

Perinatal outcome after in-vitro fertilization-surrogacy

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The perinatal outcome of pregnancies (both single and multiple) established after in-vitro fertilization (IVF)-surrogacy was evaluated and compared to the outcome of pregnancies that resulted from standard IVF. Analysis of medical records and a telephone interview with physicians, IVF-surrogates, and commissioning mothers were conducted to assess prenatal follow up and delivery care in several hospitals. 95 IVF-surrogates delivered 128 liveborn (65 singletons, 27 sets of twins and two sets of triplets). The commissioning mothers and the IVF-surrogates average ages were 37.7 ± 5.0 and 30.4 ± 4.7 years old respectively. IVF-surrogates carrying twin and triplet gestations delivered substantially earlier than those who gestated singleton pregnancies (36.2 ± 0.4 versus 35.5 versus 38.7 ± 0.3 weeks gestation respectively; $P < 0.001$). Twin newborns were significantly lighter than singleton infants born through IVF-surrogacy (2.7 ± 0.06 versus 3.5 ± 0.07 kg; $P < 0.001$). The incidence of low birth weight infants rose from 3.3% in the single births to 29.6% ($P < 0.01$) in the twins and to 33.3% in the triplets born through IVF-surrogacy. The incidence of prematurity was significantly greater in both twins delivered by IVF-surrogates (20.4%) and infertile IVF patients (58%). The occurrence of pregnancy-induced hypertension and bleeding in the third trimester was four to five times lower in the IVF-surrogates, independently of whether they were carrying multiples. The incidence of Caesarean section was 21.3% for singleton gestations, while two times higher in the IVF-surrogates carrying multiples (56.3%). Postpartum complications occurred in 6.3% of patients and the incidence of malformation was similar to those reported for the general population. The results provide general reassurance regarding perinatal outcome to couples who wish to pursue IVF-surrogacy.

Key words: antenatal complications/congenital malformations/IVF-surrogacy/perinatal outcome/postpartum complications

Introduction

The first pregnancy following in-vitro fertilization (IVF) and the subsequent transfer to an unrelated surrogate was reported

in 1985 (Utian *et al.*, 1985). Slowly afterwards, IVF-surrogacy became a viable reproductive alternative for couples who would otherwise be unable to produce a genetic child because of a non-functional uterus, excessive medical risk associated with pregnancy, or due to multiple failed attempts at conception with standard treatment options (Utian *et al.*, 1989; Serhal, 1990; Marrs *et al.*, 1993; Serafini *et al.*, 1994, 1998; Meniru and Craft, 1997). Publications on IVF-surrogacy have focused on pregnancy rates and on the events surrounding the IVF treatment; no studies centred on obstetric or perinatal performance. While the results on perinatal outcome of infertile women treated with IVF have been widely reported from individual centres and collaborative studies (Andrews *et al.*, 1986; ASRM/SART, 1988; Rizk *et al.*, 1991; Tan *et al.*, 1992; Rufat *et al.*, 1994; Petersen *et al.*, 1995; Olivennes *et al.*, 1996), the results of standard IVF may not be applicable to IVF-surrogates. Therefore, differences in the obstetric and perinatal outcomes should be examined, since there exists a history of successful pregnancies and deliveries in IVF-surrogates, who supply a receptive and proven uterine environment, along with a confident psychological framework regarding pregnancy and birth. The contribution of these factors to the pregnancy outcome, in spite of limitations of such comparisons, should be reported to place the results of IVF-surrogacy into perspective.

The objective of this study was to evaluate the perinatal outcome of pregnancies, both single and multiple, after IVF-surrogacy, and to compare the outcome of pregnancies following IVF treatments.

Materials and methods

The study population was comprised of 95 IVF-surrogates who delivered 128 children conceived with oocytes provided either by the infertile women ($n = 88$) or by oocyte donors (24). The oocytes were fertilized *in vitro* by the spermatozoa of the infertile husbands. The commissioning parents were referred to our clinic from several continents [Asia ($n = 7$), Australia ($n = 7$), Europe ($n = 5$), South America ($n = 5$), and North America ($n = 64$)]. The resulting embryos were transferred to the IVF-surrogates between October 1989 and January 1997. The number of embryos selected for transfer varied with team experience, the age of the commissioning mother, the number of previously failed treatment attempts, the morphological quality of the embryos (maximum four embryos of good quality), and from the result of an informed decision between the commissioning parents and the IVF-surrogate. These discussions took place only after detailed counselling in the presence of a third-party nurse co-ordinator, the IVF-surrogate's agent, and the embryologist. During the last 3 years, the trend was to transfer fewer embryos. The women's average ages were 37.7 ± 5.0 (commissioning women), 30.7 ± 4.5 (oocyte donors) and 30.4 ± 4.7 (IVF-surrogates) years. Before acceptance into the programme, the IVF-surrogates had successfully

Table I. Indications for IVF-surrogacy

Indications	No. of patients
Hysterectomy	24
Uterine malformation/failed surgeries	17
Medical illnesses	15
Repetitive spontaneous abortions	4
Multiple IVF and oocyte donors failures	13
Repetitive abortions + medical	9
Failed surgeries and IVF	8
Failed surgeries + IVF + medical	5

IVF = in-vitro fertilization.

delivered a child of their own (2.6 ± 2.0 deliveries) without obstetric complications, while providing no history of mental illnesses or postpartum depression. 19 IVF-surrogates (20%) were either relatives or close friends of the commissioning couple. Of these 19, none received financial compensation; however, they were required to obtain legal counselling by an experienced professional, to engage in a contract, and to undergo extensive psychological counselling throughout the IVF-surrogacy process.

The indications for IVF-surrogacy are listed in Table I. The reasons for treatment are subdivided as either a single aetiology or an association of several conditions. Included under commissioning medical illnesses were severe systemic lupus erythematosus ($n = 16$), cardiac disorders ($n = 5$), Takayasu's arteritis ($n = 2$), history of breast cancer ($n = 2$), haematological condition ($n = 1$), pulmonary hypertension ($n = 1$), residual pituitary macroadenoma ($n = 1$), and brain tumour ($n = 1$). All patients treated with IVF-surrogacy for recurrent abortions had failed husband and donor lymphocyte immunization as well as other current treatments for autoimmune syndromes.

As recommended by the American Society of Reproductive Medicine, IVF-surrogates, oocyte donors, commissioning women and their respective partners underwent screening procedures. The IVF-surrogates were psychologically and medically healthy and did not smoke cigarettes throughout gestation. The IVF-surrogates underwent psychological counselling once admitted to the program, which continued throughout the treatment, and extended through the postpartum. All IVF-surrogates had structurally normal uterine cavities, determined by hysterosalpingography, sonohysterography, and/or hysteroscopy. Comprehensive legal contracts outlining each party's commitments and obligations were obtained. Protocols for ovulation induction, oocyte retrieval, IVF laboratory techniques, and endometrial preparations have been previously described (Serafini *et al.*, 1994, 1998).

Data were collected through a detailed review of medical records from all patients who delivered live births, and by a questionnaire completed via telephone interviews with the obstetricians, paediatricians, IVF-surrogates, ovum donors, and the infertile couples. Four overseas commissioning couples were lost to follow-up (4.2%).

Antenatal complications, the necessity for multifetal pregnancy reduction, gestational age, mode of delivery, and postpartum complications were examined. The neonatal variables recorded included: birth weight, size for gestational age, congenital malformations, neonatal morbidity, and length of hospitalization in the intensive care unit. Preterm delivery (PTD) was defined as delivery before 36 weeks gestation. Those infants weighing <10th percentile for their age were considered small for gestational age (SGA), and those >90th percentile were considered large for gestational age (LGA). Low birth weight (LBW) and very low birth weight (VLBW) were defined as the infant weighing <2500 and <1500 g respectively. Outcome

Table II. The number of embryos transferred (ET) and the percentage of embryonic implantations in the IVF-surrogates and in the IVF patients reported by Brinsden and Rizk (1992)

	1 ET	2 ET	3 ET	4 ET	5 ET	6 ET
Surrogate-single	100	100	83.3	64.4	38.5	90.9
IVF-single	100	88.1	76.8	66.8	–	–
Surrogate-twin	–	–	5.5	24.4	53.8	9.1
IVF-twin	–	11.9	19.6	26.1	–	–
Surrogate triplet	–	–	11.1	4.4	7.7	–
IVF-triplet	–	–	–	6.6	–	–
Surrogate-quadruplet	–	–	3.6	6.6	–	–
IVF-quadruplet	–	–	–	0.4	–	–

Implantation outcomes are expressed in percentages. Surrogate-single/twin/triplet/quadruplet – IVF-surrogates in whom there were either established or delivered singleton/twins/triplets/quadruplets. IVF-single/twin/triplet/quadruplet – IVF-patients in whom there were either established or delivered singleton/twins/triplets/quadruplets.

IVF = in-vitro fertilization.

variables were compared with those of infertile patients treated with IVF and reported by Brinsden and Rizk (1992).

The IVF-surrogates were originally referred to our program for embryo transfer procedures; however, the management of the IVF-surrogacy prenatal care and deliveries were carried out by various obstetricians, including perinatologists when appropriate (both in academic and private practice settings mainly in the State of California, USA).

Statistical analysis

Data are represented as average \pm SEM. Continuous variables were evaluated with Student's *t*-test, as well as linear regression and correlation. Statistical significance was based on the χ^2 and Fisher's exact tests for categorical data and comparison of proportions; an α level of 0.05 was considered statistically significant.

Results

An average of 4.1 ± 0.1 embryos was transferred to the IVF-surrogates. The number of embryos transferred and the percentage of embryonic implantation in the IVF-surrogates and in the IVF patients, reported by Brinsden and Rizk (1992), are shown in Table II. The largest number of multiple implantations in the IVF-surrogates, and in the Brinsden and Rizk (1992) study, occurred from the transfer of three and four embryos (55.6 and 52.7% respectively). Although 53.8% of the twin pregnancies in the IVF-surrogacy group followed the transfer of five embryos, triplet gestations occurred in 7.7% following these transfers. A substantial decrease in multiple implantation rates in the IVF-surrogates was observed after the transfer of six embryos (9.1% twin gestations), most likely reflecting the infertility conditions of the commissioning mothers.

In all, 65 singletons (four were lost to follow-up), 54 twins (27 pregnancies) and six triplets (two pregnancies) were born following five multifetal reductions (three quadruplet and two triplet pregnancies were reduced to twins without complications).

As depicted in Table III, IVF-surrogates carrying twin and triplet gestations delivered substantially earlier than those who gestated singleton pregnancies (36.2 ± 0.4 versus 35.5 versus

Table III. The average length of gestation, infant birthweight, neonatal gestational appropriateness in relation to neonatal examination, the occurrence of preterm labour, delivery in the IVF-surrogates, and delivery in the IVF patients reported by Brinsden and Rizk (1992)

	Singleton		Twin		Triplet	
	Surrogate	IVF	Surrogate	IVF	Surrogate	IVF
GA	38.7 ± .3	38.7 ± 1.2	36.2 ± 0.4*	36.0 ± .2	35.5	33.5 ± 0.6
B.wt	3.5 ± 0.07	3.1 ± 0.03	2.7 ± 0.06*	2.4 ± 0.04	2.7 ± 0.13*	1.9 ± 0.6
AGA (%)	67.2	–	94.4	–	83.3	–
LGA (%)	32.8	–	3.7	–	0	–
SGA (%)	0	–	1.9	–	16.6	–
LBW (%)	3.3	14	29.6*	53	33.3	92
PTL (%)	14.8	–	46.3*	–	100	–
PTD (%)	11.5	14	20.4*	58	100	95

Values are means ± SEM. Surrogate = IVF-surrogates; IVF = IVF patients reported by Brinsden and Rizk (1992); B.wt = birthweight are expressed in kg. PTL = Preterm labour; PTD = preterm delivery; AGA = appropriate for gestational age; LGA = large for gestational age; SGA = small for gestational age; LBW = low birthweight (< 2.5 kg). * $P < 0.05$ compared to singleton births.

38.7 ± 0.3 weeks gestation, respectively; $P < 0.001$). Mainly, infant weight paralleled gestational age. Singleton infants born through IVF-surrogacy were significantly heavier than twins (3.5 ± 0.07 kg versus 2.7 ± 0.06 kg; $P < 0.001$). This trend was also evident by the infants born after IVF treatment, as described by Brinsden and Rizk (1992), along with several others (Andrews *et al.*, 1986; Seoud *et al.*, 1992; Rufat *et al.*, 1994).

The frequency of newborns appropriate for gestational age (AGA) was greater in the offspring of IVF-surrogates who delivered twins and triplets (94.4 and 83.3%) as opposed to the singleton infants (67.2%; $P < 0.05$). Nevertheless, a significantly greater incidence of LGA newborns was observed among the singleton births (32.8%) contrasting with the incidence of 3.7% LGA in the twin infants. As anticipated, the frequency of LBW neonates was substantially greater in the multiple IVF-surrogacy gestations and a statistically significant correlation between gestational age and birth weight ($r = 0.7725$, power = 1, $P < 0.001$) was also noticed.

The incidence of LBW infants rose from 3.3% in the single births to 29.6% ($P < 0.01$) in the twins and to 33.3% in the triplets born through IVF-surrogacy. While these findings mirror the data reported by Brinsden and Rizk (1992) for the IVF treated patients, there was a significantly greater incidence (four times) of LBW in the singletons produced by IVF in contrast to the IVF-surrogates. In addition, we found a greater frequency (twice) of LBW twins and triplets (53 and 92%) from the IVF patients, whereas the LBW observed in the IVF-surrogates was 29.6 and 33.3%. The vast majority of the IVF-surrogates who carried twins and triplets experienced preterm labour (PTL) (46.3 and 100% respectively) and pre-term delivery (PTD) when compared to those who bear singleton gestations. Multiple infants carried by the IVF-surrogates were born between 30.5 and 36 weeks gestation (birthweight ranged from 1.7 and 3.8 kg), while the singleton newborns were born between 28 to 41 weeks gestation (weighed between 1.25 and 4.8 kg). There was no perinatal mortality, but 17 infants required neonatal intensive care for a period of 4–30 days.

The results of the neonates with birthweight greater and inferior to 2.5 kg born from IVF-surrogates and infertile

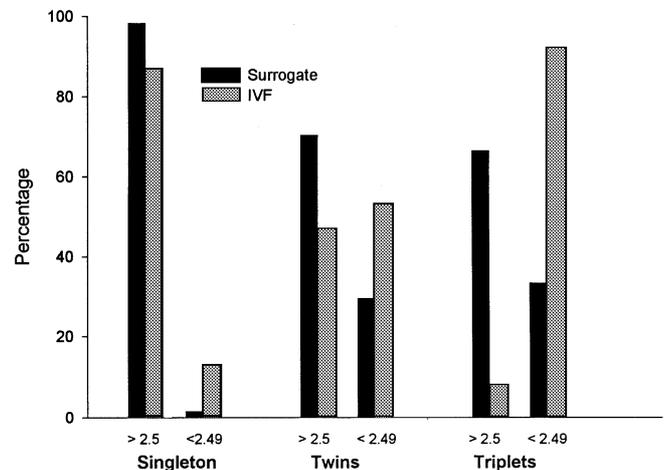


Figure 1. The percentage of singleton, twin and triplet newborns delivered by the IVF-surrogates, and the IVF patients reported by Brinsden and Rizk (1992) with birthweight greater or lower than 2.5 kg.

women treated with IVF are shown in Figure 1. As depicted by the percentages, a representative trend towards larger infants is clearly observed in the offspring of the IVF-surrogates.

As displayed in Table IV, the incidence of the most common problems of the third trimester of pregnancy, hypertension and pregnancy-induced hypertension (PIH), placenta praevia and abruption placenta, and gestational diabetes mellitus, were similarly low in the IVF-surrogates carrying singleton and multiple gestations. Conversely, the incidence of PIH/hypertension and placenta praevia/abruption in the IVF patients reported by Brinsden and Rizk (1992) are four to five times higher than those observed the IVF-surrogates.

The incidence of Caesarean births for singleton deliveries in the IVF-surrogates was 21.3% which is in accord with the 20.3% Caesarean sections reported by the US annual summary of vital statistics, 1996 (Guyer *et al.*, 1997). Twice the number of Caesarean sections were performed for the delivery of twin than for singleton births in the IVF-surrogates (59.3 versus 21.3%; $\chi^2 = 10.01$, $P = 0.002$). Although the incidence of Caesarean section increases with the multiplicity of fetuses,

Table IV. The incidence of the most common antenatal complications, Caesarean sections, infant malformations, postpartum complications in the IVF-surrogates, and in the IVF patients reported by Brinsden and Rizk (1992)

	Singleton		Twin		Triplet	
	Surrogate	IVF	Surrogate	IVF	Surrogate	IVF
PIH	4.9	14	7.4	17	0	28
PP/abruptio	4.9	17	3.7	18	0	25
Gest. DM	1.6	–	3.7	–	0	–
Cesarean	21.3	46	59.3	–	100	92
Minor malf.	4.9	–	0	–	0	–
Major malf.	0	2.9	7.4	–	0	–
P/P complic	1.6	–	7.4	–	0	–

Values are percentages.

PIH = pregnancy induced hypertension; PP = placenta praevia; Abruptio = abruptio placentae; Gest.

DM = gestational diabetes mellitus; Cesarean = Cesarean sections; Minor malf. = minor malformations;

Major malf. = major malformations; P/P complic = postpartum complications. Surrogate = IVF-surrogates;

IVF = IVF patients reported by Brinsden and Rizk (1992); * $P < 0.05$ compared to singleton births.

there is a wide variation among obstetric practices, and to a large extent, the analysis of relatively small populations could be questionable. It is also interesting to note that four different obstetricians carried out four Caesarean sections for the delivery of the second infant following successful vaginal delivery of the first twin.

The incidence of both minor and major congenital malformations was within the expected range of the general population and in accord with the data reported by Rizk *et al.* (1991). Hydrocoeles that spontaneously resolved were identified in two singleton male infants, while a benign gestational cyst was surgically removed from another. From the IVF-surrogacy twin group, a female infant delivered at 30.5 weeks gestation was diagnosed with esophageal and duodenal atresia, while her twin brother was normal. A male child was born at term with both cleft lip and palate. The infants with oesophageal–duodenal atresia and cleft lip and palate underwent successful surgery and are developing appropriately.

A Caesarean hysterectomy was performed in a 27 year old gravida 3, para 2 IVF-surrogate carrying a twin gestation for uterine perforation after an elective induction of labour at 36 weeks. After the establishment of active labour, the patient suffered from an acute onset of sharp lower abdominal pain, without relief between the contractions, along with mild tachycardia. Electronic fetal heart tracing records showed persistent and increased bradycardia and the patient was taken for an emergency Caesarean section. The neonates, who weighed 2.81 and 2.80 kg, were born slightly depressed (Apgar 6 and 4), but recovered promptly. An early lower segment rupture with extension to the left broad ligament along with the formation of a retroperitoneal haematoma (~300 ml) was identified. The obstetrician performed a Caesarean hysterectomy without needing a blood transfusion and the patient's postoperative course was uncomplicated.

After the delivery of healthy twins in another IVF-surrogate, blood transfusion was required following postpartum uterine hypotonia. In the singleton birth group, an IVF-surrogate who delivered a healthy term infant developed Rocky Mountain spotted fever associated with severe pneumonitis during the immediate puerperium. The patient improved quickly after

antibiotic therapy and was discharged after 1 week of hospitalization.

There were five cases of mild, transient postpartum 'maternal blues' as defined by Yalom *et al.* (1968) and Stowe and Nemeroff (1995). No cases of documented neurotic postpartum depression occurred in the IVF-surrogates.

Discussion

The obstetric and perinatal outcomes experienced by this large number of IVF-surrogates is unique and of special interest as a biological model to study uterine receptivity and performance during pregnancy and delivery.

IVF-surrogacy delivery rate per embryo transfer reported by the ASRM/SART in the US and Canada (ASRM, 1998) was 37.1%, which is similar to our own (37.7%) and in accord with results (37.5%) recently reported by Meniru and Craft (1997). Furthermore, these delivery rates are substantially higher than those obtained from the infertile IVF population (24.9%) reported by ASRM/SART (1998). The data on multiple gestations by the IVF-surrogates in the USA and Canada revealed that 60.0% were singletons, 35.6% twins and 4.4 % triplets; in comparison, our program showed rates of 68.4, 28.4 and 2.2% respectively. Also of interest is the similarity of rates of multiple deliveries following standard IVF (ASRM, 1998), since 63.4% were singletons, 29.6% twins, 6.4% triplets, and 0.6% of higher order multiple pregnancies (comparisons with IVF-surrogacy, $z = 0.317$; $P = 0.752$). These findings could imply uniformity by the IVF practitioners on the number of embryos transferred and consonance in patient management; or, it could merely reflect fortuitous coincidence due to the relatively small number of patients and practices performing IVF-surrogacy.

A high incidence of PTL (46.3 and 100%) was noted in the IVF-surrogates carrying twins and triplets respectively; this condition was diagnosed in 14.8% of the singleton gestations. Regardless of the possible conflicts surrounding the accuracy of PTL diagnosis, IVF-surrogates carrying multiples and recipients of ovum donation reported by Wolff *et al.* (1997) had similar experiences. In a similar way, all IVF-surrogates

experiencing PTL symptomatology were three times more likely to be placed on bed rest than spontaneously conceived patients, and were initiated on pharmacological tocolysis.

PTD, one of the most challenging obstetric problems, complicates 8–10% of births in the USA and is a leading cause of neonatal morbidity and mortality (Lockwood, 1995). While prematurity following IVF has been largely attributed to multiple pregnancy, several controlled studies have now demonstrated that substantial cases of prematurity also occur in single gestations produced by IVF (Manlan and Scott, 1978; Tan *et al.*, 1992; Rufat *et al.*, 1994; Lockwood, 1995; Friedman *et al.*, 1996; Olivenness *et al.*, 1996). The lower incidence of LBW observed in singleton infants delivered by the IVF-surrogates compared to those produced from standard IVF, reinforces the above mentioned notion. However, the observation of similar incidences of PTD in the singleton births after IVF-surrogacy and those following standard IVF (11.5 and 14% respectively) implies that additional variables may play key roles in the development of PTL and PTD. On the other hand, frequency comparison between twins delivered by IVF-surrogates (20.4%) and standard IVF patients (58%) suggests that previously successful deliveries contribute significantly to the longevity of multiple gestations.

Since 15.6% (20 out of 125) of IVF-surrogates delivered LBW infants, concerns about disorders in prematurely born and very LBW infants (Allen and Jones, 1986), which can lead to long term disability and handicap, justifies further analysis of the perinatal outcome. Although Manlan and Scott (1978) reported the association of multifetal pregnancies with intrauterine growth restriction and fetal demise, only 3.3% of the IVF-surrogate fetuses had antenatal ultrasounds suggestive of asymmetrical growth restriction, the findings being confirmed at birth. One of the SGA infants with growth restriction had oesophageal–duodenal atresia and the other was born from an IVF-surrogate who developed hypertension/PIH during pregnancy. Although the incidence of growth restriction was low in the IVF-surrogates considering the accuracy of the diagnosis, racial and genetic differences of the commissioning mothers along with the healthy uterine environmental contributions of the IVF-surrogates favoured superior outcomes.

The incidence of PIH in the IVF-surrogates carrying singleton and twin gestations (4.9 and 7.4% respectively) was much lower than that reported for standard IVF patients (14 and 17%) (Brinsden and Risk, 1992) and recipients of ovum donation (30–45%) (Pados *et al.*, 1994; Sauer *et al.*, 1995; Wolff *et al.*, 1997). The findings of this study further support the association of PIH and nulliparity.

The incidence of third trimester vaginal bleeding in both singleton and twin IVF-surrogates was substantially lower (4.9 and 3.7% respectively) than that observed in the standard IVF patients (17% in the singleton and 18% for twin gestations) (Brinsden and Rizk, 1992). The host environment most likely contributed as an essential determining factor for the low occurrence of placenta praevia and abruptio placentae in the IVF-surrogates.

Diabetes, both insulin dependent and gestational, increases with maternal age and complicates 1.8–4% of all pregnancies and up to 15% of oocyte donors recipients (Gordon *et al.*,

1991; Rufat *et al.*, 1994; Casey *et al.*, 1997). More importantly, one in eight women with gestational diabetes have LGA infants attributable to impaired glucose utilization (Casey *et al.*, 1997) and have an increased incidence of hypertension and Caesarean deliveries. Although 32.8% of the singleton IVF-surrogate newborns were LGA, only two experienced gestational diabetes; this implies that the genetics of the commissioned mothers and the environmental conditions determined the infants' weight, rather than a pathological condition.

The Caesarean section rates in the IVF-surrogates with single gestations approached the overall USA rates for the singleton deliveries; however, they were twice as low as those reported for standard IVF patients (Brinsden and Rizk, 1992). In accord, IVF and oocyte donors pregnancies also carry a greater chance of being associated with Caesarean birth than naturally conceived matched controls (Verlaenen *et al.*, 1995). Indeed, some IVF researchers reported Caesarean section rates for singleton pregnancies in the neighbourhood of 40–55.7% (Harrison *et al.*, 1995; Friedman *et al.*, 1996; Casey *et al.*, 1997; Reubinoff *et al.*, 1997). Pados and co-workers (1994) described Caesarean section rates of 63.5% for oocyte donors recipients, from which 54.5% were elective.

The congenital malformation rates following standard IVF treatment appear comparable to maternal age-standardized national rates (Rizk *et al.*, 1991; Friedman *et al.*, 1996). The incidence of combined malformations (both minor and major) in the IVF-surrogates was comparable to standard IVF rates; yet, the numbers in this study were relatively low and the interpretation of the data is consequently limited.

The most relevant and perhaps preventable puerperal complication observed in this study was the performance of a Caesarean hysterectomy. Although Caesarean section has been the traditionally recommended mode of delivery for triplets and higher-order multifetal pregnancy, the ideal route of delivery for twins appears less clear-cut, the exceptions being when the presenting twin is either breech or transverse. Supporting the elective induction of labour in twin gestation is the report by Fauset and associates (1997), which failed to identify any adverse effect on the effectiveness of oxytocin labour stimulation and serious puerperal complications following those deliveries. Therefore, while potentially preventable, Caesarean hysterectomy might not have been possible to avoid in this case, unless an elective Caesarean section was to be performed.

The lack of documented postpartum depression is also of significance. Credit should be given to the expert selection of IVF-surrogates who undergo meticulous screening as well as intense and careful psychological counselling throughout the surrogacy process. Besides the fact that surrogacy agencies reject women who have experienced postpartum depression following previous births (and are inherently at greater risk for reoccurrence), the surrogates' aspiration to become pregnant and appreciate the joy given to others, weighs heavily on the positivity of the process.

In summary, the results of this study on perinatal outcome of IVF-surrogacy provide general reassurance regarding obstetric and perinatal outcomes to patients who pursue IVF-surrogacy as an alternative to genetically related assisted conception.

Further measures to reduce multiple pregnancy, maternal and perinatal morbidity, and mortality will hopefully be available with the routine transfer of fewer embryos (blastocysts).

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