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Influence of prenatal diagnosis of abnormally invasive placenta on maternal outcome: systematic review and meta-analysis

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KEYWORDS: abnormally invasive placenta; outcome; placenta accreta; placenta increta; placenta percreta; prenatal diagnosis

ABSTRACT

Objective *To ascertain the impact of prenatal diagnosis on surgical outcome of women affected by abnormally invasive placenta (AIP).*

Methods *MEDLINE, EMBASE, CINAHL and Cochrane databases were searched. Observed outcomes included: gestational age at birth (weeks), amount of blood loss (L), units of red blood cells (RBC), platelets (PLT) and fresh frozen plasma (FFP) transfused, length of stay in hospital and the intensive care unit (ICU) (days), urinary tract injury and infection. Only studies reporting the occurrence of any of the explored outcomes in women with a prenatal compared with an intrapartum diagnosis of AIP were considered eligible for inclusion. Random-effect head-to-head meta-analyses were used to analyze the data.*

Results *Thirteen studies were included. Women with a prenatal diagnosis of AIP had less blood loss during surgery (mean difference (MD), −0.87; 95% CI, −1.5 to −0.23), had fewer units of RBC (MD, −1.45; 95% CI, −2.9 to −0.04) and FFP (MD, −1.73; 95% CI, −3.3 to −0.2) transfused, and delivered earlier (MD, 1.33 weeks; 95% CI, −2.23 to −0.43) compared with those with an intrapartum diagnosis. The risk of admission to an ICU and length of in-hospital and in-ICU stay were not different between the groups. Prenatal diagnosis of AIP was associated with a higher risk of urinary-tract injury (odds ratio, 2.5; 95% CI, 1.3–4.6), mainly due to the higher prevalence of placenta percreta in the group with AIP diagnosed prenatally.*

Conclusion *Prenatal diagnosis of AIP is associated with reduced hemorrhagic morbidity compared with cases in which such anomalies are detected at delivery.*

INTRODUCTION

The rise in Cesarean section (CS) rate observed in the past two decades has led to an increased incidence of abnormally invasive placenta (AIP)[1–6]. AIP is characterized by abnormal insertion of the placenta into the implantation site. Three different types of AIP have been described according to the severity of placental invasion: placenta accreta, in which the chorionic villi adhere to the myometrium, without invading it; placenta increta, in which the villi invade the myometrium; and placenta percreta, in which there is full invasion of the myometrium and uterine serosa with the potential to reach adjacent organs, such as the bladder or bowel[1].

AIP is associated with maternal morbidity, such as severe life-threatening hemorrhage, need for blood transfusion, re-operation and damage to adjacent organs. Prenatal diagnosis of AIP is fundamental, and it has been reported to improve the outcome of affected women by allowing preplanned treatment of these conditions in centers with a high level of surgical expertise[7].

Prenatal diagnosis of AIP is usually accomplished by ultrasound, which has an overall good diagnostic accuracy in identifying AIP, whereas magnetic resonance imaging (MRI) is employed to confirm the diagnosis and to delineate the depth and the topography of placental invasion (AIP)[8,9]. Despite this, prenatal diagnosis of AIP still needs to be standardized and has been reported to be highly variable among different centers. Furthermore, AIP can occur even in women with no classical risk factors

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such as placenta previa and prior CS, thus questioning which subset of women should be screened for these anomalies. Finally, although reported to be beneficial, the actual impact of prenatal diagnosis of AIP on maternal surgical outcome has not yet been quantified objectively.

The aim of this systematic review was to ascertain the impact of prenatal diagnosis on surgical outcome of women affected by AIP.

METHODS

Data sources

This review was performed according to an *a-priori*-designed protocol recommended for systematic reviews and meta-analyses[10–12]. MEDLINE, EMBASE, CINAHL and the Cochrane Library, including the Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE) and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched electronically on 23 February 2017, utilizing combinations of the relevant medical subject heading (MeSH) terms, keywords and word variants for 'abnormally invasive placenta', 'morbidly adherent placenta', 'prenatal diagnosis' and 'outcome' (Table S1). The search and selection criteria were restricted to the English language. Reference lists of relevant articles and reviews were hand searched for additional reports. Prisma guidelines were followed[13]. The study was registered with the PROSPERO database (registration number: CRD42017069655).

Main outcomes and measures

The observed outcomes were: gestational age at birth (weeks); blood loss (L); units of red blood cells (RBC), platelets (PLT) and fresh frozen plasma (FFP) transfused; length of in-hospital stay (days); admission to intensive care unit; length of stay in ICU (days); rate of hysterectomy; use of interventional radiology; occurrence of coagulopathy; urinary tract injury (including bladder and ureteral injuries); need for re-operation; and infection. Furthermore, we aimed to stratify the analysis, according to histopathological confirmation of AIP and those affected by placenta previa and those affected by placenta percreta.

Eligibility criteria, study selection and data collection

Only case–control studies reporting on the occurrence of any of the explored outcomes in women with a prenatal compared with those with an intrapartum diagnosis of AIP were considered eligible for inclusion. Studies not reporting a control group and those without clear confirmation of AIP were excluded. Studies published before 2000 were excluded, as we considered that advances in prenatal imaging techniques and improvements in the diagnosis and definition of AIP make these less relevant. We planned to perform a sensitivity analysis including only cases affected by placenta percreta in view of the reported stronger association between this type of AIP and adverse maternal outcome compared with that with less severe types of placental invasion.

Prospective and retrospective case–control studies and case series were analyzed. Opinions, case series with fewer than four cases of AIP and case reports were also excluded in order to avoid publication bias.

Two reviewers (D.B., F.D.A.) extracted data independently. Inconsistencies were discussed by the reviewers and consensus reached. For those articles in which targeted information was not reported but the methodology was such that the information might have been recorded initially, the authors were contacted requesting the data. Histopathological findings and/or surgical notes were used as a gold standard.

Quality assessment of the included studies was performed using the Newcastle–Ottawa Scale (NOS) for case–control studies. According to NOS, each study is judged on three broad perspectives: selection of the study groups; the comparability of the groups; and the ascertainment of outcome of interest[13,14]. Assessment of the selection of a study's groups includes the evaluation of the representativeness of the exposed cohort, selection of the non-exposed cohort, ascertainment of exposure and demonstration that outcome of interest was not present at the start of the study. Assessment of the comparability of the study includes evaluation of the comparability of cohorts based on the design or analysis. Finally, ascertainment of the outcome of interest includes the evaluation of the type of assessment of the outcome of interest, and length and adequacy of follow-up. According to NOS, a study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability[14].

Statistical analysis

First, we used random-effect head-to-head meta-analyses to compare the explored clinical outcomes in women with a prenatal diagnosis of AIP *vs* those in women with an intrapartum AIP diagnosis. Furthermore, we aimed to stratify the analysis, including only women affected by placenta previa, those affected by placenta percreta and those undergoing hysterectomy.

For each continuous outcome, results were expressed as a summary mean difference (MD) with 95% CI; for each categorical outcome, results were expressed as a summary odds ratio (OR) with 95% CI. Some of the continuous outcomes were expressed as medians and ranges; in such cases, we used the method described by Hozo *et al.* to obtain the corresponding means and SDs[15]. When interquartile ranges (IQRs) rather than ranges were reported, they were divided by 1.35 to obtain the equivalent SD[16]. In all meta-analyses, statistical heterogeneity was quantified using the I^2 metric.

Second, meta-analyses of proportions were performed to estimate the pooled rates of each categorical outcome

in women with a prenatal AIP diagnosis and in those with an intrapartum AIP diagnosis. In order to account for between-study heterogeneity, meta-analyses were performed using a random-effect model.

Assessment of potential publication bias was problematic because of the scarce number of studies. The formal tests for funnel plot asymmetry cannot be used when the total number of publications included for each outcome is less than 10, because its power is too low to distinguish chance from real asymmetry[17]. We were thus able to assess publication bias only in the meta-analysis comparing blood loss in women with a prenatal *vs* intrapartum diagnosis of AIP. We displayed the effect estimates of individual studies *vs* the logarithm of their standard errors (SE), and we performed Egger's regression asymmetry test[18].

RevMan 5.3 (The Cochrane Collaboration, 2014) and Stata version 13.1 (Stata Corp., College Station, TX, USA, 2013) were used to analyze the data.

RESULTS

General characteristics

A total of 1008 articles were identified. After screening the abstracts, 65 full-text articles were assessed with respect to their eligibility for inclusion (Table S2) and 13 studies were included in the systematic review (Table 1 and Figure 1)[19–31]. These 13 studies included 971 pregnancies affected by AIP; of these, 53.0% (95% CI, 50.8–57.3%; 514/971) were diagnosed prenatally by ultrasound or MRI, while 47.0% (95% CI, 44.8–51.3%; 457/971) were detected at the time of delivery. The prevalence of placenta previa was 91.4% (95% CI, 83.4–96.9%; $I^2 = 82\%$) in the group with AIP detected prenatally, while it was 57.9% (95% CI, 39.0–75.6%; $I^2 = 90.4\%$) in the group with an intrapartum diagnosis, with an OR of 12.0 (95% CI, 5.9–24.6; $I^2 = 51\%$). The severity of placental invasion based upon surgical or histopathological analysis was reported in only six of the included studies; overall, the prevalence of the most severe type of AIP, placenta percreta, was 43.9% (95% CI, 28.9–59.5%; $I^2 = 77.3\%$) in the group with a prenatal diagnosis and 12.3% (95% CI, 4.8–22.7%; $I^2 = 54.1\%$) in the group with an intrapartum diagnosis, while the corresponding figures for placenta accreta/increta were 56.1% (95% CI, 40.5–71.1%; $I^2 = 77.3\%$) and 87.7% (95% CI, 77.3–95.2%; $I^2 = 54.1\%$). In women with a prenatal diagnosis of AIP, hysterectomy was performed in 83.7% (95% CI, 70.8–93.6%) compared with 75.1% (95% CI, 56.8–90.0%) of those in which AIP was discovered at delivery, a difference that did not reach statistical significance (OR, 2.0; 95% CI, 0.94–4.41; $I^2 = 67\%$; $P = 0.07$). Interventional radiology was performed in 53.5% (95% CI, 25.3–80.7%) of women with a prenatal diagnosis of AIP and in 16.0% (95% CI, 0–45.8%) of those with an intrapartum diagnosis. Finally, women with a prenatal diagnosis of AIP delivered at an earlier gestational age compared with those who had such anomalies discovered at the time of CS (MD, −1.33; 95% CI, −2.23 to −0.43).

Quality assessment of the included studies performed using the NOS for cohort studies is shown in Table 2. Most of the included studies showed an overall good rating for selection and comparability of study groups. The main weaknesses of these studies were their retrospective design, small sample size and lack of stratification of the analysis according to severity of placental invasion for the majority of the included series.

Synthesis of results

Eleven studies, including 700 pregnancies, explored the difference in total blood loss during surgery in women with compared with those without a prenatal diagnosis of AIP. Women with a prenatal diagnosis of AIP had less blood loss during surgery (MD, −0.87 L; 95% CI,

Table 1 General characteristics of studies reporting on women with prenatal or intrapartum diagnosis of abnormally invasive placenta (AIP) and included in systematic review

Study	*Country*	*Study design*	*Period analyzed*	*Reference standard*	*Prenatal imaging*	*AIP* (n)
Pilloni (2016)[19]	Italy	Prospective	2011–2014	Surgery/pathology	US	37
Thurn (2016)[20]	Sweden, Norway, Denmark, Finland, Iceland	Retrospective	2009–2012	Surgery	US, MRI	205
Bailit (2015)[21]	USA	Retrospective	2008–2011	Surgery	NS	158
Asicioglu (2014)[22]	Turkey	Retrospective	2005–2010	Surgery	US	46
Hall (2014)[23]	USA	Retrospective	2005–2012	Pathology	US, MRI	36
Chantraine (2013)[24]	Belgium, Germany, Switzerland	Retrospective	1998–2011	Pathology	US	66
Fitzpatrick (2014)[25]	UK	Prospective	2010–2011	Surgery/pathology	US, MRI	133
Tikkanen (2011)[26]	Finland	Retrospective	1998–2010	Surgery/pathology	US, MRI	44
Angstmann (2010)[27]	Australia	Retrospective/ prospective	2001–2009	Pathology	NS	26
Diop (2010)[28]	France	Retrospective	2002–2008	Surgery/pathology	US, MRI	17
Eller (2009)[29]	USA	Retrospective	1996–2008	Surgery/pathology	US, MRI	76
Warshak (2010)[30]	USA	Retrospective	1990–2008	Pathology	US, MRI	99
Bodner (2006)[31]	USA	Retrospective	2000–2002	Pathology	US, MRI	28

Only first author given for each study. MRI, magnetic resonance imaging; NS, not stated; US, ultrasound.

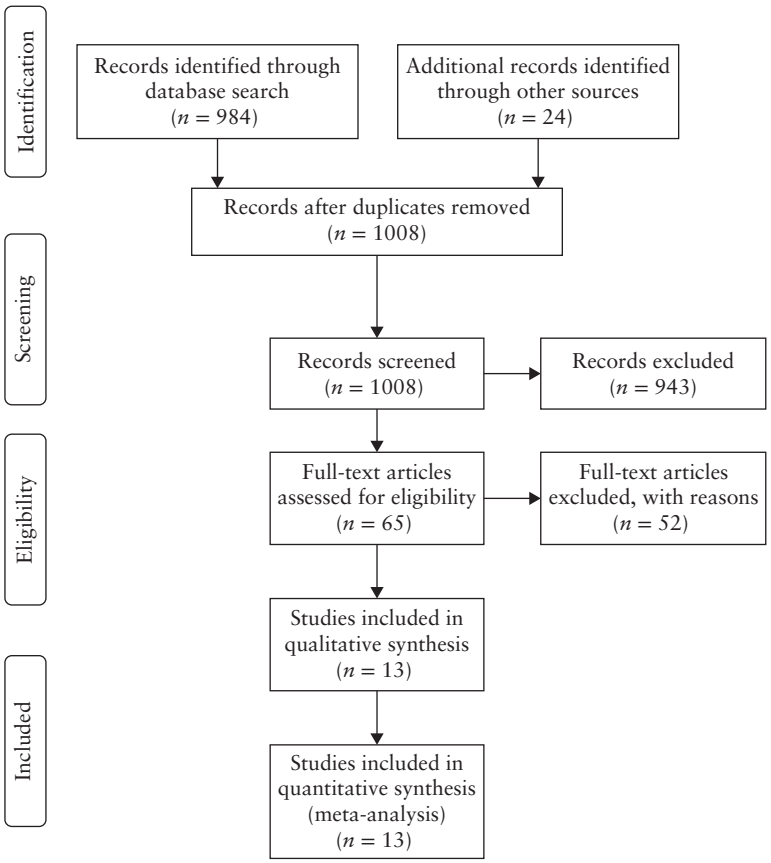

Figure 1 Flowchart of inclusion of studies reporting on women with prenatal or intrapartum diagnosis of abnormally invasive placenta.

Table 2 Quality assessment of included studies reporting on women with prenatal or intrapartum diagnosis of abnormally invasive placenta, according to Newcastle–Ottawa Scale

Study	*Selection*	*Comparability*	*Outcome*
Pilloni (2016)[19]	★★	★	★★
Thurn (2016)[20]	★★	★	★★
Bailit (2015)[21]	★★	★	★★
Asicioglu (2014)[22]	★★	★	★★
Hall (2014)[23]	★★	★	★★
Chantraine (2013)[24]	★★	★	★★
Fitzpatrick (2014)[25]	★★	★	★
Tikkanen (2011)[26]	★★	★★	★★
Angstmann (2010)[27]	★★	★	★★
Diop (2010)[28]	★★	★	★★
Eller (2009)[29]	★★	★	★
Warshak (2010)[30]	★★	★	★
Bodner (2006)[31]	★★★	★★	★★

Only first author of each study is given. Maximum of one star per numbered item in selection and outcome categories. Maximum of two stars for comparability.

−1.5 to −0.23 L; $P = 0.008$). Likewise, the units of RBC (MD, −1.45; 95% CI, −2.9 to −0.04; $P = 0.04$) and FFP (MD, −1.73; 95% CI, −3.3 to −0.2; $P = 0.03$) transfused were fewer in women with a prenatal diagnosis of AIP compared with in those with an intrapartum diagnosis, while there was no difference in the number of units of PLT transfused during surgery between the two study groups. The risk of admission to ICU, and median lengths of in-hospital and in-ICU stay were not different between women with a prenatal and those with an intrapartum diagnosis of AIP (Tables 3 and 4).

Women with a prenatal diagnosis of AIP had higher risk of urinary tract injury during surgery (OR, 2.5; 95% CI, 1.3–4.6) and this was mainly due to the increased risk of bladder (OR, 2.2; 95% CI, 1.1–4.4; $P = 0.02$) rather than ureteral ($P = 0.6$) injury. The higher prevalence of placenta percreta in the group of women with a prenatal diagnosis of AIP is likely to account for this difference (OR, 5.5; 95% CI, 2.7–11.2; $I^2 = 4.5\%$). Finally, there was no difference in the risk of coagulopathy during or immediately after surgery or in the risk of infection between the two groups (Table 4).

Pooled prevalence of the different categorical outcomes explored in the present systematic review is reported in Table 5.

The subanalysis considering only cases of placenta previa was affected by the small number of included cases, which might have precluded the power of the analysis. Overall, women with placenta previa who had AIP diagnosed prenatally had less mean blood loss compared with those who had an intraoperative diagnosis (MD, −0.684; 95% CI, −0.995 to −0.15; $P = 0.008$) (Tables S3 and S4).

DISCUSSION

The findings from this systematic review show that prenatal diagnosis of AIP is associated with reduced

Table 3 Results of head-to-head meta-analyses comparing selected continuous clinical outcomes in women with prenatal diagnosis of abnormally invasive placenta (AIP) *vs* those with intrapartum diagnosis

Outcome	*Studies (sample size)* (n)	*Prenatal/ intrapartum AIP*(n)	*Mean difference (95% CI)*	P	I^2 *(%)*
Gestational age at birth (weeks)	7 (499)	293/206	−1.33 (−2.23 to −0.43)	0.004	85
Blood loss (L)	11 (700)	414/286	−0.87 (−1.51 to −0.23)	0.008	81
Units of RBC transfused	7 (524)	286/238	−1.45 (−2.86 to −0.04)	0.04	69
Units of FFP transfused	5 (452)	252/200	−1.73 (−3.26 to −0.21)	0.03	86
Units of PLT transfused	5 (452)	252/200	−0.18 (−0.76 to 0.40)	0.54	83
Length of hospital stay (days)	6 (391)	220/171	0.77 (−0.40 to 1.94)	0.20	84
Length of stay in ICU (days)	5 (260)	146/114	−0.70 (−2.32 to 0.92)	0.40	86

FFP, fresh frozen plasma; ICU, intensive care unit; PLT, platelets; RBC, red blood cells.

Table 4 Results of head-to-head meta-analyses comparing selected categorical clinical outcomes in women with prenatal diagnosis of abnormally invasive placenta (AIP) *vs* those with intrapartum diagnosis

Outcome	*Studies (sample size)* (n)	*Prenatal AIP* (n/N)	*Intrapartum AIP* (n/N)	*OR (95% CI)*	P	I^2 *(%)*
Coagulopathy	4 (196)	20/128	9/68	1.09 (0.45–2.60)	0.9	0
Need for re-operation	5 (379)	18/172	29/207	0.74 (0.35–1.55)	0.4	0
Urinary tract injury	7 (564)	69/288	20/276	2.47 (1.33–4.57)	0.004	9
Bladder injury	6 (520)	51/264	15/256	2.21 (1.11–4.42)	0.02	9
Ureteral injury	4 (285)	11/194	3/91	1.36 (0.37–4.92)	0.6	0
Infection	4 (205)	32/148	12/57	0.91 (0.37–2.22)	0.8	19
Admission to ICU	8 (761)	174/379	145/382	1.18 (0.58–2.39)	0.6	70

ICU, intensive care unit; OR, odds ratio.

Table 5 Proportion meta-analysis with pooled rates of selected clinical outcomes in women with prenatal diagnosis of abnormally invasive placenta (AIP) and in those with intrapartum diagnosis

Outcome	*Prenatal AIP diagnosis pooled rate (%)*	*Intrapartum AIP diagnosis pooled rate (%)*
Need for transfusion	66.3 (55.7–76.3)	78.3 (63.3–90.7)
Coagulopathy	12.2 (0.0–36.3)	8.5 (0.0–30.7)
Interventional radiology	53.5 (25.3–80.7)	16.0 (0.0–45.8)
Hysterectomy	83.7 (70.8–93.6)	75.1 (56.8–90.0)
Need for re-operation	9.5 (5.1–14.7)	12.2 (7.6–17.6)
Urinary tract injury	20.7 (7.9–37.1)	9.8 (3.0–19.3)
Bladder injury	16.3 (5.2–31.3)	7.8 (1.6–16.9)
Ureteral injury	4.6 (1.1–9.9)	2.6 (0.0–7.9)
Infection	19.5 (10.8–29.8)	18.8 (4.4–38.3)
Admission to ICU	46.4 (26.2–67.3)	42.7 (29.4–56.4)

Data are presented with 95% CI. ICU, intensive care unit.

hemorrhagic morbidity than is detection at birth. Women with a prenatal diagnosis of AIP had less mean blood loss and fewer units of RBC and FFP transfused than did controls, suggesting a beneficial effect of prenatal imaging on maternal outcome in cases affected by AIP.

The strengths of this study are its robust methodology for identifying all possible studies for inclusion, assessing data quality and synthesizing all suitable data.

The small number of included studies, their retrospective non-randomized design, heterogeneity in surgical management of AIP, presence of confounding factors potentially affecting the observed outcomes, and lack of stratification of the analysis according to maternal risk factors and severity of placental invasion represent the main limitations of the present systematic review. In addition, the prevalence of placenta percreta in the group with AIP diagnosed prenatally was higher than in those with intrapartum detection. In this scenario, the lack of differences reported in the present systematic review for some of the explored maternal outcomes might have been the result of such higher prevalence of percreta, thus representing a considerable source of bias.

Rise in CS rate over the past two decades has led obstetricians to be faced daily with AIP disorders[6]. Prenatal diagnosis of AIP has been reported to reduce the burden of intra- and perisurgical complications associated with these anomalies. Use of interventional radiology, a tailored surgical approach and prompt availability of blood products are likely to account for these differences and highlight the need for a standardized and multidisciplinary management in centers with high diagnostic and surgical expertise[7,32].

Prenatal diagnosis of AIP is usually accomplished by ultrasound and has been reported to be accurate, especially when applied to women with anterior placenta previa and previous CS, while MRI is usually performed to confirm the diagnosis and to delineate the depth and topography of invasion[8,9]. Despite this, prenatal detection of AIP has been reported to be highly variable among difference centers. Different gestational ages at assessment and type and number of ultrasound signs used to label a case as affected are likely to account for such heterogeneity. Multiparametric models including maternal, pregnancy and ultrasound characteristics have been shown to improve the prenatal detection of AIP, although they require confirmation in large population studies[33]. At present, the highest diagnostic performance of ultrasound is achieved in women with placenta previa and a prior CS, while its accuracy in those with other risk factors has still to be ascertained but is likely to be lower. These findings highlight the urgent need to standardize

prenatal diagnosis of AIP and to stratify the risk of AIP prenatally. Until then, we think that every woman with placenta previa and at least one prior CS should be considered at high risk for AIP and referred to a center with high expertise in prenatal diagnosis of these anomalies.

In the present review, we found no difference in some of the explored outcomes, such as days of in-hospital or ICU stay and need for blood transfusion. The small number of cases included in some analyses may have precluded reaching adequate statistical power, thus explaining partially this lack of association. Furthermore, it is entirely possible that some women in the group with AIP detected at delivery might have been treated as if they were affected by these anomalies based on the presence of several risk factors, even if prenatal imaging assessment was negative.

The risk of bladder injury was higher in women with a prenatal diagnosis of AIP. Although this might seem surprising, such a difference can be explained on the basis that women with a prenatal diagnosis of AIP were more likely to be affected by placenta percreta, which is associated with a higher burden of surgical morbidity, compared with a lesser degree of invasion. Furthermore, the type of bladder injury was not specified in most of the original studies. Entry into the bladder is sometimes inevitable in case of placenta percreta, as is the need to remove portions of the bladder and/or ureters[32,34]. In this scenario, the higher rate of urinary-tract injury observed in the group with AIP diagnosed before birth might have been the result of a conscious surgical approach rather than unexpected and unwanted complications.

Large randomized studies are needed in order to improve and standardize the prenatal diagnosis and management of AIP in order to allow women with antenatal suspicion of these anomalies to be followed up and managed in centers with a high level of expertise in the surgical management of these conditions.

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SUPPORTING INFORMATION ON THE INTERNET

Tables S1–S4 may be found in the online version of this article.

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Influencia del diagnóstico prenatal de placenta invasiva en el desenlace materno: revisión sistemática y metaaná lisis

RESUMEN

Objetivo Determinar el impacto del diagnóstico prenatal en el desenlace quirúrgico de las mujeres afectadas por placenta invasiva (PI).

Métodos Se buscó en las bases de datos MEDLINE, EMBASE, CINAHL y Cochrane. Los resultados observados incluyeron: edad gestacional al nacer (semanas), volumen de pérdida de sangre (L), unidades de glóbulos rojos (GR), plaquetas (PLT) y plasma fresco congelado (PFC) transfundido, tiempo de hospitalización y tiempo en la unidad de cuidados intensivos (UCI) (días), y lesión e infección del tracto urinario. Sólo se consideraron aptos para esta revisión los estudios que mencionaron la aparición de cualquiera de los resultados estudiados en mujeres con un diagnóstico prenatal, en comparación con las que la PI se les diagnosticó durante el parto. Para analizar los datos se utilizaron metaanálisis directos de efectos aleatorios.

Resultados Se incluyeron 13 estudios. Las mujeres con un diagnóstico prenatal de PI tuvieron menos pérdida de sangre durante la cirugía (diferencia de medias [DM], −0,87; IC 95%: −1,5 a −0,23), tuvieron menos unidades de GR (DM, −1,45; IC 95%: −2,9 a −0,04) y de PFC (DM, −1,73; IC 95%: −3,3 a −0,2) transfundido, y dieron a luz antes (DM, 1,33 semanas; IC 95%: −2,23 a −0,43), en comparación con aquellas a las que se les diagnosticó durante el parto. El riesgo de ingreso en la UCI y el tiempo de hospitalización y en la UCI no fueron diferentes entre los grupos. El diagnóstico prenatal de PI se asoció con un mayor riesgo de lesión del tracto urinario (razón de momios, 2,5; IC 95%: 1,3 a 4,6), debido principalmente a la mayor prevalencia de placenta percreta en el grupo con PI diagnosticada prenatalmente.

Conclusiones El diagnóstico prenatal de la PI se asocia con una reducción de la morbilidad hemorrágica, en comparación con los casos en los que estas anomalías se detectan durante el parto.

异常植入性胎盘产前诊断对母亲结局的影响：系统评价和 meta 分析

目的：确定产前诊断对异常植入性胎盘（abnormally invasive placenta，AIP）孕妇手术结局的影响。

方法：检索 MEDLINE、EMBASE、CINAHL 和 Cochrane 数据库。观察的结局包括：分娩孕周（周），失血量（L），输注的红细胞（red blood cells，RBC）、血小板（platelets，PLT）和新鲜冰冻血浆（fresh frozen plasma，FFP）单位，住院时间和重症监护室（intensive care unit，ICU）治疗时间（天），尿道损伤和感染。仅纳入报道对出现上述任一结局的产前和产时诊断为 AIP 的孕妇进行比较的研究。采用随机效应头对头比较 meta 分析对数据进行分析。

结果：纳入 13 项研究。与产时诊断为 AIP 的孕妇相比，产前诊断为 AIP 的孕妇术中出血量较少（均数差[mean difference，MD] −0.87；95% CI，−1.5 ~ −0.23），输注 RBC（MD，−1.45；95% CI，−2.9 ~ −0.04）和 FFP（MD，−1.73；95% CI，−3.3 ~ −0.2）单位较少，分娩时间较早（MD，1.33 周；95% CI，−2.23 ~ −0.43）。组间比较，进入 ICU 治疗的风险以及住院时间、ICU 治疗时间无差异。产前诊断为 AIP 的孕妇发生尿道损伤的风险较高（比值比，2.5；95% CI，1.3~4.6），主要是由于产前诊断为 AIP 的孕妇胎盘植入的患病率较高。

结论：与分娩时发现 AIP 相比，产前诊断为 AIP 能够降低出血发生率。