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## ORIGINAL ARTICLE

# Is endomyometrial injury during termination of pregnancy or curettage following miscarriage the precursor to placenta accreta?

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**Aims:** To determine the frequency with which myometrium is removed during vacuum terminations of pregnancy or dilatation and curettage after miscarriage, and to relate these findings to subsequent placenta accreta or its proxies.

**Methods:** Archival tissues from vacuum termination of pregnancy or dilatation and blunt curettage after miscarriage were examined for the presence of myometrium. The subsequent obstetric histories were scrutinised for manual removal of placenta, postpartum haemorrhage, or retained placenta. A retrospective study comparing the frequency of miscarriage and termination in women who had or did not have a manual removal was also performed.

**Results:** Myometrium was seen in the products of conception in 44% and 35% of termination and miscarriage tissues, respectively. One of nine women with myometrium at miscarriage had a postpartum haemorrhage in a subsequent pregnancy whereas, of the 21 women without myometrium at miscarriage, three required manual removal and seven had a postpartum haemorrhage afterwards. A past history of termination and/or miscarriage was more frequent in multigravid women who had a manual removal than those who did not.

**Conclusions:** Endomyometrial injury is frequent at termination or dilatation and curettage after miscarriage, but the relation to subsequent placenta accreta remains unclear. Women requiring a manual removal of the placenta were likely to have had a past history of termination and/or miscarriage.

Placenta accreta is the morbid adherence of the placenta to the uterus.<sup>1–4</sup> Histologically, the intervening layer of decidua between the placenta and myometrium is absent. Depending on the degree of accreta, there may be a delayed third stage of labour, a need for manual removal of the placenta, and/or postpartum haemorrhage.<sup>1–3, 5</sup> Risk factors include previous uterine surgery, such as caesarean section and dilatation and curettage.<sup>6–8</sup> Women who have had an abortion have an increased risk of retained placenta or manual removal in subsequent pregnancies.<sup>5, 9–12</sup> Our objective was to test whether endometrial scarring could be the pathophysiological mechanism for this increased risk.<sup>3</sup>

## METHODS

### Prospective study

We reviewed tissue from 100 consecutive women who had a vacuum suction (without curettage) termination of pregnancy for social reasons and from 97 consecutive women who underwent a dilatation and curettage using a blunt curette only after a spontaneous miscarriage or blighted ovum that had been submitted for histopathological examination between April and May 2001 in the Women's and Children's Hospital, Adelaide, Australia. In particular, the presence of myometrium was sought. The amount of myometrium was assessed semiquantitatively by counting the number of  $\times 10$  high power fields occupied by myometrium. For both groups of women, the outcome in any subsequent pregnancy (if any) was noted by a chart review. Proxies of placenta accreta—such as postpartum haemorrhage (defined as blood loss of 500 ml or more), manual removal of the placenta, or retained placenta—and possible confounders—such as maternal age, gravidity, and parity—were sought.

### Retrospective study

A retrospective case-control study was performed by examining the obstetrical and gynaecological histories of women who had a manual removal of the placenta after vaginal delivery in 2001 or 2002 in the Women's and Children's Hospital, Adelaide compared with those who did not. The chronologically next woman in the delivery register who delivered vaginally without manual removal of the placenta served as the control. A prior history of caesarean section, other uterine surgery, terminations of pregnancy, or miscarriages with dilatation and curettage was specifically sought. Tissue from any prior terminations of pregnancy or miscarriages was reviewed for the presence of myometrium.

The  $\chi^2$  and Fisher exact tests were used to analyse the associations between categorical variables and each of the depending variables using the SPSS 11.0 statistical analysis program. Results were considered significant when  $p \leq 0.05$ .

## RESULTS

### Prospective study

An average of one and two slides were available for review from terminations of pregnancy and from miscarriages, respectively. Myometrial fibres were seen in the products of conception from 44 (44%) terminations and 34 (35%) miscarriages. The amount of myometrium ranged from a few fibres (estimated to be less than 0.01% of all tissue embedded in a standard Tissue Tek cassette measuring 28  $\times$  40 mm) to nine high power fields for each slide (estimated as 5% of tissue examined). There was no significant difference between those women with or without myometrium in their slides with respect to maternal age, gravidity, parity, gestational age, or previous history of

terminations of pregnancy, miscarriage, or caesarean section in both the termination and miscarriage groups.

During the follow up period, no patient had evidence of Asherman's syndrome or endometritis. There were only seven subsequent pregnancies from the women with a termination that resulted in an outcome: there were two miscarriages and five further terminations. Of the women who had a miscarriage, there were 53 subsequent pregnancies. Clinical charts of 10 women were not available or were missing, and there were 12 miscarriages and one termination; this left nine subsequent completed pregnancies from the 34 women with and 21 from the 63 women without myometrium in their evacuated tissue. Proxies of placenta accreta were significantly less frequent in women with evacuated myometrium from the miscarriage: one of the nine women with myometrium in the evacuated tissue had a postpartum haemorrhage whereas, of the 21 women without evacuated myometrium, three required manual removal of the placenta and seven had a postpartum haemorrhage ( $p < 0.02$ ; table 1).

**Retrospective study**

There were 142 women who had a manual removal of the placenta after a vaginal delivery in 2001 and 2002. No significant differences in maternal age (mean, 29.2 v 29.1 years), gravidity (2.7 v 2.7), parity (1.0 v 1.0), previous uterine surgery other than dilatation and curettage or vacuum aspiration (nine v eight) were found between these women and those who did not have a manual removal.

Ninety four women with (case) and 97 without a manual removal (control) were multigravid. Eight women in the case group and one woman in the control group had a repeat manual removal of the placenta. There was no significant difference between prior miscarriages (41 v 36), but more women in the case group had a previous termination of pregnancy (33 v 23;  $p = 0.08$ ). A history of termination of pregnancy and/or a miscarriage was significantly more common in the case group (63 v 51;  $p = 0.04$ ), whereas a history of caesarean section was more common in the control group (20 v 8;  $p = 0.02$ ). Where tissue from a previous miscarriage or termination was available, myometrium was present in such tissue from five of 12 cases and five of eight controls.

**DISCUSSION**

As far as we are aware, the frequency and amount of myometrium that is present within material evacuated at a vacuum suction termination of pregnancy or dilatation and curettage after a miscarriage has not been systematically investigated before. The frequency with which myometrial fibres were seen—44% in terminations and 34% in miscarriages—is probably an underestimate of the true incidence. Because the primary motive for pathological

examination after termination of pregnancy or a miscarriage is to confirm an intrauterine pregnancy, most pathologists try to select villous fragments or placental tissue over the membranous fragments that may comprise decidua and subjacent myometrium for embedding.<sup>13</sup> Consequently, more myometrium is probably evacuated than is blocked and is thus not seen in the microscope slides. Although we attempted to quantify the amount of myometrium that was present in the slides, it is unclear what proportion of the luminal uterine surface or of the myometrial bulk this represented.

*“Further studies addressing the poorly understood physiology of involution and regeneration of the endometrium after pregnancy are clearly needed and may help to elucidate the aetiopathology of placenta accreta”*

Our study could not answer whether the removal of myometrium at the time of termination of pregnancy or dilatation and curettage is contributory to future placenta accreta. In the retrospective arm of our study, a history of prior termination of pregnancy and/or a miscarriage was more common in women who had a manual removal than those who did not. However, in the prospective arm, proxies of placenta accreta were seen more frequently in women who did not have myometrium in their curettage tissue than those who did. It is not clear whether this observation is the result of the probable underestimate of the amount of myometrial tissue that was evacuated, as discussed earlier, and that it was a false negative classification for those women without observed myometrium. It is possible also that removal of myometrium per se may be less important than instrumentation within the uterine cavity or other interactive factors in giving rise to the longer term sequela of placenta accreta. As far as it can be ascertained, the endometrium regenerates well, and endometrial scarring with an associated inadequate decidual response may not necessarily follow the removal of myometrium in these procedures. For example, the endometrial lining is reconstituted after a septotomy when the uterine cavity is viewed hysteroscopically.<sup>14</sup>

Although we have shown that myometrium can be evacuated during a vacuum termination of pregnancy or at curettage after a miscarriage, the connection between this and subsequent placenta accreta is less well defined. Retained placenta, manual removal of the placenta, and (although there are other causes) postpartum haemorrhage are good proxies for placental accreta.<sup>1 3 5 8</sup> We confirmed the previously reported association between retained placenta or manual removal of the placenta and previous abortions,<sup>5 9-12</sup> but others have found that only a subset of women with previous abortions had retained placenta in subsequent pregnancies.<sup>15</sup> A prospective study where there is a sufficiently long follow up, a sufficient number of women, and where all the tissue from the evacuation—whether by suction aspiration or by curettage—is examined may provide an answer as to whether endomyometrial injury is the precursor

**Table 1** Obstetric outcomes after termination or miscarriage

Subsequent pregnancy outcome	Index pregnancy outcome		
	Termination	M+	M-
Missing notes		2	8
Termination	2	9	3
Miscarriage	5	0	1
Completed pregnancy		9	21
Postpartum haemorrhage		1	7
Required manual removal		0	3

M+, myometrium detected in tissue at curettage; M-, myometrium not detected in tissue at curettage.

**Take home messages**

- Endomyometrial injury is frequent at vacuum termination or dilatation and curettage after miscarriage, but the relation to subsequent placenta accreta is unclear
- Women requiring a manual removal of the placenta were likely to have had a past history of termination and/or miscarriage

to subsequent placenta accreta. However, women who have had a voluntary termination are less likely to want to be pregnant and this hampers the enrolment of women in such a study. Medical termination and expectant management after miscarriage are two alternatives that may minimise myometrial damage, and comparison of the incidence of subsequent placenta accreta or its proxies in women undergoing medical termination by surgery may also provide some insight.<sup>16</sup> Further studies addressing the poorly understood physiology of involution and regeneration of the endometrium after pregnancy are clearly needed and may help to elucidate the aetiopathology of placenta accreta.

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