Article

Factors and perceptions that influence women's decisions to have a single embryo transferred

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Abstract

The aim of this study was to identify factors that inhibit or promote the adoption of single embryo transfer (SET). A cohort of 163 women patients receiving IVF/intracytoplasmic sperm injection treatment, comprising 87 women choosing SET and 63 women choosing double embryo transfer (DET), were interviewed using a structured questionnaire. The data were compared using logistic regression analysis. Confidence in the chance of pregnancy with SET, younger age and first treatment were predictive of a decision for SET. Preference for a healthy and singleton pregnancy was predictive but perceptions of the incidence or risk of multiple gestation were not. Factors such as a sense of time urgency and past experience of treatment were significant and predictive of diminished choice of SET. The clinic doctor was an important influencing factor. The results of this study confirm that improved pregnancy rates in SET coupled with an official clinic policy to promote SET in younger, first cycle patients influenced many women to choose SET. However, repeated treatment, advancing age and urgency to become pregnant are factors that moderate a woman's choice for SET.

Keywords: *decision-making, in-vitro fertilization, patient counselling, single embryo transfer*

Introduction

Once the hallmark of successful IVF, multiple embryo transfer has been problematic because it relates directly to an increase in multiple gestation and consequent increase in perinatal mortality and infant morbidity (Lieberman, 1998; Elster, 2000; Adamson and Baker, 2004; Healy, 2004). Because of these concerns, reducing the incidence of multiple pregnancies is argued to be of paramount importance for any responsible assisted reproduction clinic (ESHRE Capri Workshop Group, 2000). Strategies for reducing multiple gestation included limiting the number of embryos transferred to two. This has eradicated triplet pregnancies but has failed to reduce the incidence of twin pregnancy (Cohen, 2006). It has been argued that twin pregnancy does not deserve the 'demonization' that has occurred as a consequence of efforts to reduce multiple pregnancy (Belaisch-Allart, 2007); however twin pregnancy is still responsible for a three-fold increase in maternal death and a nine-fold increase in prematurity and associated morbidity (Cohen, 2006). The issue of embryo transfer is complex since it is not only the number of embryos transferred that counts towards treatment outcome. It has been emphasized that multiple implantation rates are higher where more robust embryos, according to the grading of morphological characteristics, are transferred (Gerris *et al.*, 1999; Emiliani, 2006).

Single embryo transfer (SET) has been proposed as an effective solution to multiple gestation (Gerris *et al.*, 1999, 2002, 2004; De Sutter *et al.*, 2002; Neubourg *et al.*, 2002; Bhattacharya and Templeton, 2004; Healy, 2004; Kjellberg *et al.*, 2006). But several studies have shown that patients desire multiple birth despite recognition of the associated maternal and infant risks (Leiblum *et al.*, 1990; Gleicher *et al.*, 1995b; Goldfarb *et al.*, 1996; Pinborg *et al.*, 2003; Child *et al.*, 2004b; Ryan *et*

al., 2004b). Therefore, an emerging challenge in the clinical management of infertile patients is patient autonomy and the collaborative process between physician and patient of deciding whether to transfer one, two or more embryos in IVF/intracytoplasmic sperm injection (ICSI) treatment.

To counter patient choice, one proposal is that restriction of the number of embryos transferred to a single embryo should be implemented and regulated by social policy. Already some countries have introduced such legislation.

In Australia, accreditation standards restrict the number of embryos transferred to two for women less than 40 years of age (Fertility Society of Australia, 2002). However, in the study clinic, a policy to minimise the risk of multiple pregnancy was introduced in 2002. Where patients are less than 38 years of age on their first cycle of IVF/ICSI, and especially when having blastocyst transfer, elective SET is recommended to the patient by the physician. All patients are advised of the risks of multiple embryo transfer in the clinic patient information booklet and, under the directives of this policy, physicians advise women less than 38 years of age that increasing embryo numbers does not increase their chance for pregnancy but greatly increases their chance of conceiving twins. The incidence of patients receiving elective SET in the study clinic has increased from <10% in 1999–2000 to 30–40% in 2003 and over 50% by 2004 (Wang *et al*., 2004). In the past 12 months, over 80% of transfers have been elective SET.

But despite increased emphasis on counselling and consent practices, a number of patients continue to accept the risks associated with twin gestation. In previous studies of the desire for multiple pregnancy, patient's desire for a multiple birth was reported to be influenced by factors such as the duration of infertility and previous experience of IVF treatment (Grobman *et al*., 2001; Child *et al*., 2004a; Blennborn *et al*., 2005), advancing age (Gleicher *et al*., 1995a), and a lower family income (Child *et al*., 2004a; Ryan *et al*., 2004a).

The acceptance of single embryo transfer by all patients is now a global problem as SET is promoted as the way forward. Variability in patient response to information and counselling is likely to be related to their perceptions of risk and beliefs about their chance for success. In order to effectively promote SET, it is therefore important to understand the views of patients who choose SET, as well as the views of those who do not.

The aim of this study was to survey a cohort of women and describe their views of SET at a specific point during an IVF/ICSI treatment, and identify factors that inhibited or promoted their adoption of SET. The focus of this current paper is the analysis of women's decision for SET or double embryo transfer (DET), the association between their perceptions about the possibility of pregnancy and twin gestation and about the risk to themselves or to a child conceived, and the factors they report to be influential to their decision.

Materials and methods

Ethics approval for this study was obtained from the Research Ethics Committee of the Women's and Children's Hospital with whom the clinic is affiliated.

A questionnaire was developed that contained 17 questions, some of which had multiple parts. Firstly, women were asked to indicate whether they had used sources of information such as the clinic information booklet, professionals, word of mouth, the media or the worldwide web to inform their decision and to rate the perceived influence of particular types of information on their decision for SET or DET. Secondly, they were asked to rate their perception of the chance for pregnancy and for multiple pregnancy with SET or DET in the treatment, and also their perception of the risk of complications occurring to themselves or their baby with a singleton or twin pregnancy. Thirdly, they were asked to indicate whether the possibility of particular outcomes were influential and to rate the influence on the decision for SET or DET that they perceived. Finally, the women were asked to rate the influence of others (such as their partner, their children or clinic staff) in the decision for SET or DET. Demographic data was collected for each participant.

A cohort of 324 women was identified from the clinic database as having enrolled in an IVF or ICSI treatment between August 2005 and February 2006. Because the questionnaire would be administered after the consent for embryo transfer had been obtained, women patients were assumed to be reporting a decision mutually arrived at by both herself and her partner in collaboration with the physician. To minimise additional stress associated with research participation during treatment, all women were interviewed in the down-regulation phase of their treatment. The cohort of women was sent information about the survey and invited to participate in a structured telephone interview with a clinic research nurse. A consent form was included with the information material. A follow-up phone call was made to each participant 2 weeks after sending the information material. Nine women had already begun their treatment when contacted and a further 24 women were unable to be contacted after two attempts, and were excluded.

In total, 163 women agreed to participate in the survey (a response rate of about 50%). All but seven of them had made a decision and signed a formal consent regarding the number of embryos to be transferred in this procedure.

A structured interview was conducted by telephone in which prompts were used to orient the participants to each section of the questionnaire. For example, the clinic research nurse introduced a particular question by explaining what aspect of the decision was going to be asked about and how the participant would be asked to rate her answer. Women were asked to indicate their responses along an 11-point Likert Scale in which 0 represented 'not influential', 5 represented 'moderately influential' and 10 represented 'highly influential'. Although more relevant terms were substituted to suit the question, this range of values was consistently re-presented.

Frequencies for categorical variables and descriptive statistics for continuous variables were obtained. Any data entry mistakes were noted and addressed. Data were analysed in SAS 9.1 for windows. Statistical analysis employed logistic regression analysis, first with each covariate and predictor separately. Where $P = 0.25$ or less, the predictor was retained for the final model. Using chi-squared test, multivariate regression analysis was used to assess the relationship between the covariates of age, level of education and whether this was the first cycle of

IVF/ICSI treatment, and various predictor variables related to chance of pregnancy and complications. $P < 0.05$ was considered statistically significant.

Results

Analysis was restricted to those women who had either one or two embryos transferred. The data of six women aged 42–45 years, who indicated a decision to have three embryos transferred due to age-related infertility, were excluded as there were insufficient cases for analysis. A further seven women who were undecided about SET or DET at the time of interview were also excluded from the analysis.

There were 87 women (58%) who indicated a preference for SET in their current treatment, while 63 (42%) indicated a preference for DET. The demographic characteristics of women in both SET and DET groups are described in **Table 1**.

No effect for the woman's level of education was demonstrated. A significant predictive linear association was found for women's age (odds ratio (OR) = –0.2; 95% confidence interval (CI) = –0.314 to –0.098; $P = 0.0003$) and whether it was her first cycle of IVF/ICSI treatment (OR = 1.358; CI = 0.438 to 2.360; $P = 0.005$). Younger women were more likely to have chosen SET on their first cycle of treatment. In subsequent regression models, these variables were controlled.

For statistical analysis, Likert scale responses were divided into the following categories: 0 = 'no chance'; 1–3 = 'small chance'; 4–7 = 'moderate chance'; and 8–10 = 'high chance'.

Chance of becoming pregnant

Table 2 sets out the women's responses to various questions regarding their perceptions of possible outcomes according to the actual treatment decision they had made. When the women were asked to rank how they perceived their chance of becoming pregnant during this cycle of treatment with actual SET or DET, the majority of women in both groups rated their chance for pregnancy as moderate or high. Three women in total rated themselves as having no chance of pregnancy at all.

The women were then asked to assess their perceived chance of becoming pregnant in a single cycle of IVF/ICSI where the opposite condition respective to their decision for SET or DET existed. Women who had chosen SET rated the chance for pregnancy with DET as higher while women who had chosen DET rated the chance for pregnancy with SET as only small or moderate. Nine indicated that they perceived no chance of pregnancy at all with SET. When various factors about pregnancy that influenced their decision to have one or two embryos transferred were assessed, one factor, the 'desire to avoid a twin pregnancy' was significantly associated with the decision to have SET (OR = 0.297; CI = 0.128 to 0.485; $P = 0.001$).

For the linear regression, the rating categories of 'none' and 'small chance' were collapsed.

The regression analysis reported in **Table 3** indicates that patient perception of a high or moderate chance of pregnancy with SET was predictive of the choice to have one embryo transferred. Similarly, perception that a high or moderate chance for pregnancy existed with DET was predictive of the choice to have two embryos transferred.

Table 1. Demographic characteristics of the survey sample.

Characteristic	*Single embryo transfer* (n = *87*)	*Double embryo transfer* (n = *63*)
Female age in years (mean; range)	33.4; 24–51	37.8; 27–47
First cycle	48 (55)	13 (21)
Repeat treatment	39 (45)	50 (79)
Maternal education level		
Up to year 12	10 (6.6)	16 (10.6)
Year 12	31 (20.6)	17 (11.3)
Higher degree	44 (29.3)	30 (20)
Other	2 (1.3)	0
Partner education level		
Up to year 12	22 (14.6)	15 (10)
Year 12	25 (16.6)	21 (14)
Higher degree	39 (26)	25 (16.6)
Other	1 (0.6)	2 (3)
Parity		
No child	60 (69)	54 (86)
Child together	22 (25)	4 (6)
Child from woman's previous relationship	3 (3)	3 (5)
Child from man's previous relationship	2 (2)	2 (3)

Values are *n* (%), unless otherwise stated.

Table 2. Congruence of choice for SET/DET and patient perception of possible outcomes.

Variable	*Category*	*Actual SET* (n = 87)		*Actual DET* (n = 63)	
		SET (%)	*DET (%)*	*SET (%)*	*DET (%)*
Perception of the chance of pregnancy	None	2	2	14	1.5
	Small	14	8	38	11
	Moderate	65	55	39	58
	High	17	17	8	29
Perception of the risk of complicated delivery	None	5	0	6	3
	Small	61	7	40	16
	Moderate	23	59	41	52
	High	11	34	13	29
Perception of the risk of twin gestation	None	28	0	38	0
	Small	72	22	62	27
	Moderate	0	61	0	61
	High	0	17	0	11
		Singleton (%)	*Twins (%)*	*Singleton (%)*	*Twins (%)*
Perception of the risk to maternal health	None	9	1	3	1
	Small	53	17	52	14
	Moderate	30	30	35	63
	High	8	8	9	9
Perception of the risk to infant health	None	9	3	5	1
	Small	69	32	68	33
	Moderate	21	56	24	57
	High	1	8	3	8
Perception of the risk of miscarriage	None	2	1	3	3
	Small	49	21	43	25
	Moderate	37	62	43	57
	High	11	16	11	14

Table 3. Association of patient perception of SET/DET and their chance of pregnancy in this IVF/ICSI treatment.

Variable[a]	*B (95% confidence interval)*	P-*value*
High chance of pregnancy (actual SET)	2.416 (0.604, 4.365)	0.01
Moderate chance of pregnancy (actual SET)	2.645 (1.488, 3.970)	0.0001
High chance of pregnancy (actual DET)	–2.453 (–4.357, –0.670)	0.008
Moderate chance of pregnancy (actual DET)	–2.184 (–3.826, –0.673)	0.006

[a]Reference category for regression analysis is 'small' or 'none'.

Chance of multiple gestation

With regard to the chance of having a twin gestation following IVF/ICSI, the women were asked to rate their perception of the chance of having a singleton or twin pregnancy following SET and DET respectively. Women who had chosen SET rated the chance of a twin gestation as low with SET but higher with DET. Women who had chosen DET also rated the chance of a twin gestation as low with SET and less of them rated the chance as higher with DET (**Table 2**).

In multivariate analysis, there was no significant difference between women who chose DET and women who chose SET in their perception of the chance of conceiving twins. Perceptions about the possibility of a multiple gestation were not predictive of the choice for SET or DET.

The risk of complications

The women were then asked to rate the perceived chance of any problems occurring with pregnancy and birth following SET or DET. The majority of women in both groups rated the possibility of various maternal health problems (such as gestational diabetes and conditions that would require hospitalization), having a baby with major health problems (such as a birth defect or premature birth), having a miscarriage and having a problem with delivery (such as caesarian section or a difficult labour) as small/moderate in both SET and DET (**Table 2**).

In multivariate analysis, there was no significant difference between women who chose DET and women who chose SET regarding their perception of the possibility of various complications occurring to themselves or their baby.

Table 4. Factors influencing the decision for SET/DET.

Variable	*B (95% confidence interval)*	P-*value*
A sense of time urgency (No)	–2.6513 (–4.731, –0.571)	0.01
Past experience of treatment (No)	–2.3603 (–3.728, –0.993)	0.0007
Desire for a single pregnancy (Yes)	–1.5752 (–2.736, –0.415)	0.007
Desire for a healthy pregnancy (Yes)	–2.1024 (–4.190, –0.015)	0.04
Doctor's recommendation (Yes)	–2.8158 (–4.719, –0.913)	0.003

Awareness of complications was not predictive of the choice for SET or DET.

Important factors in the decision

The women were then asked to indicate 'yes' or 'no' to a variety of factors that may have influenced their decision for SET or DET. Ten factors were included: the chance of becoming pregnant; the cost of treatment; a sense of time urgency to become pregnant as quickly as possible; past experience of IVF/ICSI treatment; the desire to have a healthy baby; the desire for a singleton pregnancy; the desire for a healthy pregnancy; the recommendation of the clinic doctor; previous experience of pregnancy; and the quality of embryos.

Women in both groups emphasized the importance of the chance of becoming pregnant in this treatment and their desire to have a healthy baby as important factors in their decision. After controlling for women's age, first cycle and education level, five influential factors emerged as significantly associated with the decision to transfer one embryo (**Table 4**). Women who emphasized a desire for a singleton pregnancy, a desire for a healthy pregnancy and who rated the recommendation of the clinic doctor as influential were more likely to have chosen SET. Women who did not emphasize a sense of time urgency or the past experience of treatment were more likely to transfer a single embryo. These factors remained significantly associated when the 'first cycle' variable was removed.

Discussion

Although patients in this study appeared to be informed about the risk of adverse maternal and infant outcomes associated with multiple pregnancies, a woman's choice for SET was not predicted by awareness of increased risk to herself or her baby or to her pregnancy and delivery. Although there was a trend for all women to rate the chance of experiencing complications as higher with twin gestation, women choosing SET did not have an increased perception of adverse consequences associated with a multiple gestation. Nonetheless, a desire to avoid a twin pregnancy was predictive of women choosing SET. It is possible that this desire is not cognitively linked with consequences of morbidity so much as with other effects, such as changes to lifestyle for instance.

Arguably, the medical community considers the current rate of twin pregnancy to be high and is active in promoting strategies to reduce it and so reduce infant morbidity. But women in this study perceived the chance of having a twin pregnancy after DET as only small to moderate. This suggests that disparity exists between the factors that practitioners expect will be important in a patient's decision about the number of embryos for transfer and what the patient considers important in a personal context.

These findings are not unique; several previous studies have shown that patients continue to desire a multiple birth despite recognition of the associated maternal and infant risks (Leiblum *et al*., 1990; Gleicher *et al*., 1995b; Goldfarb *et al*., 1996; Pinborg *et al*., 2003; Child *et al*., 2004b; Ryan *et al*., 2004b). However, a Scottish study found that despite being aware of the risks associated with twin gestation and ranking the risk of multiple gestation as unimportant, two-thirds indicated a preference for a single baby (Murray *et al*., 2004).

In this study, the choice for SET was not influenced by awareness of complications, yet positive attitudes were demonstrated towards avoiding a multiple pregnancy and having a single, healthy baby. This suggests that factors other than the spectre of risks associated with multiple gestations are at play in patients' decisions for SET and are subject to complex 'balancing'. In other studies, there has been recognition that there may be other priorities that take precedence over the goal of avoiding multiple pregnancy (Gleicher *et al*., 1995a; Ryan *et al*., 2004a). In Ryan's US study, avoiding a multiple birth was reported to be less important to patients than treatment efficacy, safety, affordability and the waiting time to conception (Ryan *et al*., 2004a) and, in Murray's Scottish study, a multiple birth was considered a less serious outcome than failed treatment (Murray *et al*., 2004).

In this study, feelings that are commonly associated with infertility, such as a sense of time urgency and past experience of treatment (including stress and treatment failure), were significant factors in the decision about embryo transfer that diminished the likelihood of patients choosing SET.

Another significant factor predictive of a choice for SET was the recommendation of a clinic doctor. Due to the study design, it was not possible to identify explicit factors in the doctor–patient consultation that were influential; however, this finding suggests that while a patient's denial of risks and adverse outcomes seem immutable, the decision is susceptible to physician counselling.

In corroboration, a major finding of this study is that female age and first cycle of treatment were predictive of a choice for SET. This confirms that women in this study were influenced by the official policy of the clinic to promote SET in younger,

first cycle patients. The wish to become pregnant in the current cycle of treatment was rated as highly influential in relevant survey questions by all the women. Congruence between the decisions that women had made for embryo transfer and their perception of having a good chance of becoming pregnant in the IVF/ICSI cycle was also demonstrated.

The findings of this study suggest that whilst risks and complications of multiple pregnancies are a primary concern for the medical community and form the rationale for promoting SET, patient rationality is different and decisions are driven by a complexity of other concerns. The current findings suggest that it is unhelpful to focus on risks and complications when counselling patients since evidence to date indicates that, despite being made aware of them, a patient's decision to have SET is more likely to be related to their personal experience of infertility. The results of this study suggest that more personal aspects of patient experience need to be elaborated upon and incorporated in counselling practices to promote SET. Similarly, in light of the findings in this study, imposing policy to restrict patient choice to SET may intensify negative experiences for many women and possibly undermine their psychosocial wellbeing. An ethical alternative to paternalism is collaboration. The results of this study suggest that, to reduce the incidence of multiple gestations, it is imperative for a clinic to first establish improved pregnancy rates from SET and to promote SET in the patient population in a way that sustains patient confidence in achieving a good outcome. Central to this process is systematic identification of the factors that matter most to patients and that influence their choice, coupled with ongoing consultation.

Acknowledgements

This study was supported by a Bertarelli Foundation grant and a Colin Matthews Research grant. The authors wish to acknowledge the assistance of Repromed in this study and are especially indebted to the women who volunteered to be interviewed.

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Received 19 July 2007; refereed 26 July 2007; accepted 22 August 2007.