (such as liver or renal illness, preeclampsia, complicated heart disease during pregnancy, etc.), or severe surgical procedures must be considered.

Approach: Every single woman who took part in the study underwent:
1) Take a thorough medical history:
• Relevant medical history, including details such as smoking status, as well as demo-graphic information (age, occupation, etc.).
For any grievance.
Medical history related to pregnancy and childbirth.
Ask about your menstrual cycle.
Background of any previous medical conditions or surgeries.
Your family trees.
Physical examinations
Overall assessment
In order to rule out systemic illnesses,
• Critical indicators (heart rate, temperature, blood pressure, respiration rate).
• Indications of (Lymph node enlargement, pallor, cyanosis, and jaundice).
The anthropometric measurements used to determine body mass index (BMI) include height (in centimeters) and weight (in kilograms).
A person's standardized body mass index (BMI) z-score was also computed by dividing

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their height in meters squared by their weight in kilograms. Standing on the horizontal plane between the patient's lower rib cage and iliac crest, the patient's waist circumference was measured (Cacciari et al., 2006).

2) Medical Examinations:
• Standard laboratory tests include a complete blood count (CBC), a blood glucose level, an evaluation of liver and kidney function, and a coagulation test.

Procedures

The tourniquet maneuver is performed by-

1– As low as possible, good bladder dissection:
• The operation began with the bladder being carefully dissected away from the lower uterine region. The lower uterine portion could thus be more easily viewed, which allowed for easier surgery that followed. As a result, the bladder was less likely to sustain damage during the procedure.

The patient's hemodynamic status, the anesthesiology and surgical teams' suspicion of PA, and their collective judgment determined the administration of general anesthesia.

2- Incision across the placenta:
• To access the bottom part of the uterus, we cut through the placenta.
• The birth of the baby
• We were able to extract a large portion of the placenta from the uterine wall by reaching the site of attachment through the transplacental incision.

3- Exercising (Cervical Elevation):
• Elavage of the Cervix's Front and Back Lips with Two Alis Forceps.

4- Tourniquet Application:
• After delivery, the first step was to externalize the uterus and placenta.
• With a firm grip, the assistant exerted cephalad traction to the uterine fundus. At the same time, a tourniquet maneuver is performed by inserting Foley's catheter as low as possible below the cervix level.

When sewing the placental bed, follow these steps:
• If the placenta was fully split, check the placental bed for bleeding and treat it as needed.
• When closing the pouches of the placental bed, work your way around the edges first, then the front and back.
• The cervix and uterine walls are entered in a certain order: from outside to inside, and then back out again.

Both the vaginal and abdominal sides of the body were examined for signs of bleeding.

6- Uterine tamponading, plus or minus:
• The last step of the procedure is to insert an Atom uterine hemostatic balloon that is filled with 150 mL of distilled water. This will help to increase intrauterine pressure and boost endometrial hemostasis.
• The uterine wound was closed using two layers of continuous sutures. The standard method of closing the uterine incision was then employed.

They performed a Cs hysterectomy if the Tourniquet maneuver was unsuccessful.

They monitored the patients in the ward or intensive care unit based on how stable their hemodynamics were.
• After the surgeries were completed, the patients will receive a thorough explanation of what happened, what treatments were done, and how long they may expect to be in the hospital.

Data analysis

This prospective study includes cases of Placenta previa and PAS. patients will be selected from obstetrics department clinics of Minia University Hospitals.

This study included 40 patients with Age > 18 years, had one or more previous cesarean deliveries and presence of Major placenta previa were confirmed by ultrasound.

Pre-coded data will be processed and statistically analyzed by using the statistical package of the social science software (SPSS), version 21. Data summarized using mean and SD for normally distributed quantitative variables. Number and percentage used for description of qualitative variables.

Comparison between qualitative variables made by using the Chi-square test and t test.

P-values < 0.05 considered statistically significant.

Results are shown below:

Results
Table (1): Distribution of patients' characteristics in the studied group.

	Studied group N = 40
Age (years)	
Mean ±SD	31.81 ±4.27
Median (Min-Max)	32 (23-41)
Gravida	
Mean ±SD	4.78 ±1.72
Median (Min-Max)	4 (2-9)
G2	1 (3.7%)
G3	5 (18.52%)
G4	9 (33.33%)
G5	4 (14.81%)
G6	3 (11.11%)
G7	3 (11.11%)
G8	1 (3.7%)
G9	1 (3.7%)
Parity	
Mean ±SD	3.30 ±1.41
Median (Min-Max)	3 (1-7)
P1	2 (7.41%)
P2	5 (18.52%)
P3	11 (40.74%)
P4	4 (14.81%)
P5	3 (11.11%)
P6	1 (3.7%)
P7	1 (3.7%)
Number of previous CS	
Mean ±SD	3.26 ±1.13
Median (Min-Max)	3 (1-6)
Past surgical history	
No surgical history	13 (48.15%)
Previous appendectomy	8 (29.63%)
Previous cholecystectomy	2 (7.41%)
Previous hernioplasty	3 (11.11%)
Previous myomectomy	1 (3.7%)

This table shows that, mean of age was 31.81 ±4.27 years with median 32 (23-41), mean of gravida was 4.78 ±1.72 with median 4 (2-9), 3.7% of patients were G2,8 and 9, 11.11% of patients were G6 and 7, 14.81% of patients were G5, 18.52% of patients were G3, and 33.33% of patients were G4, mean of parity was 3.30 ±1.41 with median 3 (1-7), 3.7% of patients were P6 and 7, 7.41% of patients were P1, 11.11% of patients were P3, 14.81% of patients were P4, 18.52% of patients were P2, and 40.74% of patients were P3, mean of Number of previous CS was 3.26 ±1.13 with median 3 (1-6), 3.7% of patients had Previous myomectomy, 7.41% of patients had Previous cholecystectomy, 11.11% of patients had Previous hernioplasty, 29.63% of patients had Previous appendectomy, and 48.15% of patients had no surgical history.
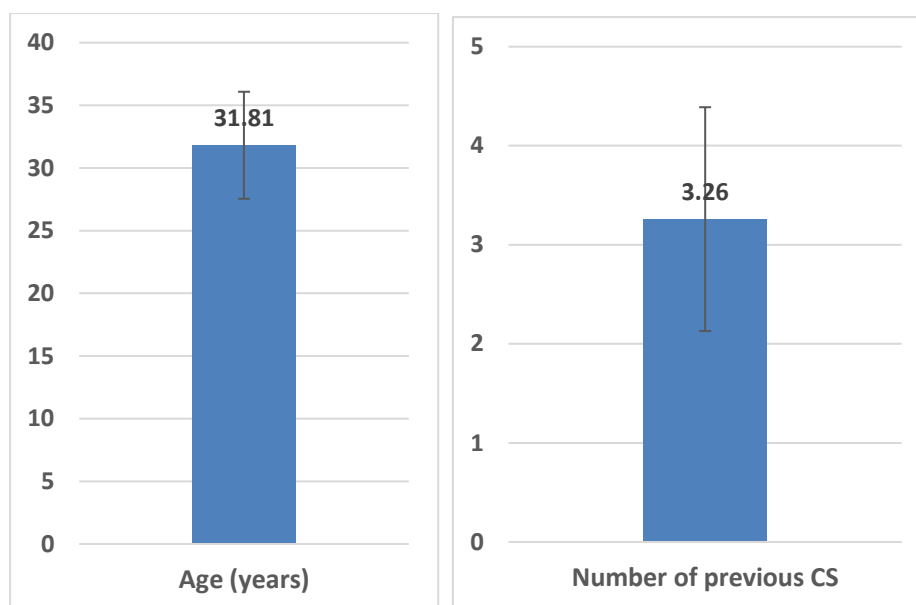
Figure (1): Distribution of Age and Number of previous CS in the studied group.
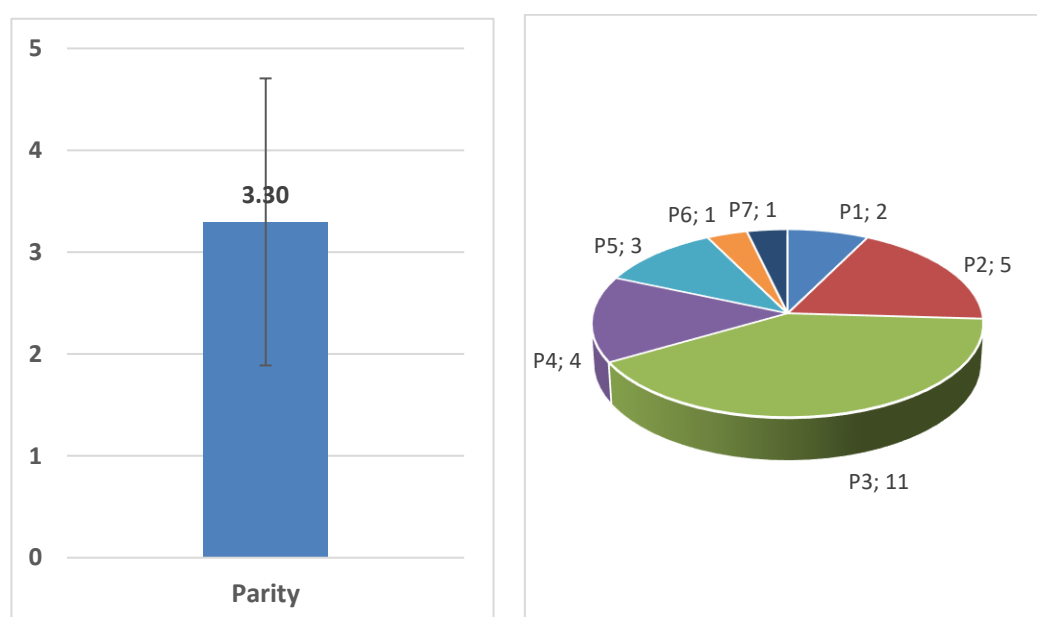
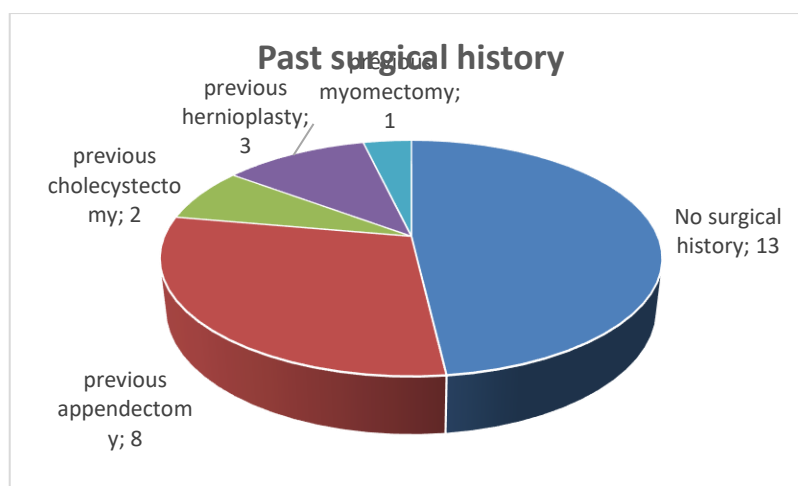**Figure (2): Distribution of Parity in the studied group.**

                                                    Role of Tourniquet in management of
                                                    placenta Previa and possible Accreta

Figure (3): Distribution of Past surgical history in the studied group.

Table (2): Distribution of clinical data in the studied group.

	Studied group N =40
Gestational age (years) Mean ±SD	37.22 ±0.70
35 weeks	1 (3.7%)
36 weeks	1 (3.7%)
37 weeks	16 (59.2%)
38 weeks	9 (33.3%)
Placental location	
PPL	1 (3.70%)
PPMP	1 (3.70%)
PPMA	13 (48.15%)
PPC	12 (44.44%)
Placental invasion	
No invasion	1 (3.70%)
Focal accreta	10 (37.04%)
Accreta	16 (59.26%)
Comorbidities	
No comorbidities	16 (59.26%)
GDM	4 (14.81%)
GHTN	2 (7.41%)
GHTN & GDM	1 (3.70%)
Hypothyroidism	4 (14.81%)
Fetal condition	
Good fetal condition	22 (81.48%)
Cardiac anomalies	2 (7.41%)
Potter Type 2	1 (3.70%)
Renal anomalies	1 (3.70%)
IUFD	1 (3.70%)

This table shows that, mean of **Gestational age** was 37.22 ±0.70 years, 1 patient (3.7%) had Gestational age 35 weeks, 1 patient (3.7%) had Gestational age 36 weeks, 16 patients (59.2%) had Gestational age 37 weeks and 9 patients (33.3%) had Gestational age 38 weeks. regarding **Placental**

location, 1 patient (3.7%) with PPL, 1 patient (3.7%) with PPMP, 13 patients (48.15%) with PPMA and 12 patients (44.44%) with PPC. Regarding **Placental invasion**, 1 patient (3.7%) had No invasion, 10 patients (37.04%) had Focal accreta and patients 16 (59.26%) had Accreta. Regarding **Comorbidities,** 16 patients (59.26%) had No comorbidities, 4 patients (14.81%) had GDM, 2 patients (7.41%) had GHTN, 1 patient (3.7%) had GHTN & GDM and 4 patients (14.81%) had Hypothyroidism. Regarding **Fetal condition,** 22 patients (81.48%) had Good fetal condition, 2 patients (7.41%) had Cardiac anomalies, 1 patient (3.7%) had Potter Type 2, 1 patient (3.7%) had Renal anomalies and 1 patient (3.7%) had IUFD.

Discussion

According to histopathology, placenta accreta occurs when the trophoblast, which can be a portion or the entire placenta, invades the myometrium of the uterine wall in an inappropriate manner. pathologists classified placenta accreta as "creta" when the villi adhere superficially to the myometrium without interposing decidua, "increta" when they penetrate deeply into the uterine myometrium, and "percreta" when they perforate through the entire uterine wall and potentially invade the surrounding pelvic organs. [2]

This publication will use the term placenta accreta spectrum (PAS) to refer to both the invasive and abnormally adherent variants of accreta placentation. Mothers are more likely to suffer from complications or die from complications related to severe hemorrhage, which can necessitate blood transfusions. Longer hospital admissions and hysterectomies are common outcomes for individuals with PAS [9].

A history of cesarean section is the most common risk factor for placenta accreta, although there are other potential causes. As the number of caesarean sections performed rises, so does the prevalence of postpartum hemorrhage. Asherman syndrome, multiple pregnancies, an older mother, a history of uterine surgery or curettage, and multiple births are additional risk factors [10, 11].

Placenta accreta is a substantial risk factor due to placenta previa; the risks for the first, second, third, fourth, and fifth or more cesarean sections are 3%, 11%, 40%, 61%, and 67%, respectively. Ultrasound or magnetic resonance imaging is typically used to diagnose PAS. Ultrasound and magnetic resonance imaging both have comparable diagnostic value when done by trained professionals for the detection of PAS. Two of the most specific ultrasound criteria for PAS are a myometrial thickness below 1 mm and extensive intra-placental blood lakes, which are described as placental lacunae on color Doppler ultrasound enhancement [12: 14].

The usual therapy for placenta accreta is a hysterectomy because the condition can be fatal. Possible side effects of treating placenta accreta include bleeding, damage to other pelvic organs, and infertility in the future. Removing the placenta or utero-placental tissue without removing the uterus is considered conservative therapy [15].

There is still a big void in comprehensive guidelines and standardized procedures for managing placenta previa and probable placenta accreta, even if there have been breakthroughs in this area. Conservative PAS management should be regarded as experimental due to the lack of published data.

With that in mind, this study set out to determine whether or not the Tourniquet maneuver was safe and effective in preventing excessive bleeding caused by placenta previa and placenta previa accreta.

40 patients, all over the age of 18, who had an ultrasound-confirmed presence of major placenta previa and a history of one or more cesarean sections were included in this prospective study. Minia University Hospitals' obstetrics clinics were the sites of patient selection. •Here are the key takeaways from the study:

3.7% of patients were G2,8, and 9, 11.11% were G6, and 7, and the mean gestational age was 4.78 ±1.72 years with a median of 4 (2-9). The participants' ages ranged from 23 to 41 years in the present study. 14.81% of patients were G5, 18.52% of patients were G3, and 33.33% of patients were G4, mean of parity was

3.30 ±1.41 with median 3 (1-7), 3.7% of patients were P6 and 7, 7.41% of patients were P1, 11.11% of patients were P3, 14.81% of patients were P4, 18.52% of patients were P2, and 40.74% of patients were P3, mean of Number of previous CS was 3.26 ±1.13 with median 3 (1-6), 3.7% of patients had Previous myomectomy, 7.41% of patients had Previous cholecystectomy, 11.11% of patients had Previous hernioplasty, 29.63% of patients had Previous appendectomy, and 48.15% of patients had no surgical history.

Consistent with our findings, Ghaleb et al., (2022) [16] outlined a method for conservatively managing placenta previa accreta that conserves the uterus and aims to control postpartum hemorrhage, including intrapartum hemorrhage, while also evaluating the method's effectiveness and safety. The results showed that the age was 30.9 ± 4.8, the parity was 3.0 (2.0-4.0), and the number of caesarean sections performed was 2.0 (2.0-3.0).

Pham et al., (2023)[17] also found that a conservative strategy to treating placenta accreta spectrum disorders (PASD) was beneficial when combining uterine myometrial excision with transverse B-Lynch suture. This finding lends credence to our findings. According to their findings, the average age of the mother was 32.78 ± 5.19, and over 50% of the pregnant women included in the study were less than 35 years old. Nearly all instances (96%) had a history of caesarean sections.

Conclusion
An effective and safe technique to controlling excessive bleeding associated with placenta previa and placenta previa accreta following cesarean sections is the Tourniquet Maneuver, as demonstrated in this study. Successful outcomes were achieved when this approach was systematically used on 27 patients with significant placenta previa and a history of prior cesarean births. The average estimated blood loss was 966.67 ± 983.42 ml, and the blood transfusion volume was 1016.67 ± 989.76 ml. Importantly, the approach was deemed safe because 74.07% of patients did not have any problems. Consequences include bladder damage (18.52%) and the requirement for a cesarean hysterectomy (7.31% of instances) show how complicated these procedures may

be. Careful preoperative planning and postoperative treatment are even more important considering the median hospital stay of 2 days (range: 1–14) and the statistically significant drop in postoperative hemoglobin and platelet counts. This study provides preliminary evidence that the Tourniquet Maneuver can improve maternal outcomes in high-risk obstetric situations; nevertheless, additional large-scale trials are needed to confirm its effectiveness and determine the best way to use it.

References

1. Petpichetchian, C., Pranpanus, S., Suntharasaj, T., Kor-anantakul, O., & Hanprasertpong, T. Comparison of trans-abdominal and transvaginal sono-graphy in the diagnosis of placenta previa. Journal of Clinical Ultrasound, (2018).46(6),386-390.
2. Jauniaux, E., D'Antonio, F., Bhide, A., Prefumo, F., Silver, R. M., Hussein, A. M., Shainker, S. A., Chantraine, F., Alfirevic, Z., & panel, D. consensus expert. Modified Delphi study of ultrasound signs associated with placenta accreta spectrum. Ultrasound in Obstetrics & Gynecology, (2023). 61(4), 518–525.
3. Sadek, S. M., Ahmad, R. A., Atia, H., & Abdullah, A. G. Towards more accurate measurement of edge to os distance in low-lying placenta using three dimensional transvaginal ultrasound: an innovative technique. BMC Pregnancy and Childbirth, (2018). 18, 1-9.
4. Pegu, B., Thiagaraju, C., Nayak, D., & Subbaiah, M. Placenta accreta spectrum-a catastrophic situation in obste-trics. Obstetrics & Gynecology Science, (2021). 64(3), 239–247.
5. Happe, S. K., Yule, C. S., Spong, C. Y., Wells, C. E., Dashe, J. S., Moschos, E., Rac, M. W. F., McIntire, D. D., & Twickler, D. M. Predicting placenta accreta spectrum: validation of the placenta accreta index. Journal of Ultrasound in Medicine, (2021). 40(8), 1523–1532.
6. Varlas, V. N., Bors, R. G., Birsanu, S., Maxim, B., Clotea, E., & Mihailov, M. Maternal and fetal outcome in placenta accreta spectrum (PAS) associated with placenta previa: a retrospective analysis from a tertiary center. Journal of Medicine and Life, (2021). 14(3), 367.

7. Fonseca, A., & de Campos, D. A. Maternal morbidity and mortality due to placenta accreta spectrum disorders. Best practice & research Clinical obstetrics & gynaecology, (2021). 72, 84-91.

8. Zakherah, M. S., Abdel-Aziz, M., Othman, E. R., & Abbas, A. M. Maternal and neonatal outcomes of placenta previa and accreta at Assiut women's health hospital, Egypt. Int J Reprod Contracept Obstet Gynecol, (2018). 7(8), 3024.

9. Morlando, M., & Collins, S. Placenta Accreta Spectrum Disorders: Challenges, Risks, and Management Stra-tegies. International Journal of Women's Health, (2020). 12, 1033. https://doi.org/10.2147 /IJWH.S224191

10. Badr, A. A., & El-Maghraby, I. M. Placenta accreta index as a predictor of placental invasion in cases of placenta previa. Journal of Medicine in Scientific Research, (2022). 5(3), 9.

11. Liu, X., Wang, Y., Wu, Y., Zeng, J., Yuan, X., Tong, C., & Qi, H. What we know about placenta accreta spectrum (PAS). European Journal of Obstetrics & Gynecology and Reproductive Biology, (2021). 259, 81-89.

12. Silver, R. M., & Barbour, K. D. Placenta accreta spectrum: accreta, increta, and percreta. Obstetrics and Gynecology Clinics, (2015). 42(2), 381–402.

13. Faralli, I., Del Negro, V., Chinè, A., Aleksa, N., Ciminello, E., & Piccioni, M. G. Placenta accreta spectrum (PAS) disorder: ultrasound versus magnetic reso-nance imaging. Diagnostics, (2022). 12 (11), 2769.

14. Kennedy, A., Silver, R. M., Branch, D. W., Comstock, J., & Woodward, P. J. Ultrasonography of the explanted uterus in placenta accreta spectrum: correlation with intraoperative findings and gross patho-logy. Obstetrics & Gynecology, (2023) 141(3), 544-554.

15. Huras, H., Cnota, W., Czajkowski, K., Grzesiak, M., Jaworowski, A., Kaczmarek, P., ... & Sieroszewski, P.. Placenta accreta spectrum (PAS)—prenatal diagnosis and management. The Polish Society of Gynecologists and Obstetricians Guide-lines. Ginekologia Polska, (2024)95(11), 902-920.

16. Ghaleb, Mahmoud M., et al., "Conservative stepwise surgical approach for manage-ment of placenta previa accreta: a prospective case series study." Interna-tional Journal of Gynecology & Obstetrics 157.2 (2022): 383-390.

17. Pham, X. T. T., Vuong, A. D. B., Vuong, L. N., & Nguyen, P. N. A novel approach in the management of placenta accreta spectrum disorders: a single-center multidisciplinary surgical experience at Tu Du Hospital in Vietnam. Taiwanese Journal of Obstetrics and Gynecology, (2023)62 (1), 22-30.