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Original Article

Choosing the optimal therapeutic strategy for placental polyps using power Doppler color scoring: Transarterial embolization followed by hysteroscopic resection or expectant management?

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ABSTRACT

Objective: To evaluate a protocol for selection of placental polyp management, including expectant management and hysteroscopic resection with or without transarterial embolization (TAE), using power Doppler color score (PDCS) as the vascularity parameter.

Materials and Methods: This retrospective case–control study included 25 patients who were diagnosed with placental polyps. We evaluated the vascularity of placental polyps with PDCS measured by transvaginal ultrasonography as follows: PDCS 1, no blood flow; PDCS 2, minimal flow; PDCS 3, moderate flow; and PDCS 4, marked blood flow. We then selected expectant management or hysteroscopic resection with or without TAE.

Results: Three of 17 patients with PDCS 1 or 2 underwent surgical intervention, and expectant management was successful in 14. Seven of eight patients with PDCS 3 or 4 underwent surgical intervention, while expectant management was successful in only one patient.

Conclusion: PDCS is a simple examination for evaluating the vascularity of placental polyps. PDCS might be useful for selecting the optimal treatment for placental polyps, such as expectant management or surgical intervention, according to their vascularity.

Introduction

A placental polyp is a polypoid mass that develops after parturition, induced abortion, and incomplete miscarriage [1,2]. It is a fragment of retained placental tissue in the uterine cavity that is synonymous with retained products of conception. The most significant of these is a hypervascular placental polypoid mass, which may be potentially life threatening, as it can cause severe vaginal hemorrhage that sometimes requires hysterectomy for complete hemostasis [3,4]. Transarterial embolization (TAE) with hysteroscopic resection is a minimally invasive procedure for the treatment of hypervascular placental polyps. However, this procedure is associated with surgical complications such as uterine perforation and infection. Although no standard method to predict severe spontaneous vaginal hemorrhage due to hypervascular placental polyps has been established, dilation and curettage without TAE may be used because it is less invasive [1].

Transvaginal ultrasonography is a convenient and conventional method for gynecologists, which is widely used to evaluate the endometrial cavity. Transvaginal Doppler ultrasound has been reported to be useful for the diagnosis and assessment of placental polyps [5,6]. Hypervascular placental polypoid masses show prominent vascularity on Doppler ultrasound and computerized tomographic angiography [2,7]. Therefore, insufficiently assessed dilation and curettage can lead to life-threatening hemorrhage. TAE followed by hysteroscopic resection has recently been reported as a useful procedure [3,4,7]. In cases of hypovascular placental polyps that do not require therapeutic intervention, expectant management has been reported as a curative treatment [1].

In this study, we retrospectively reviewed 25 placental polyp cases and assessed the validity of surgical intervention with respect to vascularity evaluated with Doppler ultrasound.

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Materials and Methods

Twenty-five patients with placental polyps treated at Nagoya University Hospital, Nagoya, Japan between January 2008 and February 2013 were included in this study. This study was approved by the Ethics Committee of Nagoya University Graduate School of Medicine. The diagnosis of placental polyps was based on the presence of a measurable focus of hyperechoic mass within the endometrial cavity on two-dimensional gray-scale transvaginal ultrasound. The diagnosis was confirmed by hysteroscopy and/or magnetic resonance imaging with or without blood flow on transvaginal ultrasound.

The International Ovarian Tumor Analysis group has suggested the use of subjective semiquantitative assessment of flow to describe the vascular features of ovarian masses [8,9]. A color score is used to describe the amount of blood flow for the whole tumor: color score 1, no detectable blood flow; score 2, minimal flow; score 3, moderate flow; and score 4, highly vascular [5,8,9]. We divided the 25 patients into four groups based on the power Doppler color score (PDCS; Figure 1). The transvaginal ultrasound settings were adjusted to allow maximal sensitivity to blood flow. Ultrasonic frequency was set at 8.0 MHz and power Doppler gain was reduced until the artifacts disappeared. This color score only refers to the color Doppler image, not the Doppler shift spectrum. A subjective qualitative assessment of flow within the placental polyp was performed.

We also evaluated the patients' ages, serum β-human chorionic gonadotropin (β-hCG) levels, serum hemoglobin (Hb) concentrations, maximum diameter of placental polyps on initial medical examination, and treatment periods. Patients who received expectant management were included as controls and those who underwent hysteroscopic resection only or TAE followed by hysteroscopic resection were included as cases. Some patients underwent computed tomography (CT) and three-dimensional CT angiography for hypervascularity evaluation.

Data were analyzed using IBM SPSS Statistics version 20 (IBM, Endicott, NY, USA). We used the Student *t* test or the Mann–Whitney *U* test to compare the patients' characteristics, variables, serum β-hCG levels, serum Hb levels, maximum placental polyp diameter, and treatment periods between cases and controls. The Mann–Whitney *U* test was applied instead of the Student *t* test when the variables did not pass a normality test. A p value < 0.05 was considered statistically significant.

Results

Twenty-five women with a median age of 32 years (range, 22–42 years) were recruited for this study. Table 1 presents the patients' clinical characteristics, including PDCS. The median (minimum–maximum) serum β-hCG levels, Hb levels, and treatment periods of the 25 patients were 20.0 mIU/mL (range, 1.2–4377.3 mIU/mL), 11.9 g/dL (range, 4.9–14.3 g/dL), and 45 days (range, 3–202 days), respectively. The mean maximum placental polyp diameter was 22 mm (range, 10–45 mm). Two women underwent hysteroscopic resection alone, eight women underwent TAE followed by hysteroscopic resection, and 15 women received expectant management. Of the 25 patients, 28% (7/25) had PDCS 1, 40% (10/25) had PDCS 2, 24% (6/25) had PDCS 3, and 8% (2/25) had PDCS 4. One of 17 women with PDCS 1 or 2 underwent hysteroscopic resection, two underwent TAE followed by hysteroscopic resection, and 14 received expectant management. The two patients with TAE followed by hysteroscopic resection had undergone dilation and curettage before transfer to our hospital. One of eight women with PDCS 3 or 4 underwent hysteroscopic resection, six underwent TAE followed by hysteroscopic resection, and one with PDCS 4 received expectant management. Chi-square test of independence showed that increasing PDCS was related to difficulty in successful expectant management ($\chi^2 = 11.06$; $p = 0.002$; Table 2).

Figure 2 shows the findings of a patient with PDCS 4 (Case 22 in Table 1) on transvaginal Doppler ultrasound at initial medical

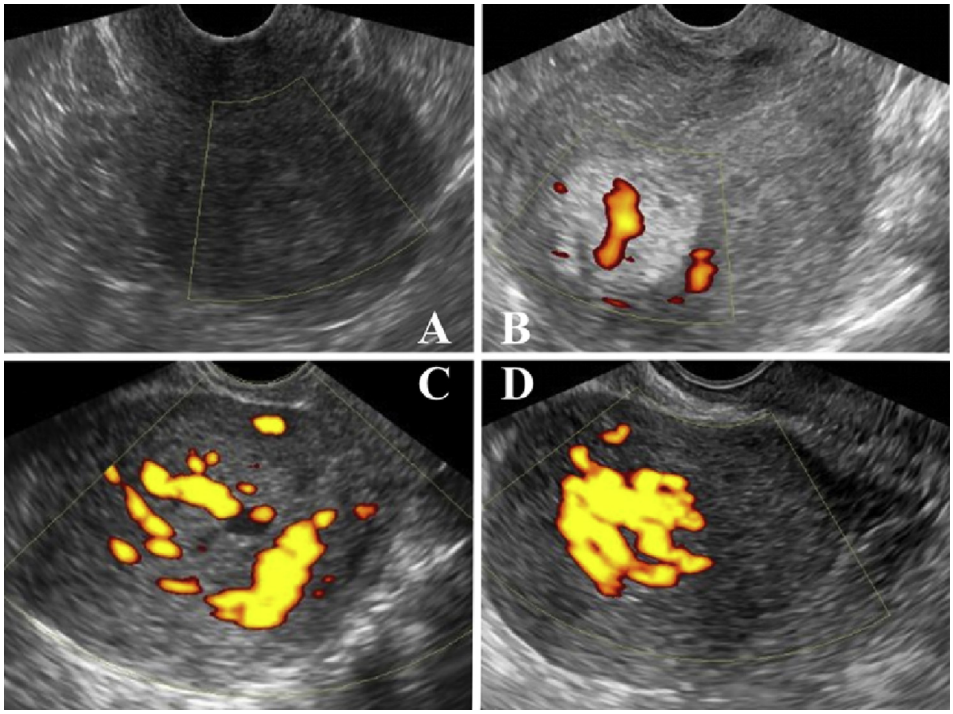

Figure 1. Power Doppler color score (PDCS) as the vascularity parameter of placental polyps. (A) PDCS 1 (no detectable blood flow), (B) PDCS 2 (minimal flow), (C) PDCS 3 (moderate flow), and (D) PDCS 4 (highly vascular).

Table 1
Patients' clinical characteristics.

Case	Age (y)	Gravida	Para	NVD	CS	Miscarriage	Artificial abortion	β-hCG (mIU/mL)	Hb	Diameter (mm)	PDCS	Procedure	Treatment period[a]
1	32	4	0	0	0	4	0	3.9	10.7	30	3	TAE followed by hysteroscopic resection	21
2	32	3	0	0	0	3	0	1082.0	7.5	40	3	TAE followed by hysteroscopic resection	16
3	29	4	2	0	0	0	0	1.4	11.0	15	2	Expectant management	30
4	41	2	1	1	1	1	0	114.0	11.0	40	3	TAE followed by hysteroscopic resection	53
5	39	1	1	1	0	0	0	<1.2	13.2	15	1	Expectant management	60
6	29	1	0	0	1	1	0	32.3	13.2	10	2	Expectant management	25
7	27	2	1	0	1	1	0	134.0	13.2	10	2	Expectant management	87
8	25	2	1	0	1	1	0	4.5	13.0	15	1	Expectant management	51
9	35	3	0	0	0	3	0	83.6	12.1	40	3	Hysteroscopic resection	38
10	29	1	0	0	0	1	0	20.0	11.9	20	2	Hysteroscopic resection	25
11	40	1	1	1	0	0	0	<1.2	13.2	15	1	Expectant management	158
12	39	2	1	1	0	1	0	<1.2	14.3	20	1	Expectant management	49
13	37	5	3	0	3	2	0	34.5	11.8	45	2	Expectant management	92
14	26	1	0	0	0	0	1	9.8	10.6	35	3	TAE followed by hysteroscopic resection	6
15	42	2	1	1	0	1	0	112.0	12.1	18	2	Expectant management	74
16	38	2	1	0	1	1	0	<1.2	12.0	20	1	Expectant management	31
17	29	1	0	0	0	1	0	14.4	8.0	28	1	Expectant management	45
18	32	1	1	0	1	0	0	18.9	12.3	30	2	Expectant management	106
19	35	3	0	0	0	1	2	113.1	12.2	22	4	TAE followed by hysteroscopic resection	5
20	29	2	2	1	1	0	0	25.8	11.3	44	3	TAE followed by hysteroscopic resection	3
21	32	3	2	0	2	1	0	<1.2	11.7	32	2	Expectant management	202
22	29	1	0	0	0	0	1	351.2	12.5	34	4	Expectant management	99
23	25	3	1	1	0	2	0	35.7	4.9	21	2	TAE followed by hysteroscopic resection	5
24	22	3	1	0	1	1	1	9.4	8.7	14	1	Expectant management	28
25	36	3	1	0	1	2	0	4377.3	11.0	26	2	TAE followed by hysteroscopic resection[b]	69
Median (range)	32 (22–42)							20.0 (1.2–4377.3)	11.9 (4.9–14.3)	22 (10–45)			45 (3–202)

CS = cesarean section; Hb = hemoglobin; NVD = normal vaginal delivery; PDCS = power Doppler color score; TAE = transarterial embolization; β-hCG = β-human chorionic gonadotropin.
[a] The days that were about to confirm the disappearance of placental polyps from the first medical examination.
[b] The case of expectant management failure.

examination, early arterial phase of dynamic contrast-enhanced CT, three-dimensional CT angiography, and transvaginal Doppler ultrasound after elimination of the placental polyp.

Subsequently, we compared each parameter between the cases and controls (Table 3). We found no significant difference in ages between the cases and controls ($p = 0.799$). By contrast, we found significant differences in β-hCG levels ($p = 0.030$), Hb concentrations ($p = 0.013$), maximum placental polyp diameter ($p = 0.016$), PDCS ($p = 0.001$), and the treatment periods ($p = 0.002$) measured between the cases and controls.

Discussion

A portion of placental tissue may become rigidly attached to the uterine muscle layer and develop into a hypervascular placental polyp by tissue degeneration with fibrin deposition and inflammatory changes [2,3]. Retained placental tissue is suspected in cases of persistent postpartum or postabortion bleeding. The incidence of placental polyp is < 0.25% of all pregnancies. Furthermore, only 6% of placental polyps are hypervascular and cause severe hemorrhage [3,10].

Selection of an appropriate management strategy for placental polyps is important because they may cause severe hemorrhage, which could be potentially life threatening and require hysterectomy [3,4]. Hysterectomy is not an option for patients hoping to preserve fertility. Therefore, TAE followed by hysteroscopic resection could be used for hypervascular placental polyps instead of hysterectomy. However, TAE has been associated with complications such as uterine necrosis and placenta accreta in subsequent pregnancy [11,12].

Transvaginal Doppler ultrasound is a useful initial test for a suspected hypervascular uterine lesion. In addition, more specific imaging modalities for the diagnosis of placental polyps include CT angiography and magnetic resonance imaging [3,4,7,13]. However, there are no reliable indexes to predict severe hemorrhage and the feasibility of expectant management.

In this study, we demonstrated that evaluation of PDCS in the initial examination was helpful for predicting the prognosis of placental polyps. According to our results, PDCS 1 and 2 indicate low risk and PDCS 3 and 4 indicate high risk of severe hemorrhage. Specifically, TAE followed by hysteroscopic resection should be performed in high-risk cases, and we recommend expectant management for low-risk cases (Figure 3). We successfully performed expectant management for all patients with PDCS 1. Among

Table 2
Procedures used according to PDCS.*

Procedure	PDCS 1 & 2 ($n = 17$)	PDCS 3 & 4 ($n = 8$)
Hysteroscopic resection with or without TAE	3	7
Expectant management	14	1

* $p = 0.002$ (Chi-square test).
PDCS = power Doppler color score; TAE = transarterial embolization.

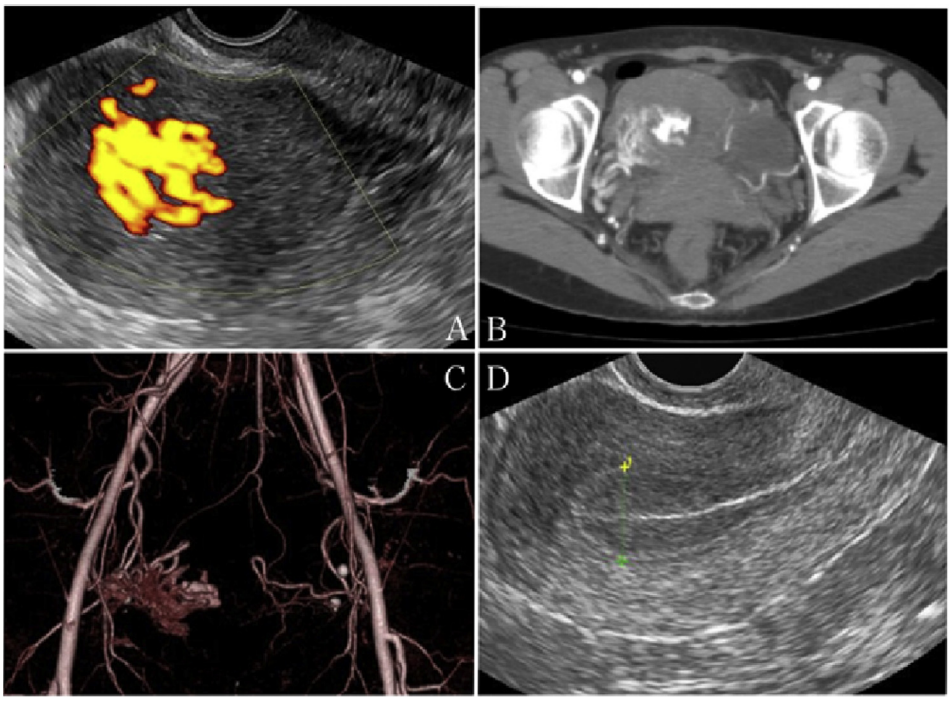

Figure 2. Preoperative and postoperative images of a patient with Power Doppler color score 4. (A) Doppler ultrasound on initial medical examination, (B) early arterial phase of dynamic contrast-enhanced computed tomography, (C) three-dimensional computed tomography angiography, and (D) transvaginal Doppler ultrasound after elimination of the placental polyp.

Table 3
Difference in variables between cases and controls.

Variable	Cases ($n = 10$)	Controls ($n = 15$)	p
Age (y)	32.0 ± 4.9	32.6 ± 6.1	0.799
β-hCG (mIU/mL)	59.7 (3.9–4377.3)	9.4 (1.2–351.0)	0.030
Hb (g/dL)	11.0 (4.9–12.2)	12.3 (8.7–14.3)	0.013
Diameter (mm)	31.8 ± 9.1	21.4 ± 10.1	0.016
PDCS	3 (2–4)	2 (1–4)	0.001
Treatment period (d)	18.5 (3–69)	60 (25–202)	0.002

Data are presented as mean ± standard deviation or median (minimum–maximum).
Hb = hemoglobin; PDCS = power Doppler color score; β-hCG = β-human chorionic gonadotropin.

patients with PDCS 2, one underwent hysteroscopic resection and two underwent TAE followed by hysteroscopic resection. Two of these patients had undergone dilation and curettage before our initial medical examination. In these cases, hypervascularity of placental polyps might not have been evaluated correctly using PDCS just after curettage. However, expectant management was not successful in one patient with PDCS 2 (Case 25 in Table 1). This patient had the highest β-hCG level in this study group. Viability of the retained placental tissue might have been related to hemorrhage requiring TAE.

By contrast, hypervascularity in PDCS 3 or 4 cases demonstrates persistent communication between the residual placental tissues and maternal circulation. Therefore, spontaneous elimination of placental polyps without severe hemorrhage is unlikely. Thus, hysteroscopic resection or TAE followed by hysteroscopic resection was performed for seven of eight cases with PDCS 3 and 4. However, expectant management was successfully performed in one patient with PDCS 4 (Case 22 in Table 1); thus, surgical intervention may not be necessary for some patients with PDCS 3 and 4. Therefore, prospective studies are needed to evaluate the use of PDCS as a predictor of successful expectant management for placental polyps.

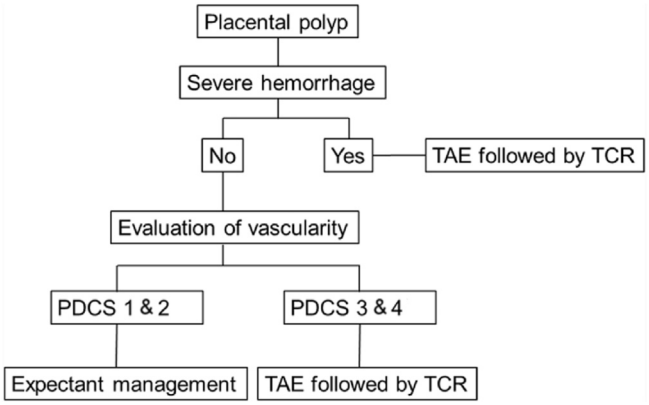

Figure 3. Algorithm showing the management of placental polyps using power Doppler color score (PDCS). TAE = transarterial embolization; TCR = transcervical resection.

Another problem to be addressed is the treatment period. Although expectant management is the most minimally invasive procedure for patients, the treatment duration could be longer than that of surgical intervention. We encountered three cases of expectant management performed for over 100 days. Hysteroscopic resection without TAE after a certain period of expectant management in cases with PDCS 1 and 2 might be a preferable strategy.

In conclusion, an appropriate management strategy for placental polyps is important, and insufficiently assessed dilation and curettage for hypervascular placental polyps should be avoided. PDCS is a simple variable for evaluating the vascularity of placental polyps. We recommend expectant management for cases of placental polyps with PDCS 1 and 2, and surgical intervention, if needed, after TAE in cases of PDCS 3 and 4. This is the first report of a therapeutic algorithm for placental polyps.

Conflicts of interest

The authors have no conflicts of interest to disclose.

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