Treatment of infertility in 31 men with spinal cord injury

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Introduction: *The majority of men with a spinal cord injury (SCI) are infertile due to ejaculatory dysfunction and poor semen quality. The goal of this retrospective study is to present the outcomes of assisted reproductive technology (ART) in a group of couples with SCI male partners.*
Materials and methods: *A review was conducted of the records of 31 couples with SCI male partners who were treated at the Institut de réadaptation Gingras-Lindsay-de-Montréal, at PROCREA Cliniques or at a hospital center. A semen sample was obtained either by manual stimulation, penile vibratory stimulation, electroejaculation or testicular sperm extraction. ART technique was selected according to the sperm parameters.*
Results: *The mean age of the men was 29 years (23-48) and of their female partners, 29 years (25-41). The average sperm count was 110.4 M/mL ± 16.2 M/mL and the average sperm motility rate was 12.3% ± 16.5%. Among the 10 couples treated with intravaginal insemination, 9 pregnancies occurred among 7 couples. No pregnancies resulted from intrauterine insemination (2 cases). Among the 18 couples treated with in vitro fertilization, 12 pregnancies were reported among 10 couples. The pregnancy rate/cycle was 43%. Following these ART techniques, the pregnancy rate reached 55%. Three pregnancies occurred from the use of donor sperm in 7 couples. Overall, 20 men with a SCI (64% of the group) became fathers to at least one child.*
Conclusions: *Fertility treatments are effective for couples with SCI male partners and secondary infertility.*

Key Words: infertility, spinal cord injury, assisted reproductive technology

Introduction

The incidence of spinal cord injuries (SCI) in Canada is estimated to be about 1500 cases per year, of which 80% are men.[1] One of the major consequences of SCI in men is decreased sexual function, which in most of these cases leads to erectile dysfunction, frequent anejaculation and poor semen quality.[2-3] All of these conditions considerably reduce the fertility rate among men with a SCI, which is estimated at around 5%[2-4] if no treatment is administered.

For couples with SCI male partners who seek medical advice to have a child, the fertility potential of the man can be determined from a sperm sample obtained by manual stimulation, penile vibratory stimulation (PVS),[5] rectal probe electroejaculation (EEJ)[6] or, if none of these techniques are successful, through testicular sperm extraction (TESE) or percutaneous epididymal sperm aspiration (PESA).[7] The recommended assisted reproductive technology (ART) technique is based in particular on the total number of motile sperm as well as the medical condition of the female partner: intravaginal insemination of fresh sperm at the hospital or at home,[8] intrauterine insemination in a hospital setting[9] or in vitro fertilization (IVF), together with intracytoplasmic sperm injection (ICSI) in cases of severe asthenospermia and for subjects who have undergone TESE or PESA.[10]

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Among the couples with SCI male partners who were evaluated at the Institut de réadaptation Gingras-Lindsay-de-Montréal (IRGLM) for an infertility problem, 31 received and completed various treatments that were administered at the IRGLM outpatient clinic, at another hospital center, or at the fertility clinic of PROCREA Cliniques. The treatments provided were customized according to the fertility potential of each couple. A global assessment of the fertility outcome for these couples, in light of outcomes already published in the literature regarding similar treatments for this clientele at other centers, could possibly help us better assess and, if needed, adjust our clinical interventions.

The goal of this retrospective study is therefore to evaluate the outcomes of ART treatments among 31 couples with SCI male partners.

Materials and methods

Methodology

The study is of a retrospective design based on patient records. The study received approval from the IRGLM Research Ethics Committee and the Ethics Committee of PROCREA Cliniques.

Study population

The records selected for this study were from patients who met the following inclusion criteria: men with a SCI and a fertility disorder resulting from the SCI, a female partner whose health status had been verified, completed fertility treatments, and treatment outcomes noted in the records.

Fertility treatments

Fertility treatments are defined here as the various procedures used to collect sperm as well as the ART techniques carried out following a first consultation. Out of the various sperm recovery methods which included manual stimulation, PVS with a Ferticare personal vibrator (Multicept, Denmark) or EEJ equipment (Seager Model 14, Dalzell, USA), the use of subcutaneous (sc) physostigmine combined with manual stimulation, which some of our patients underwent,[11] has been discontinued for a number of years due to frequent adverse effects. The ART procedures included intravaginal insemination (IVI) using fresh sperm (either at home or in hospital), intrauterine insemination (IUI), conventional IVF or IVF with ICSI. The majority of IVF treatments were administered at PROCREA Cliniques using a standard ovarian stimulation protocol. When required, TESE was performed under local anesthesia the same day as transvaginal egg retrieval using the ultrasound guidance method, followed by ICSI. If the pregnancy test conducted 2 weeks after the embryo transfer came out positive, screening for a clinical pregnancy was conducted 1 month after the egg retrieval using ultrasonography to detect the presence of a gestational sac and a fetal heart beat. For those couples with no pregnancy resulting from these procedures, donor sperm (insemination or IVF) was another option used to achieve pregnancy.

Data collected from patient records

Level of the SCI (cervical, thoracic, lumbar) and the degree of impairment (complete lesion, incomplete lesion) of the patients were documented.[12] Sociodemographic data related to patients and their female partners along with the following data were compiled: the timeframe (years) between the date of the SCI and the date of treatments; the nature and number of technique(s) (more than one for some patients) used to obtain sperm, i.e., sc physostigmine, PVS, EEJ, TESE; sperm parameters, i.e., sperm count and motility rate (%); the nature and number of ART techniques conducted (possibility of more than one per patient), i.e., IVI, IUI, IVF, as well as the number of donor sperm use (insemination or IVF). For the 13 couples who received IVF treatments at PROCREA Cliniques (data are not available for couples treated with IVF at other locations), the data compiled include the number of cycles and, for every cycle, the number of eggs retrieved, the number of eggs fertilized, the number of embryos (fresh and frozen) transferred and the number of pregnancies and births.

Results

Subject characteristics

Level of SCI was cervical in 10 men, thoracic in 20 men and lumbar in one man. The lesion was complete in 19 men and incomplete in 12 others. Their average age was 29.7 ± 4.8 years (range: 23-48) and the average age of their female partners was 29.3 years ± 4.5 years (range: 22-41); the average timeframe between the date of the SCI and the date of the first fertility consultation was 7.6 ± 6 years (range: 1-29).

Sperm recovery methods

A sperm sample was obtained through manual stimulation in 10 cases, including 6 men treated by sc physostigmine, 4 through PVS and 5 through EEJ. TESE was conducted on 12 subjects.

Sperm parameters

For the men from whom a sperm sample was obtained (n = 19), the average sperm count (M/mL) was 100.4 ± 16.2 (1-515) and the average sperm motility rate was 12.3% ± 16.5 (0-53).

TABLE 1. **Treatment outcomes from assisted reproductive technology**

	No. patients*	No. pregnancies	No. births	No. paternities
IVI	10	9**	9	7
IUI	2	0		
IVF	18	12**	13***	10
DS	7	3	4***	3
Total		24	26	20

IVI = intravaginal insemination; IUI = intrauterine insemination; IVF = in vitro fertilization; DS = donor sperm (sperm insemination: six cases; IVF: one case)
*The same couple may have been treated with more than one assisted human reproductive procedure
**Two pregnancies for two couples
***Including twins

Assisted reproductive technology procedures and outcomes

Table 1 shows the outcomes of the various treatment approaches used on the 31 couples whose records were studied. In three couples of the IVI group with no subsequent pregnancy, one underwent IUI and the two others underwent IVF. The majority of couples were treated by IVF. Overall, the pregnancy rate reaches 55% and 17 couples became parents following these various ART techniques. Therapeutic donor sperm insemination (TDI) was conducted on four couples out of the cases for whom IVF failed and on two couples who chose this option from the outset. For these couples who underwent TDI, the average number of treatment cycles was 4.1 (3-9). The seventh case in the donor sperm group involved IVF. Overall, 20 men among the 31 couples (64%) who were treated for infertility became fathers to at least one child. Finally, two couples from among those who did not succeed to have a child turned to adoption. Table 2 shows the characteristics and outcomes of IVF treatment conducted on the 13 couples treated at PROCREA Cliniques, identified as subject (S) 1 to S13, all treated with ICSI. Among these couples, the pregnancy rate/cycle was 43%.

TABLE 2. **Outcomes of in vitro fertilization treatments among 13 couples**

	No. Cycles	No. ER	No. EI	No. E	No. TE	No. Preg.	% Preg./cycle
S1	2	27	8	12	5	1	50
S2	6	68	66	38	24	1	16
S3	1	9	9	1	1	1	100
S4	3	29	26	21	12	2	66
S5	1	5	3	1	1	1	100
S6	1	17	15	10	6	0	0
S7	1	19	18	13	6	2	100
S8	2	12	11	5	4	0	0
S9	2	33	29	18	7	2	100
S10	2	18	12	2	2	0	0
S11	4	47	44	29	9	2	50
S12	1	14	13	4	1	0	0
S13	2	23	17	15	6	1	50

ER = eggs retrieved; EI = eggs injected; E = embryos; TE = transferred embryos (fresh and frozen); Preg. = pregnancy

Discussion

These results show that the majority of men with a SCI from our sample became fathers to a child following treatment for secondary infertility. Compared to the results of 13 similar studies that reported an overall pregnancy rate of 51% following fertility treatments among couples with SCI male partners,[13] the results observed in our study show a comparable efficacy. IVI is usually the first recommended approach when sperm parameters have not been greatly affected. Only two couples were treated with IUI because the total number of motile sperm did not exceed 5 million, as ordinarily recommended.[14] For couples treated with IVF, the pregnancy rate per cycle reported in our study (43%) seems acceptable when compared to the reported rate (27.6%) resulting from IVF treatments administered to 154 couples with SCI male partners who were treated at different centres.[15] Some of these studies do not indicate the number of embryo transfers per cycle or the number of embryos included per transfer, which makes a comparison between the study results incomplete.

In the case of our subjects, the embryos were usually transferred on day 3 and rarely, when possible, on day 5 (blastocyst stage), which is sometimes desirable due to a higher embryo implantation rate at this stage.[16]

The average number of 1.9 embryos (fresh and thawed) per transfer among the couples in our study probably exceeds the number currently used, as this number was lowered to a single embryo per transfer in 2010 following the implementation of a provincial public program in Quebec to fund infertility treatments using assisted reproductive technologies;[17] however, depending on the quality of the embryos, a maximum of two embryos for women aged 36 years and under and three embryos for women aged 37 years and older has also been included in the regulation. With the goal of decreasing the incidence of multiple pregnancies, this government initiative has considerably improved access to assisted reproductive technology services, especially considering the financial constraints that have prevailed until recently. At this stage, however, it is not known whether a reduction in the number of transferred embryos will have an impact on the pregnancy rate. Two twin pregnancies occurred as a result of IVF: the first case after the transfer of three embryos (two gestational sacs were detected through ultrasound) and the second case after conventional IVF with fresh sperm from an anonymous donor and the transfer of two embryos (day 5). It should be noted that all reported pregnancies led to a birth and that there were no cases of spontaneous abortion.

Out of a total of 18 couples treated with IVF, no complications were observed in relation to the ovarian stimulation protocol. As the pregnancy rate has nevertheless remained relatively low among couples treated with IVF, one could question whether sperm abnormalities[3] have a potentially negative impact on the success of IVF. However, no difference was demonstrated in the outcomes of IVF treatments for male infertility between the groups of men with a SCI and men without a SCI.[18] Also, the timeframe between the date of the SCI and the date of sperm collection for fertility treatment does not seem to be a determining factor, as it has been shown that the quality of sperm from men with a SCI remains stable over time.[19] Perhaps, future developments in applications of fertility treatments in couples with the male partner with a SCI might improve the outcome of these procedures as it seems to be the case in able-bodied couples.[20] Finally, we would also like to underscore that, according to a study comparing the children of fathers with a SCI and those of fathers without a SCI, the medical condition of new fathers with a SCI has no negative impact on the development of their children.[21]

Conclusion

In conclusion, the reproductive options for couples with SCI male partners are sufficiently effective to warrant encouraging these services for any man with a SCI who wishes to father a child.

This retrospective study has certain limitations, including a limited number of couples included in the study and whose treatment outcomes were therefore subject to qualified interpretation. Moreover, considering the lack of technical information on the IVF treatments that some couples received at institutions other than PROCREA Cliniques, the absence of these data may have an impact on the overall findings. □

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