

Fertility and Pregnancy after Uterine Artery Embolization

Victoria Bracke

Student number: 00903916

Supervisor 1: Prof. Dr. Steven Weyers

Supervisor 2: Prof. Dr. Ilse van Rooij

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Preface/Voorwoord

Deze masterproef kon niet tot stand komen zonder een aantal belangrijke mensen in mijn leven en carrière.

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Abstract

Uterine artery embolization (UAE) is a safe and effective treatment for symptomatic uterine fibroids. In clinical practice we see a reluctance towards uterine artery embolization for women with symptomatic fibroids who wish to have children. Reflectively, guidelines (e.g. NICE, RCOG) are likewise still reserved about fecundity and pregnancy complications after UAE.

A literature review was performed to evaluate the effect of an elective uterine artery embolization on fertility chances and the course of pregnancy and labour. In this review, all published original studies and case reports on this topic were investigated, even as all review studies from 2014 and later.

Some studies showed a significant reduction in fertility chances, due to a decrease in ovarian reserve (and so induction of premature ovarian failure) or due to endometrial damage after UAE. Once pregnant, studies showed high miscarriage rates of up to sixty percent. Although we realise the study population had an average age of over 40, whereby the high miscarriage rate is very concerning.

However, a large number of pregnancies after UAE is reported. After twelve weeks pregnancy, most of them will end without any complications, with a healthy, term infant. Nevertheless from observational data we know that the risk of placentation problems after UAE, e.g. placenta accreta, or postpartum haemorrhage is increased. Also, physicians tend to perform more caesarean sections to deliver the infant from the idea of preventing labour complications.

From this literature study can be concluded that UAE has a higher risk of fertility problems, as well as a high miscarriage rate (in comparison to myomectomy). Therefore, UAE should be avoided as the treatment of choice for young women who wish to have children. The possible risk of complications on fecundity and pregnancy should be well discussed with the patient (and partner). Once the patient is pregnant, follow-up can be the same as in the standard population, with extra attention to placentation. The risk of abnormal placentation and postpartum haemorrhage (PPH) marks the importance of a safe labour setting, preferable in a hospital setting with sufficient knowhow on treating placenta accrete/increta and PPH.

Introduction

Uterine fibroids (UFs), also known as myomas or leiomyomas, are the most common benign tumors of the female reproductive tract [1]. The cumulative incidence of UFs is 20–40% of women during their reproductive years [1]. Although many affected women are asymptomatic (approximately 50%), UFs can cause significant morbidity and deterioration of life quality [1, 2]. Symptomatic UFs can cause heavy menstrual bleeding and complaints related to the impact of the enlarged uterus on the adjacent pelvic structures ('bulk' symptoms) and infertility [1, 2]. Moreover, UFs may have a negative impact on fecundity. In case of cavity-distorting fibroids an impaired implantation rate and higher abortion rate has been described and hysteroscopic resection seems to have a beneficial effect [3, 4]. For intramural fibroids the effect on fecundity is less well stated and up until now removal for fertility reasons is debatable. Subserosal UFs have no effect on fertility [1].

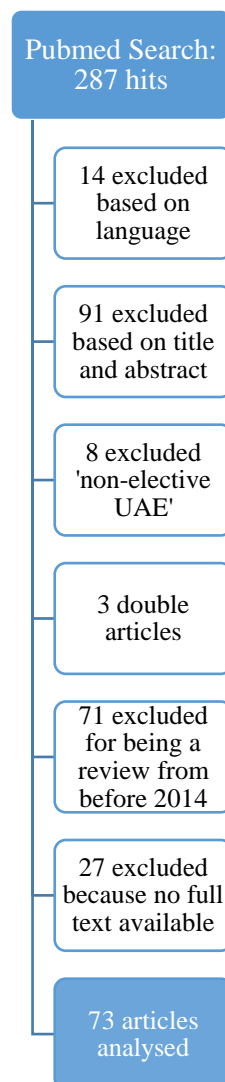
Apart from subfertility reasons, suffering from severe complaints is another reason for treating fibroids during the reproductive years. Medical as well as surgical treatments are available. The choice of treatment depends on number, size and location of UFs, patient's age and preferences, and the desire to have children [1].

In 1995, the first uterine artery embolization (UAE) was described by Ludwig et al. [5]. Uterine artery embolization is a minimally invasive treatment of symptomatic UFs using embolic material to occlude the uterine artery branches in order to reduce the blood supply and infarct the UFs [1]. Several studies [6-12] demonstrated the technique to be safe and effective, with a success rate of over 90-95%, in reduction of UF size as well as of patient complaints. There is no consensus in guidelines on the use of UAE in patients during their reproductive years [13]. In case of symptomatic UFs which cannot be relieved by medical therapy or in cases of the patient wanting children, the option of UAE is always discussed in spite of the absence on non-conflicting data on fecundity. There are concerns on the effect on the endometrium as well as on ovarian reserve. Different techniques of embolization can be applied to treat the fibroid as specifically as possible. In this study, a concise literature review is performed on UAE and fertility/pregnancy.

Methodology

In January 2020 a Pubmed search on “pregnancy or fertility after uterine artery embolization for fibroids or adenomyosis” was performed. This provided 287 hits with articles from 1997 till 2019. Fourteen articles were excluded based on language (only studies in English, French or Dutch were included) and 91 articles were excluded based on title and abstract. For the review of the literature, every pregnancy - also case studies - reported after an elective UAE was included. Therefore, pregnancy after emergency UAE, e.g. in the case of postpartum haemorrhage was excluded. Only systematic reviews from 2014 and later were included. Besides the Cochrane review, equally the available NICE guideline and RCOG guideline were consulted.

In July 2020 results of the long expected FEMME trial (Fibroids with Embolization or Myomectomy to Measure the Effect on quality of life) [14] were reported. Those results were also processed in the present literature review.



Results

Fertility after UAE

Questions about fertility after UAE remain largely unanswered. Some studies reveal the risk of amenorrhea after UAE due to adverse effects on ovarian reserve or on endometrial quality [15, 16]. Cases of premature ovarian failure (POF) after UAE [17] are particularly worrisome.

Reduction in ovarian reserve

Concerns about the reduction in ovarian reserve after UAE were on the increase, after Torre et al. [15] observed in 4 out of 62 premenopausal women who wanted children a persistent amenorrhea after UAE. The mechanism of this complication could be the existence of collateral circulation between the uterine artery and the vasculature of the ovaries. After embolization, ovarian failure could appear due to hypoxia.

During a three months follow-up, and in 30 patients who underwent UAE, Czuczwar et al. [18] noticed a significant decrease of AMH (anti-Mullerian hormone) levels and AFC (antral follicle count) with a significant increase in FSH (follicle stimulating hormone) levels. In addition, the values significantly differed from the follow-up values measured three months after supracervical hysterectomy (AMH $p < 0,001$; AFC $p = 0,006$; FSH $p = 0,15$). Even though the results are impressive, the limitation of the study is the short follow-up.

Kim et al. [19] investigated 32 women after UAE and found significant differences in AMH levels and AFC 3 months post procedure ($p < 0,001$), with partial recovery at twelve months follow-up, though still significantly lower than baseline ($p = 0.029$).

El Shamy et al. [5] conducted a meta-analysis to investigate the impact of UAE on ovarian reserve as determined by serum AMH concentration. There was no significant effect on AMH-levels at three, six and twelve months after the procedure. Two of the reviewed studies showed a significant reduction of the antral follicle count at three months follow up, with partial recovery after twelve months follow up. There was a trend of increasing FSH levels after UAE, but this was not significant.

Also the results of the recent FEMME trial (Fibroids with Embolization or Myomectomy to Measure the Effect on quality of life) from Manyonda et al. [20] showed no significant differences in hormonal levels of AMH, LH and FSH after UAE. The FEMME trial randomly assigned 116 women in the UAE group, compared to 119 women in the myomectomy group. No significant difference in hormonal levels, compared to baseline values or compared to myomectomy, were reported.

Endometrial quality

Mara et al. [21] examined 49 patients over three to nine months (average 5.6 months) after UAE with a hysteroscopic evaluation of the uterine cavity. In 63% of the patients, hysteroscopic abnormalities were found, the most common were macroscopic signs of necrosis, originating from protruding embolized fibroids. Adhesions were found in seven patients, five of them demanding adhesiolysis. Five women had a missed abortion after UAE, of them three had minor and one had major hysteroscopic abnormalities [22].

Torre et al. [23] performed a hysteroscopic evaluation post UAE for UF in eleven women and a laparoscopic evaluation in thirteen patients. On hysteroscopy, adhesiolysis was necessary two times and five cases demanded hysteroscopic fibroid removal. Three patients had fibroid debris in their cavity. Laparoscopy showed pelvic adhesions (two of them with positive chlamydia serology) in four out of thirteen patients.

Fertility after UAE

Table one provides an overview of the available data and can be summarized as follows.

The FEMME trial [20] reported ten pregnancies in 9/52 women trying to conceive within the two years after UAE. Three miscarriages occurred and one termination of pregnancy, resulting in six live births. These results were compared to 5/48 women who conceived after myomectomy (RR 0.6 (95% CI 0.2, 1.7)), resulting in four live births (no miscarriages).

One study of Torre et al. [24] showed a 60% live birth rate in fifteen patients trying to conceive after UAE. No complications were reported. One other study of Torre et al. [15] did not document one single pregnancy in 31 women trying to conceive, while signalling one miscarriage only.

Hamoda et al. [25] observed a 13.6% live birth rate in 22 women trying to conceive after UAE. The study of Redecha et al. [26] described a 31.8% live birth rate in 22 women trying to become pregnant. Bonduki et al. [27] described a 18.7% live birth rate in 75 women trying to become pregnant after UAE. Two early miscarriages were reported. Firouznia et al. [28] reported a 56.5% live birth rate in 23 women trying to conceive, and described two miscarriages. Pinto et al. [29] showed a 14% live birth rate in 57 women trying to become pregnant after UAE. Kim et al. [30] observed a 31.6% live birth rate in nine patients who wanted children after UAE. Three spontaneous abortions, two therapeutic abortions, three elective abortions, and one ectopic pregnancy were reported.

Mara et al. performed two comparative studies, one study of Mara et al. [31] reported similar pregnancy rates after UAE and laparoscopic uterine artery occlusion (LUAO), 69% and 66.7%

respectively, and reported evenly similar abortion rates (34.2% and 33.3%). In contrast, Holub et al. [32] also assessed the reproductive outcomes after LUAO and UAE in women with symptomatic fibroids. 68 pregnancies (in 58 women) resulted in 36 live births, 18 spontaneous abortions, 3 elective terminations, 2 ectopic pregnancies, and 7 ongoing pregnancies. Conception rates between both procedures were comparable, but significant differences in live births and miscarriage rates were observed: 65% live births after LUAO and 35.7% after UAE, respectively. In the laparoscopic group, there were 4 first-trimester miscarriages, 1 ectopic pregnancy, and 1 elective termination. In the embolization group, there were 14 first-trimester miscarriages, 1 ectopic pregnancy, and 1 elective termination.

The other study of Mara et al. [33] is a randomized controlled trial (RCT) comparing UAE and myomectomy. During the observation time, the pregnancy rate after UAE was 50%, delivery rate 19%, and abortion rate 64%, while after myomectomy the pregnancy rate was 78%, delivery rate 48%, and abortion rate 23%. The differences in all of these parameters were statistically significant. The fact finding that the rate of abortions after UAE was higher than 60% (in contrast with 23% after myomectomy) is concerning and poses further clarification.

Walker et al. [34] investigated the difference between women after UAE having a miscarriage and pregnancies resulting in a live birth. The only significant difference was in terms of age, with those women with no live birth after UAE being on average 3.0 years older. No significant difference was found in terms of initial uterine/dominant uterine volume or radiological response between these two subgroups.

Homer et al. [35] performed a review of a total of 227 completed pregnancies after UAE, using information collected from 8 studies. The researcher mentioned used a control group of 1121 pregnancies complicated by intramural fibroids derived from 14 studies, in which the fibroids were untreated. In the control group with untreated intramural fibroids 16.5% miscarriages was reported. In contrast, 35.2% miscarriages after UAE were reported ($P < 0.0001$, OR 2.8, 95% CI 2.0-3.8). One possible explanation is that UAE-induced endometrial ischemia has a considerable impact on implantation of the embryo [35].

Course of pregnancy after UAE

Several case-reports stated – sometimes more rare – pregnancy complications after UAE: preterm delivery [36, 37], sometimes occurring after premature prelabour rupture of membranes (PPROM) [38], abnormal placentation (placenta praevia [39], placenta accreta [40-43], placenta increta [44]), uterine rupture [45], uterine atony requiring hysterectomy [39], postpartum haemorrhage (PPH) [38, 41, 43, 46, 47]. One case of intramyometrial ectopic pregnancy in an

ICSI patient [48] was diagnosed on MRI and successfully treated with methotrexate. One case of maternal death due to bilateral amniotic fluid embolism after postpartum hysterectomy for PPH was described [47]. Even though complications are more frequent and most probably equally reported, also uneventful live births are reported [49-52], even after two UAE [53] or in case of twin pregnancy [38, 54].

Furthermore, larger observational studies summarised in table 2 describe pregnancy complications as preterm delivery, abnormal placentation and postpartum haemorrhage.

Redecha et al. [26] described seven pregnancies after UAE and observed one case of placental retention which was delivered manually in an uneventful procedure. One C-section was performed due to breech presentation. The data of Bonduki et al. [27] showed all fourteen ongoing pregnancies being ended by primary C-section (because of UAE). Placenta accreta occurred in two patients, and one case terminated in a puerperal hysterectomy. Firouznia et al. [28] examined thirteen full-term uncomplicated pregnancies, ending in elective C-section. One PPH occurred, based on retention of the placenta. Pinto et al. [29] describes eight live births, of which four delivered vaginal and four by C-section. No cases of abnormal placentation occurred. Kim et al. [30] observed six successful full-term pregnancies with five delivered by Caesarean section.

Singh et al. [55] reported 24 pregnancies in 21 women after UAE, resulting in 18 live births. Four preterm deliveries were seen, nine women delivered vaginally, four elective C-sections were performed and five secondary C-sections. There were two cases of placenta praevia and one PPH which required puerperal hysterectomy.

Walker et al. [56] studied 56 pregnancies after UAE using a retrospective study design. They noted 33 live births, 12 first trimester miscarriages (7 underwent evacuation of retained products), 1 second trimester miscarriage, 2 stillbirths (one due to a true knot in the cord and one after uterine rupture of a previous C-section scar). One case of placenta abruption was reported and one case of placenta praevia. Five cases of PPH occurred, two requiring blood transfusion.

Homer et al. [35] compared in a review 227 pregnancies after UAE with a control group of 4454 pregnancies complicated with untreated fibroids (derived from 10 studies). There was no significant difference in preterm birth, malpresentation or intra-uterine growth restriction (IUGR). The percentage of C-sections (66% versus 48.5%) and PPH (13.9% versus 2.5%) was significantly higher after UAE treatment.

International recommendation

International guidelines are hesitant in promoting uterine artery embolization in fertility-seeking women with (symptomatic) uterine fibroids [13]. The EMAS (European Menopause and Andropause Society) state to use UAE only in women who don't express a desire to have children [2]. Many authors suggest myomectomy as a clear therapy of choice for the vast majority of fibroid patients desiring pregnancy [2, 16]. The review of Kahn et al. [57] even states that UAE can't be offered to women with symptomatic fibroids who wish to have children because of the lack of evidence. In contrast, the review of Firouznia et al. [58] claims to take UAE into consideration for women who wish to have children because pregnancy certainly is possible after embolization and the new-born outcome seems normal and satisfactory, despite higher obstetrical complications. The RCOG guideline of 2013 [59] states that the evidence of fertility and pregnancy after UAE is poor, and that treatment for fibroids in women who wish to become pregnant in the future (whether it's UAE or myomectomy) should be offered only after fully informed discussion. The NICE guideline of 2010 [60] only notes that patients contemplating pregnancy should be informed that the effects of the procedure on fertility and pregnancy are uncertain.

Karlsen et al. [61] made an update on the 2014 Cochrane review [6] on UAE for treating symptomatic fibroids, focussing on fertility after UAE. Karlsen et al. [61] reviewed 989 women trying to conceive after UAE (including one RCT, two CCT and fourteen case series). 50% of women achieved pregnancy, which was lower than after myomectomy (78%), and also miscarriage rates seemed to be higher after UAE (60%) than after myomectomy (20%). However, as in the Cochrane review, the quality of evidence is very low. In contrast, the FEMME trial [20], the recent RCT focusing on fertility comparing UAE and myomectomy, is showing comparable fertility rates after UAE (9/52 women, resulting in six live births) and myomectomy (5/48 women resulting in four live births) (RR 0.6 (95% CI 0.2, 1.7)).

Discussion

Mara et al. [33] and the FEMME trial from Manyonada et al. [20] are the only randomized controlled trials comparing UAE and myomectomy to date. In the RCT of Mara et al. [33] 26 women after UAE were actively trying to become pregnant, in the FEMME trial, 52 women were trying to conceive (although not clear if the desire to have children was active or latent). The high abortion rate of 64% in the RCT of Mara et al. was worrying. The FEMME trial has a miscarriage rate of 30% (3 abortions out of 10 pregnancies). The live birth rate compared to the number of women wanting to become pregnant, is 11.2% in the FEMME trial and 19.2% in the RCT of Mara et al.

All other observational studies also give divergent results (Table 1). For fertility assessment, questions on the numerator (number of live births) and the denominator (number of women attempting to conceive after embolization) need to be answered [15]. Most studies only show a small study population and it is likely that some studies will be subject to a reporting bias, after underreporting miscarriages. Nevertheless, the fact that some (observational) studies show very low conception rates or very high miscarriage rates cannot be ignored. Further, it remains unknown whether the findings were caused by UAE or the fibroids per se. Since fibroids are known to cause decreased pregnancy rates and increased miscarriage rates, it is unknown whether the negative results reported after UAE are caused by a remaining fibroid mass or endometrial damage [61]. Also the type (submucosal, intramural, subserosal) and size of the fibroids will have an impact on the results of the embolization, which makes the study population less defined. Further, the age of participating women (mostly mean age of 40 or older) complicates the results.

In all published studies (Table 1), an average miscarriage rate of 33.4% is noticed, comparable with the 30% seen in the FEMME trial. If this miscarriage rate is compared to the control group of 1121 pregnancies with untreated intramural fibroids (Homer et al. [35]) in which a 16.5% miscarriage rate was reported, it may be hypothesised that UAE doubles the risk for miscarriage in women with fibroids.

The induction of premature ovarian failure seems to be more an incidental finding. The meta-analysis of El Shamy et al. [5] shows that eventual unintended embolization of the utero-ovarian collateral circulation (= non-targeted embolization) during UAE does not significantly affect the ovarian blood supply. Moreover, the FEMME trial [20] reports no significant differences in hormonal levels after UAE. Therefore the risk of POF after UAE seems to be negligible.

From observational studies and case reports, we learn that the risk of abnormal placentation and postpartum hemorrhage is higher, which marks the importance of a well-prepared labour and a safe labour setting, preferable in a hospital setting with sufficient knowhow on treating placenta accreta/increta and PPH. For the fetus itself, the impact seems to be very low, with only few reports of premature labour or intra-uterine growth restriction (probably not higher than average in a population).

All the guidelines described were edited based on the same (observational) data, so the fact that guidelines are divergent, is based on the wide range of interpretations of the results available. Most of the guidelines were anticipating the results of the FEMME study. However with the results now available, we don't expect large changes in guidelines as the rate of conception after UAE or myomectomy of the FEMME study is too small to yield strong evidence. Longer follow-up could possibly reinforce the evidence. The aim of the FEMME trial is to follow-up until 4 years postprocedure, so we expect more data to come in the next three to four years.

Although large randomized controlled trials (RCT) are lacking, this literature review demonstrates that UAE has a higher risk of fertility problems, as well as a high miscarriage rate (in comparison to myomectomy or untreated women). Therefore, UAE should actively be avoided as the treatment of choice for women who want children. The possible risk of complications on fecundity and pregnancy should be discussed thoroughly with the patient (and partner). If treatment is necessary, after patients were well informed, UAE can be the right treatment depending on the patients individual requirements. Once the patient is pregnant, follow-up should be the same as in the standard population, with extra attention to placentation. The risk of abnormal placentation and postpartum haemorrhage (PPH) marks the importance of a safe labour setting, preferable in a hospital with sufficient knowhow on treating placenta accreta and PPH.

Tabel 1: fertility after UAE

Study	Number of patients trying to conceive	Number (%) of patients pregnant	Number of pregnancies	Number (%) of miscarriages per pregnancy%	Number (%) of live births per pregnancy	Percentage of live births to number of patients trying to conceive
Manyonda et al. [20]	52	9 (17.3)	10	3 (30)	6 (60)	11.5
Torre et al. [24]	15	8 (53.3)	10	1 (10)	9 (90)	60
Hamoda et al. [25]	22	4 (18.2)	4	1 (25)	3 (75)	13.6
Torre et al. [15]	31	1 (3.2)	1	1 (100)	0 (0)	0
Redecha et al. [26]	22	6 (27.3)	7	0 (0)	7 (100)	31.8
Mara et al. [31]	42	29 (69)	42	13 (31)	23 (54.8)	54.8
Bonduki et al. [27]	75	15 (20)	16	2 (12.5)	14 (87.5)	18.7
Firouznia et al. [28]	23	14 (60.9)	15	2 (13.3)	13 (86.7)	56.5
Pinto et al. [29]	57	10 (17.5)	11	3 (27.3)	8 (72.7)	14.0
Mara et al. [33]	26	13 (50)	17	11(64.7)	5 (29.4)	19.2
Kim et al. [30]	19	12 (63.2)	15	9 (60)	6 (40)	31.6
Holub et al. [32]	39	20 (51.3)	28	14 (50)	10 (35.7)	25.6
Kim et al. [62]	6	5 (83)	8	0 (0)	7 (87.5)	>100
Dutton et al. [63]	187	27 (14.4)	37	18 (48.6)	19 (51.4)	0.10
Holub et al. [21]	27	14 (51.8)	17	8 (47.1)	9 (52.9)	33.3

Mara et al. [22]	12	7 (58.3)	9	6 (66.7)	2 (22.2)	16.7
Carpenter et Walker [64]	79	24 (30.4)	26	7 (27)	17 (65.4)	21.5
Singh et al. [65]	?	21	24	6 (25)	18 (75)	?
Walker et al. [56]	?	56	56	13 (23.2)	33 (58.9)	?
TOTAL			353	118 (33.4)	209 (59.2)	
TOTAL*	734	206 (28.1)	273	99 (36.2)	158 (57.9)	21.5

* only studies with full data included

Tabel 2: pregnancy course after UAE

Study	Number of pregnancies surviving first trimester	Abnormal placentation	PPH	Preterm birth	Other complications
Torre et al. [24]	10	0	0	0	-
Hamoda et al. [25]	3	0	0	0	-
Torre et al. [15]	0	0	0	0	-
Redecha et al. [26]	6	0	1 (placental retention)	0	-
Bonduki et al. [27]	14	2 placenta accreta	0	0	1 puerperal hysterectomy

Firouznia et al. [28]	13	0	1 (placental retention)	0	-
Pinto et al. [29]	8	0	0	0	-
Kim et al. [30]	6	0	0	0	-
Singh et al. [55, 65]	18	2 placenta praevia 1 placenta accreta	3	4	1 puerperal hysterectomy
Walker et al. [56]	35	1 placenta praevia	5	0	2 stillbirths 1 placental abruption
Carpenter et Walker [64]	18	1 placenta praevia	3	5	2 PPROM 1 placental abruption
Kim et al. [62]	7	0	0	1	1 PPROM

Tabel 3: Cases described in literature.

Study	Case	Course of pregnancy	Gestational age at delivery	Mode of delivery	Birth	Complications
Vanisht et al. [49, 50]	Spontaneous conception, 11 months post embolization	Uneventfull	38 wks	Elective C-section	Male, 3380 grams, AS 9/10	None

Goldberg [38]	G1P0	PPROM at 24 wks	28 wks	C-section		PPH due to uterine atony, requiring hysterectomy
	G1P0, DCDA twin	Uneventfull	36 wks	C-section		None
D'angelo [54]	DCDA twin, spontaneous conception 20 months after UAE.	PPROM 34 wks	34 wks	First twin with forceps, second with C- section due to cord prolaps	2000 grams for each twin	None
Nabeshima [51]	Spontaneous conception 17 months after UAE + subsequent myomectomy	Uneventfull	Term	Elective C- sectio		None
Trastour [46]	Spontaneous conception 16 months after UAE	29 wks admission for fibroid necrosis	37 wks + 5d	Elective C- sectio (breech)	Male, 3700 grams	1L bloodloss, without need for transfusion
Pietura [42]	Spontaneous conception 3 months after UAE	IUGR, but smoker	40 wks	Elective C- section	2240 grams	Placenta accreta

Ng [37]	Spontaneous conception 6 months after UAE and myomectomy	33 wks 5 d minor contractions	33 wks 5 d	Elective C-section		None
El-Miligy [43]	Spontaneous conception after UAE	Uneventfull	At term	Elective C-section for breech		<ul style="list-style-type: none"> - Myometrial defect at C-section - Placenta accreta - PPH
Foote [36]	Spontaneous conception after UAE	35 wks 5 d fetal distress	35 wks 5 d	Elective C-section	Normal weight	PPH demanding blood transfusion
Volkers [52]	Unplanned conception after UAE	Uneventfull	39 wks 5 d	Secondary C-section fetal distress	2780 grams (p3); AS 3/7/9	None
Leyder [48]	ICSI 5 months after UAE.	Intramyometrial ectopic pregnancy, treated with MTX (implantation in a necrotized fibroid				

		in the uterine wall)				
Takahashi [41]	Spontaneous conception 24 months after UAE	PPROM 34 wks, followed by labor	34 wks	Vaginal birth	1950 grams	Placenta accreta, with massive PPH demanding supracervical hysterectomy, estimated blood loss 5L
Kitson [44]	34 y old	Uneventfull	35w 5d	Elective C-section with postpartum hysterectomy planned	Female, 2350 g.	Placenta increta
Ravangard [53]	Spontaneous conception 6 months after second UAE for symptomatic fibroids	Uneventfull	40w 6d	Induction of labour, secondary C-section (arrest of dilatation)	Male, 3288 g	None
Yeaton-Massey [45]	6 years after UAE and 5 years after hysteroscopic myomectomy,	26 weeks first admission (no planned pregnancy,	29w 1d	Urgent laparotomy	Healthy male	2 myometrial defect (anterior and fundal) + placenta increta, supracervical

	unplanned conception	amenorrhoea since 6 years) - 26 weeks heavy vaginale bleeding - 29w 1d uterine rupture				hysterectomy performed, 3L blood loss
Jeanneteau [47]	37 y old, G5P4, UAE for fibroids performed after 4th delivery	Uneventfull	41w 5d	Induction of labour, fetal distress led to C-section	Male, 3890-g	PPH of 2,4 L, postpartum hysterectomy. 2 hours after birth cardiac arrest and death of mother, due to massive bilateral amniotic fluid embolism.

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Nederlandse samenvatting

Uterusembolisatie (Eng. Uterine Artery Embolization, UAE) is een veilige en bewezen effectieve behandeling voor vrouwen met een symptomatische uterus myomatosus. In de praktijk voelen artsen een weerstand voor het toepassen of aanbevelen van uterusembolisaties bij vrouwen met een symptomatische uterus myomatosus en (toekomstige) kinderwens. Ook richtlijnen (oa. NICE, RCOG) blijven erg voorzichtig over fertiliteitskansen en zwangerschapscomplicaties na uterusembolisatie.

We voerden een literatuurstudie uit om het effect van een electieve uterusembolisatie te evalueren op fertiliteitskansen en op het verloop van zwangerschap en bevalling. Alle gepubliceerde originele studies en casussen binnen dit onderwerp werden in beschouwing genomen, even als alle review artikelen van 2014 of recenter.

Sommige studies tonen een sterke reductie in de fertiliteitskansen, te wijten aan een verlaagde ovariële reserve (en zo inductie van prematuur ovarieel falen), of te wijten aan endometriumschade ten gevolge van de embolisatie. Bovendien tonen sommige studies bij zwangere patiënten hoge miskraamratio's, tot 60%. Hoewel de studiepopulatie vaak een gemiddelde leeftijd van ouder dan 40 jaar heeft, is de hoge miskraamratio zorgwekkend en vraagt dit verdere uitklaring.

Toch werd een groot aantal zwangerschappen na uterusembolisatie gerapporteerd. Eens de twaalf weken voorbij, zullen veel zwangerschappen eindigen zonder complicaties, met een gezond, a terme geboren kind. We weten echter van observationele data dat er een groter risico is op abnormale placentatie na uterusembolisatie, zoals bv. placenta accreta, of op postpartum hemorragie. Bovendien zijn artsen ook geneigd eerder een sectio caesarea te verrichten ter preventie van perinatale complicaties.

Deze literatuurstudie toont aan dat het verrichten van een uterusembolisatie een risico geeft op fertiliteitsproblemen nadien, net zoals een hoger miskraamrisico (in vergelijking met het uitvoeren van een myomectomie, of in vergelijking met geen behandeling). Daarom menen we dat een uterusembolisatie niet de eerste keuze behandeling is voor vrouwen met een duidelijke (toekomstige) kinderwens. De mogelijk negatieve invloed op de fertiliteit en zwangerschapsuitkomst moeten in ieder geval goed met patiënte (en partner) overlopen worden. Eens de patiënte zwanger is na uterusembolisatie, kan standaard follow-up voldoende zijn, met

extra aandacht voor de placentatie. Het risico op abnormale placentatie en postpartum hemorragie toont ook het belang aan van een veilige bevallingssetting.