Oocyte donation recipients of very advanced age: perinatal complications for singletons and twins

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Objective: To compare maternal, obstetric, and neonatal outcomes between women who underwent oocyte donation at or after age 50 years and from 45 through 49 years.
Design: Single-center, retrospective cohort study.
Setting: Maternity hospital.
Patient(s): Forty women aged 50 years and older ("older group") and 146 aged 45–49 years ("younger group").
Intervention(s): Comparison between the older and younger groups, globally and after stratification by type of pregnancy (singleton/twin pregnancy).
Main Outcome Measure(s): Maternal, obstetric, and neonatal outcomes.
Result(s): The rate of multiple-gestation pregnancies was similar in both groups (35% in the older and 37.7% in the younger group). We observed no significant difference globally between the two groups for outcomes, except for the mean duration of postpartum hospitalization, which was significantly longer among the older women (mean ± SD, 9.5 ± 7.4 days vs. 6.8 ± 4.4 days). The rates of isolated pregnancy-related hypertension and of fetal growth restriction in singleton pregnancies were statistically higher in the older than in the younger group (19.2% vs. 5.5%, and 30.7% vs. 14.3%, respectively). Complication rates with twin pregnancies were similar between groups and very high compared with singleton pregnancies.
Conclusion(s): Complication rates were similar among women aged 50 years and older and those aged 45–49 years. Nonetheless, given the high rate of complication in both groups, especially among twin pregnancies, single embryo transfer needs to be encouraged for oocyte donations after age 45 years. (Fertil Steril® 2017;107:89–96. ©2016 by American Society for Reproductive Medicine.)
Key Words: Advanced maternal age, obstetric complications, oocyte donation, twin pregnancy

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Since the mid-1970s, both the mean age of women at delivery and the proportion of women aged 40 years and older at delivery have not stopped rising in industrialized countries. This phenomenon, although multifactorial, is explained especially by advances in reproductive medicine. Oocyte donation in particular continues to increase (1) and allows women to become mothers at a very advanced age, into their sixth decade and even after menopause. However, these women are at risk of complications because of their age, on the one hand, and their use of donated oocytes, on the other (2–4); both factors are known to be associated with a high rate of obstetric complications. The literature describes higher risks of maternal and obstetric complications for women at an advanced age who are pregnant via oocyte donation; these include gestational diabetes, hypertension, pre-eclampsia, premature rupture of the membranes, and cesarean delivery (5–7). Neonatal risks are also higher, with more preterm deliveries and more infants with a birth weight <2,500 g (8, 9). However, most of these studies define advanced maternal age as older than

Received June 6, 2016; revised August 31, 2016; accepted September 11, 2016; published online October 12, 2016.
E.G. has nothing to disclose. A.V.-R. has nothing to disclose. S.B. has nothing to disclose. P.S. has nothing to disclose. F.G. has nothing to disclose. C.L.R. has nothing to disclose.
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Fertility and Sterility® Vol. 107, No. 1, January 2017 0015-0282/$36.00

http://dx.doi.org/10.1016/j.fertnstert.2016.09.021

40 or 45 years, and few have assessed risks among women aged 50 years and older. The several published studies are either descriptive series without a comparison group (10, 11) or comparative studies with either a heterogeneous comparison group (12) or relatively few subjects in the comparison group (13).

Moreover, in older women, oocyte donation is often required and associated with a high rate of multiple pregnancies, well known to be high-risk pregnancies (10, 12–14).

Our aim was to assess the risks of maternal, obstetric, and neonatal complications, according to maternal age (before 50 years or afterward) and type of pregnancy (singleton or twin) among women aged 45 years and older.

MATERIALS AND METHODS

This retrospective, single-center cohort study reviewed the records of patients giving birth at the Port Royal Maternity Hospital in Paris (France), a level 3 facility with approximately 5,400 deliveries per year, during the period from January 1, 2006, to January 30, 2015.

This study was approved by the National Data Protection Authority (Commission Nationale de l'Informatique et des Libertés, CNIL n° 1755849). Under French regulations, this study was exempt from institutional review board review because it was an observational study using anonymized data from medical records. Women were informed that their records could be used for the evaluation of medical practices and were allowed to opt out of these studies. The study's exempt status was confirmed by the institutional review board Ile-de-France.

Study Population

We included all oocyte donation recipients aged 45 years and older who gave birth after 22 weeks of gestation during the study period. The study group comprised women aged 50 years or more at delivery ("older"), and the comparison group all those aged 45–49 years at delivery ("younger"). We identified the women from the department's computerized database and then reviewed each woman's complete medical files, one by one. The study included only the women who received prenatal care at our maternity ward from early in pregnancy. Women referred from another hospital during pregnancy because of either a maternal or fetal disorder during pregnancy were excluded.

Our maternity ward's protocols for management—prenatal care, type of delivery, induction, and labor—are the same as those applied to women who are either younger or did not have assisted reproductive technology (ART).

Because the use of donated oocytes is restricted in France to women younger than 43 years, all the women in our study underwent ART with oocyte donation in a facility abroad.

Study Outcomes

The following maternal and obstetric criteria were studied: pregnancy-related hypertension, defined by systolic blood pressure $\geq$140 mm Hg and/or diastolic blood pressure $\geq$90 mm Hg; pre-eclampsia, combining hypertension with proteinuria >0.3 g/24 h; severe pre-eclampsia, defined by at least one of the following criteria: severe hypertension (systolic blood pressure >160 mm Hg and/or diastolic blood pressure >110 mm Hg), renal damage with oliguria <500 mL/24 h, creatinine >135 μmol/L or proteinuria >5 g/d, acute pulmonary edema, persistent severe epigastric pain (Chaussier sign), HELLP syndrome, eclampsia, intractable neurologic disorders (visual disorders, abnormal deep tendon reflexes, headaches), thrombocytopenia <100 μ/L, abruptio placentae, or fetal distress; gestational diabetes (characterized by fasting blood glucose >0.92 g/L, blood glucose 2 hours postprandial >1.20 g/L, or blood glucose on ingestion of 75 g glucose greater than the thresholds defined by the French College of Gynecologists and Obstetricians and the French-speaking Diabetes Society in 2010 [15]); premature rupture of the membranes (PPROM); cesarean delivery; postpartum hemorrhage (PPH), defined by blood loss >500 mL; hospitalization for more than 24 hours during pregnancy; transfer to the intensive care unit (ICU); mean duration of hospitalization including delivery; and difficulties in mother–child bonding. The latter must have been mentioned in the medical file by the pediatrician caring for the child or a departmental psychologist and have resulted in prolongation of the hospitalization for observation of this bonding and/or hospitalization in a mother–baby psychiatric unit.

The perinatal complications studied were fetal growth restriction (FGR), defined by a birth weight below the 10th percentile (according to the French Audipog curves [16]), preterm delivery before 37 weeks (global preterm birth), before 32 weeks (severe preterm birth), or before 28 weeks (extreme preterm birth), in utero fetal death, 5-minute Apgar score $\leq$7, umbilical cord pH $\leq$7.10, transfer to the neonatal ICU (NICU), and neonatal death.

We compared the maternal and perinatal complications for the two age groups, globally and after stratification by type of pregnancy (singleton or twin). Triplet pregnancies were excluded from the stratified analyses.

The following population characteristics were compared between the groups: women's mean age at delivery, geographic origin, presence of a partner/spouse, parity, any uterine scar, hypertension, obesity, or diabetes, as well as the specific type of oocyte donation (e.g., oocyte donation only or dual gamete donation), as well as the country where the donation took place.

Statistical Analysis

The statistical analysis compared the numbers of individuals with the χ^2 test or Fisher's exact test (n < 5), and compared means with Student's *t* test. We used STATA version 11.0 software (StataCorp) for the analyses.

RESULTS

The study included 40 women (26 with singleton pregnancy and 14 with twin pregnancy) aged 50 years and older and 146 women (91 with singleton pregnancy, 53 with twin pregnancy, and 2 with triplet pregnancy) aged 45–49 years who gave birth at Port Royal, after becoming pregnant via oocyte donation during the study period. Two women aged 50 years and older

TABLE 1

Comparison of mothers' characteristics between the two groups.

	Singleton			Twin			Population		
Characteristic	**≥50 y (n = 26)**	**45–49 y (n = 91)**	***P* value**	**≥50 y (n = 14)**	**45–49 y (n = 53)**	***P* value**	**≥50 y (n = 40)**	**45–49 y (n = 146)**	***P* value**
Maternal age (y), mean ± SD	52.2 ± 3.1	46.6 ± 1.2	<.001	51.4 ± 1.1	46.9 ± 1.3	<.001	51.9 ± 2.6	46.7 ± 1.2	<.001
Range	50.0–62.4	45–49.5		50.3–54.4	45.0–49.2		50–62.4	45–49.5	
Geographic origin									
Europe	20 (76.9)	75 (82.4)		8 (71.4)	43 (81.1)		28 (70.0)	119 (81.5)	
North Africa	1 (3.8)	5 (5.5)		4 (28.6)	8 (15.1)		5 (12.5)	13 (8.9)	
Sub-Saharan Africa/West Indies	4 (15.4)	8 (8.8)		1 (7.1)	0 (0.0)		5 (12.5)	9 (6.2)	
Asia	1 (3.8)	3 (3.3)	.75	1 (7.1)	2 (3.8)	.08	2 (5.0)	5 (3.4)	.31
Family situation									
Married	10 (38.5)	43 (4.7)		10 (71.4)	21 (39.6)		20 (50.0)	65 (44.5)	
Lives with partner	12 (46.1)	36 (39.6)		3 (21.4)	26 (49.1)		15 (37.5)	62 (42.5)	
Lives alone	4 (15.4)	12 (13.2)		1 (7.1)	6 (11.3)		5 (12.5)	19 (13.0)	.83
No. of pregnancies, mean ± SD	2.2 ± 2.0	1.4 ± 1.4	.03	1.5 ± 1.5	1.4 ± 1.4	.25	2.1 ± 1.9	1.4 ± 1.4	.01
Parity, mean ± SD	0.5 ± 0.8	0.2 ± 0.5	.01	0.6 ± 0.9	0.2 ± 0.4	.04	0.5 ± 0.8	0.2 ± 0.5	<.001
Nulliparas	17 (65.4)	79 (86.8)	.02	9 (64.3)	41 (77.4)	.32	26 (65.0)	122 (83.6)	.01
Uterine scar	7 (26.9)	12 (13.2)	.17	2 (14.3)	7 (13.2)	1	9 (22.5)	20 (13.7)	.32
1	6 (23.1)	9 (9.9)		2 (14.3)	7 (13.2)		8 (20.0)	17 (85)	
≥2	1 (3.8)	3 (3.3)		0	0		1 (2.5)	3 (15)	
Smoker	2 (7.7)	6 (6.6)	1	0 (0.0)	6 (11.3)	.33	2 (5.0)	12 (8.2)	.74
BMI (kg/m^2), mean ± SD	21.9 ± 3.0	23.2 ± 3.7	.08	22.2 ± 3.9	22.3 ± 3.5	.91	22 ± 3.3	23 ± 3.7	.14
Obesity	0 (0)	5 (5.5)	.58	1 (7.1)	3 (5.7)	1	1 (2.5)	9 (6.2)	.69
Chronic hypertension	1 (3.8)	4 (4.4)	1	0 (0.0)	1 (1.9)	1	1 (2.5)	5 (3.4)	1
Pre-existing diabetes	1 (3.8)	2 (2.2)	.53	0 (0.0)	1 (1.9)	1	1 (2.5)	3 (2.1)	1
Mode of conception									
Dual gamete donation	5 (19.2)	12 (13.2)	.53	1 (7.1)	10 (18.9)	.43	6 (15.0)	23 (15.8)	.91

Note: Values are number (percentage) unless otherwise noted. BMI = body mass index.

Guesdon. Oocyte donation at very advanced age. Fertil Steril 2016.

who gave birth outside our hospital (one chose to change hospitals during pregnancy, and one gave birth at 35.5 weeks after PPROM in another city) were not included. One woman aged 50 years or older and nine aged 45–49 years were also not included because they began prenatal care at another hospital and were referred to us in the course of that care.

Population Characteristics

The mean age in the older study group was 51.9 years and in the younger group 46.7 years ($P<.001$). The groups were comparable for their demographic characteristics (Table 1). Oocyte donation took place principally in Spain and Greece (47.5% and 7.5% for the older women and 49.3% and 8.9% for the younger), and occasionally in the Czech Republic and the United States. The donor's age was available for 122 women and did not differ between the two groups (mean ± SD, 25.8 ± 4.3 years for the older and 26.0 ± 3.9 years for the younger groups). Their obstetric histories differed significantly, with fewer nulliparas among the older women (65% vs. 83.6%, $P=.01$). The multiple gestation rate was high and similar in both groups (35% and 37.7%), with two triplet pregnancies among the younger women. All the multiple gestations were dichorionic or trichorionic pregnancies. When these age groups were considered separately according to whether they had singleton and twin pregnancies, they remained similar for origin, body mass index, and previous medical conditions.

Maternal Complications

We observed no significant difference between the groups for maternal complications in the total population (Table 2). The prevalence of complications was nonetheless high, among both the older and younger groups, especially for preeclampsia (20% and 24%). There were no thromboembolic complications, no maternal transfers to ICU, and no maternal deaths. Among women with singletons, isolated pregnancy-related hypertension was higher in the older group (19.2% vs. 5.5%, $P=.04$).

Obstetric Outcomes

The obstetric outcomes did not differ significantly between the groups in the overall population (Table 3). Complication rates were high in both groups, especially PPROM before 37 weeks (12.5% for the older and 10.3% for the younger women) and PPH (respectively, 15.5% and 18.5%). Among the women aged ≥50 years, all PPHs were resolved after the administration of sulprostone alone (n = 6). Among the younger women with PPH (n = 27), however, there were four emergency hysterectomies to achieve hemostasis, one uterine artery embolization, and two B-Lynch uterine compression suture procedures. The cesarean rate was also very high (65.5% among the older and 63.7% in the younger women), overall and for both singleton and twin pregnancies. The mean duration of postpartum hospitalization was significantly longer among the older women compared with the younger women (9.5 ± 7.4 days vs. 6.8 ± 4.4 days, $P=.004$). Rates of PPROM (28.6% and 20.7%) and PPH (21.4% and 28.3%) in twin pregnancies were similar, but very high.

Neonatal Outcomes

Overall, the two groups did not differ significantly for neonatal outcomes (Table 4). Gestational age at delivery was 37.8 ± 3.5 weeks for the babies of the older women and 37.6 ± 3.4 weeks for those of the younger women. However, after stratification, there were more singletons with FGR in the older group (30.7% vs. 14.3%, $P=.05$). The overall rate of preterm birth (<37 weeks) was high, approximately 29% in both groups. There were two in utero fetal deaths among the younger women: one because of very severe FGR in a triplet pregnancy and the other because of a Benckiser hemorrhage in a twin pregnancy. There were two medically indicated terminations of pregnancy in each group: one for hydrocephaly of both fetuses in a dichorionic twin pregnancy in a woman aged ≥50 years, and two selective terminations of pregnancy, one for hydrocephaly and one for exstrophy of the bladder, in two of the younger women. There was also one neonatal death among the older women: a preterm baby born at 26 weeks who died at 15 days.

DISCUSSION

In our total population, all pregnant via oocyte donation, maternal, obstetric, and neonatal outcomes did not differ significantly between women aged 50 years and older and those aged 45–49 years. Nonetheless the complication rates were very high in both groups, especially for twin pregnancies. Among women with singletons, we found higher rates of isolated pregnancy-related hypertension and FGR in the older group.

Our study is original, for data on this subject are generally sparse, with series without any comparison group (10, 11) or with a heterogeneous comparison group (12) or only a few subjects (13). The single-center nature of our series ensures that obstetric management was homogeneous in the two groups. The obstetric data collection, based on careful reading of the files, one by one, was valid and exhaustive, with very few missing data. In other studies of the same type, performed at the initiative of ART centers, especially the study by Kort et al. (13), the women gave birth in different maternity units. Moreover, they used a telephone survey to collect some obstetric data, which were therefore probably less reliable than the data taken directly from the medical file. Finally, our comparison group was homogeneous, composed as it is only of oocyte donation recipients, to study the fraction of complications attributable to age.

Our study nonetheless had some limitations. The fact that it was a single-center study may introduce a selection bias, associated with the maternity unit, even though we excluded women transferred during pregnancy from another facility for prenatal care. That is, the population seen in a level 3 maternity ward is probably at higher risk than the general population of women of advanced age, because of underlying maternal disease, a significant obstetric history, or a multiple-gestation pregnancy. This may explain in part the high rate of twin pregnancies in our study. Nonetheless this potential recruitment bias is the same in both groups, and we can

TABLE 2

Comparison of maternal outcomes between the two groups.

Outcome	Singleton (n = 117) ≥50 y (n = 26)	Singleton (n = 117) 45–49 y (n = 91)	*P* value	Twin (n = 67) ≥50 y (n = 14)	Twin (n = 67) 45–49 y (n = 53)	*P* value	Population (n = 186) ≥50 y (n = 40)	Population (n = 186) 45–49 y (n = 146)	*P* value
Isolated pregnancy-related hypertension	5 (19.2)	5 (5.5)	.042	1 (7.1)	4 (7.5)	1	6 (15.0)	9 (6.2)	.10
Preeclampsia, total	5 (19.3)	14 (15.4)	.76	3 (21.4)	20 (37.7)	.35	8 (20.0)	35 (24.0)	.68
Severe pre-eclampsia	2	1		0	6		2	7	
Mean term at onset of pre-eclampsia (wk), mean ± SD	36.3 ± 3.1	37.2 ± 3.9	.67	37.2 ± 0.2	35.2 ± 2.1	.27	36.6 ± 2.4	36.0 ± 3	.68
Gestational diabetes	6 (23.1)	11 (12.1)	.16	1 (7.1)	8 (15.1)	.67	7 (17.5)	19 (13.0)	.46
Dietary treatment	6	4		0	7		6	11	
Insulin	0	7		1	1		1	8	
Prenatal hospitalization	7 (26.9)	24 (26.4)	1	9 (64.3)	37 (69.8)	.75	16 (40.0)	63 (43.2)	.86
Placenta abnormality	2 (7.7)	7 (7.7)	1	2 (14.3)	3 (5.7)	.28	4 (10.0)	10 (6.9)	.50
Low lying	1	1		1	2		2	3	
Marginal and central or partial placenta	1	4		1	0		2	4	
Accreta	0	2		0	1		0	3	

Values are number (percentage) unless otherwise noted.

Guesdon. Oocyte donation at very advanced age. Fertil Steril 2016.

reasonably suppose that it has no effect on the comparison of the results between the two groups. Similarly, although the number of women in our study is similar to or even greater than that of other studies on the subject, it remains limited. This number is too small to allow us to study rare and severe maternal and perinatal complications, especially maternal mortality, and the power may be insufficient to find statistical differences in our stratified analyses. Finally, groups are not totally comparable, thus we cannot exclude potential confounders, such as geographic origin and parity.

Independently of the mode of conception, complications increase with maternal age, especially cesarean delivery, gestational diabetes, hypertensive diseases, placental abnormalities, and preterm delivery (17–21). We thus expected that complications in pregnancies resulting from oocyte donation would be more frequent among women aged 50 years and older than in those aged 45–49 years. We did not, however, find very significant differences between these two adjacent age groups. Our global results are consistent with those reported by Kort et al. (13), which used a comparison group younger than ours (≤42 years); the effect of maternal age does not seem to be predominant in women pregnant via oocyte donation.

After stratification, however, we found, in agreement with the results reported by Simchen et al. (12), that FGR among singletons was twice as likely in the older as in the younger groups (30.7% vs. 14.3%). Previous series of oocyte

TABLE 3

Comparison of obstetric outcomes between the two groups.

Outcome	Singleton (n = 117) ≥50 y (n = 26)	Singleton (n = 117) 45–49 y (n = 91)	*P* value	Twin (n = 67) ≥50 y (n = 14)	Twin (n = 67) 45–49 y (n = 53)	*P* value	Population (n = 186) ≥50 y (n = 40)	Population (n = 186) 45–49 y (n = 146)	*P* value
PPROM <37 wk	1 (3.8)	4 (4.4)	1	4 (28.6)	11 (20.7)	.50	5 (12.5)	15 (10.3)	.77
Type of delivery									
Vaginal delivery, spontaneous	5 (19.2)	18 (19.8)		5 (35.7)	12 (22.6)		10 (25.5)	30 (20.5)	
Instrumental vaginal delivery	2 (7.7)	19 (20.9)		2 (14.3)	4 (7.6)		4 (10.5)	23 (15.8)	
Cesarean	19 (73.1)	54 (59.3)	.32	7 (50.0)	37 (69.8)	.31	26 (65.5)	93 (63.7)	.63
Postpartum hemorrhage	3 (11.5)	12 (13.2)	1	3 (21.4)	15 (28.3)	.74	6 (15.5)	27 (18.5)	.82
Transfusion	2 (7.8)	6 (6.6)	1	1 (7.1)	9 (17.0)	.67	3 (7.5)	15 (10.3)	.77
Duration of postpartum hospitalization (d), mean ± SD	8.6 ± 8.0	5.5 ±1.7	<.001	11.3 ±5.8	8.7 ±5.8	.15	9.5 ± 7.4	6.8 ± 4.4	.004
Problem of mother–child bonding	2 (7.7)	1 (1.1)	.12	2 (14.3)	5 (9.4)	.63	4 (10.0)	7 (4.8)	.25

Values are number (percentage) unless otherwise noted.

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TABLE 4

Comparison of neonatal outcomes of live births in each group.

Outcome	Singleton (n = 117) ≥50 y (n = 26)	Singleton (n = 117) 45–49 y (n = 91)	*P* value	Twin (n = 129) ≥50 y[a] (n = 26)	Twin (n = 129) 45–49 y[b] (n = 103)	*P* value	Population (n = 251) ≥50 y[a] (n = 52)	Population (n = 251) 45–49 y[b] (n = 199)	*P* value
Gestational age at birth (wk), mean ± SD	38.7 ± 3.9	39.4 ± 2.6	.34	36.8 ± 2.8	36.2 ± 3.3	.40	37.8 ± 3.5	37.6 ± 3.4	.7
Preterm birth (wk)									
<37	5 (19.2)	9 (9.9)	.30	10 (38.5)	43 (41.8)	.83	15 (28.8)	57 (28.6)	1
<32	2 (7.7)	2 (2.2)	.21	2 (7.7)	15 (14.6)	.52	4 (7.7)	17 (8.5)	1
<28	1 (3.9)	1 (1.1)	.40	0 (0)	4 (3.9)	.58	1 (1.9)	5 (2.5)	1
Birth weight (g), mean ± SD	2,966 ± 863	3,191 ± 602	.13	2,394 ± 475	2,401 ± 654	.96	2,680 ± 748	2,742 ± 759	.60
FGR	8 (30.7)	13 (14.3)	.05	8 (30.8)	34 (33.0)	.83	16 (30.8)	51 (25.6)	.48
5-min Apgar ≤7	5 (5.5)	1 (3.8)	1	1 (3.9)	8 (7.8)	.69	2 (3.8)	13 (6.5)	.74
Cord pH ≤7.10	1 (4.2)	9 (9.9)	.68	0 (0)	4 (4.1)	.58	1 (1.9)	13 (6.5)	.31
Admission to NICU	6 (23.1)	14 (15.4)	.38	6 (23.1)	32 (31.1)	.42	12 (23.1)	50 (25.1)	.86

Values are number (percentage) unless otherwise noted.
[a] Two terminations of pregnancy in group ≥50 years in a twin pregnancy.
[b] One in utero fetal death and two terminations of pregnancy among twins (NB: one in utero fetal death in a triplet pregnancy).

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donation recipients found FGR rates of 5% to 15%, and Abdalla et al. found a relation between FGR and ovarian dysfunction, consistent with our findings (22, 23).

Likewise, when we considered only singleton pregnancies, the risk of isolated pregnancy-related hypertension was much higher in the older group (almost four times the risk of the younger group, 19.2% vs. 5.5%). However, we did not find such differences in the global analysis, which could be because the excess risk associated with twin pregnancy predominated over that of maternal age for these complications.

The prevalence of the principal complications was nonetheless high in both groups. The risk of pre-eclampsia (20% among the older and 24% among the younger women) was very high: 10 times the risk of the general population of women giving birth in France, twice that of women older than 45 years, and four times that of women older than 40 years (17, 18, 24). The risk of gestational diabetes (17.5% in the older and 13% in the younger group) was also high: twice as high as the risk of the general population in France (24). The risk of postpartum hemorrhage (15.5% and 18.5%) was three times higher than for the general population in France (5%) (25). Moreover, there were four emergency hysterectomies in the younger group, that is, more than five times the usual rate among cesarean deliveries (0.5%) and 10 times the rate among all deliveries (0.5 to 2 per 1,000 pregnancies) (26–29). Nevertheless, the obstetric teams undoubtedly took the advanced maternal age into account in their decision to perform a hysterectomy, and we can assume that obstetricians are more inclined to preserve the uterus for younger women. This hypothesis was enhanced by the low amount of transfusion in these four cases (minimum 3 to maximum 6 units packed red blood cells and minimum 2 to maximum 4 units of fresh frozen plasma), whereas in the literature, the mean number of units of packed red blood cells received during emergency hysterectomies varies between 7.7 and 9.1, and the mean number of units of fresh frozen plasma varies between 3.9 and 5.0 (27, 29). Moreover, the absence of transfers to the intensive care unit, despite the four hysterectomies, suggests that the decision was quicker at this age, prevented a more severe hemorrhage, and might well have been treated differently for younger women.

The multiple-gestation pregnancy rate is high in our study: 35% among the older women. It is higher than the rates observed among women in this age group by Kort et al. (13) (26.7%) and Paulson et al. (10) (31.1%), but consistent with those of Spanish studies (37.5% after fresh oocyte donation [30] and 36.5% after two embryo transfers [31]); a large plurality of our patients underwent oocyte donation in Spain. These multiple-gestation pregnancies are at higher risk of preterm delivery, birth weight <2,500 g, hypertension, and PPH, and the maternal mortality rate associated with them is three times higher than for mothers of singletons (32, 33). The risks attributed to multiple pregnancies are thus already very high, and the additional risk for older women, compared with the younger women in our study, is probably too low to produce a significant difference. Hence, the rate of complications in the twin

pregnancy group is very high, especially for PPROM (28.6% and 20.7%), preterm birth (38.5% and 41.8%), and PPH (21.4% and 28.3%), regardless of the age group. The risk of PPROM is three times that seen in a series of twins (7.3%), although the risk for singleton pregnancies (3.8% and 4.2%) is similar to that of general population of singleton (3.7%) (34). The risk of PPH is twice that seen in a series of twins after ART (12.9%) (35), although the rate of preterm births is similar to that in a different series of twins after ART (36). Thus, age does not seem to increase the already substantial risk of premature birth in twin pregnancies with oocyte donation.

Reducing the rate of multiple-gestation pregnancies is therefore a major goal for reducing maternal and neonatal morbidity. The implantation rate for oocyte donation is closely associated with oocyte quality, which is determined principally by the donor's age (31, 37, 38). Accordingly, the relevant British, Canadian, and US learned societies recommend taking the donor's age into account in determining the number of embryos to transfer (39–41). Some authors report that a reduction in the number of embryos transferred enables excellent implantation rates, while reducing the risks of multiple gestations and thus the risks of complications during pregnancy (42–44).

Our cesarean rate reached 65.5% among the older group, although our obstetric practices do not vary according to age or mode of conception. The particular effects of maternal age and mode of conception on type of delivery have already been described: cesarean rates reach 40%–76% after oocyte donation according to series (22), and even 100% for women aged 50 years or older (12). The causes mentioned include an increase with age in the rate of positions associated with dystocia, placenta previa, and previous cesareans (17, 18), together with myometrial efficiency that diminishes with age, leading to higher rates of mechanical dystocia (45). It is also possible that parental anxiety plays a role by influencing the management chosen by the obstetrics team (45, 46).

Finally, the longer postpartum hospitalizations among the older women, even though they did not have more frequent medical complications that might cause this prolongation, lead us to wonder about the psychological implications of these late pregnancies. The longer hospitalizations may be explained by greater psychological—and to a lesser extent social—difficulties among the older women. That is, the longer hospitalizations were observed for reasons related to the need for social services (time required to set up services for mother or child at home) or psychological care (awaiting a bed in a mother–baby psychiatric unit or delayed discharge to monitor the mother–child relationship). Very few studies have studied the psychological effects of very late pregnancies. It has been reported that women aged 35 years and older have higher stress scores and a longer period of adjustment to motherhood (4–6 months compared with 2–3 months) (47, 48). Conversely, in a prospective cohort study of 49 donor oocyte recipients aged 50 years and older, Steiner et al. did not observe poorer parenting capacities linked to either physical or mental abilities or parental stress than among women in their 40s or in their 30s who became pregnant with ART (49). The retrospective design of our study limits the interpretation of our data about mother–child bonding. Only a prospective study assessing all women with oocyte donation would enable us to answer this question.

Overall we did not observe substantial differences for complications among the donor oocyte recipients aged 50 years and older than among those aged 45–49 years in our overall population. However, the prevalence of complications was especially high among twin pregnancies in our study. Therefore single embryo transfer needs to be encouraged after age 45 years to reduce the prevalence of complications in this population.

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