Original Article

Does Testicular Sperm Alter Reproductive and Perinatal Outcomes in Assisted Reproductive Technology Cycles? 10 Years' Experience in an Indian Clinic

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Abstract

Background: Intra-Cytoplasmic Sperm Injection (ICSI) has revolutionized the reproductive outcomes for couples with male factor infertility. Especially in azoospermic men, use of ICSI with surgically retrieved testicular sperm has helped them have their own biological child. However, considering the immature nature of testicular sperm safety of testicular sperm has been debated. **Aims:** To compare reproductive outcomes, neonatal outcomes and the incidence of congenital malformations in children born after intracytoplasmic sperm injection (ICSI), using different sperm origins. **Settings and Design:** This is a retrospective study in which a total of 989 participants were enrolled. Study group (Testicular Sperm Aspiration (TESA) ICSI group) had 552 couples with female partners aged ≤37 and had self gamete cycles. ICSI cycles with ejaculated sperm (EJS) acted as the control group. **Materials and Methods:** All male patients underwent surgical sperm retrieval and all the women underwent controlled ovarian stimulation and transvaginal oocyte retrieval and Ovum Pick Up (OPU) as per the standard operating procedures of the clinic. Frozen embryo transfer with two good-grade blastocysts, which had shown 100% survival, were transferred in subsequent cycles. **Statistical Analysis Used:** The Student's *t*-test was performed for age distribution; odds ratio was performed to find the confounding factors. **Results:** Embryonic and reproductive outcomes were comparable and not statistically significant in the study and control groups. Incidence of congenital anomalies was observed in singleton live births and twin live births in both the TESA-ICSI group and the EJS-ICSI group, but the difference was not statistically significant. **Conclusions:** Our study revealed that congenital malformations in children born out of ICSI using testicular sperm and EJS were similar; no difference was observed in miscarriages between the testicular sperm-ICSI and EJS-ICSI group. Our data suggests that surgical sperm retrieval in couples with male factor infertility does not alter their reproductive outcome.

Keywords: *Assisted reproductive technology, azoospermia, implantation rate, semen analysis*

Introduction

Since the first successful live birth of Louis brown in the United Kingdom and Durga in India through *in vitro* fertilisation (IVF) in 1978,[1-3] two revolutionary advances in assisted reproductive technology (ART) that have occurred in the last two decades are the introduction of intracytoplasmic sperm

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injection (ICSI) in 1992[4] and the usage of epididymal or testicular sperm in an increasing number of infertile couples.[5-8]

Sperm factors of abnormal morphology, the excessive residue of cytoplasmic droplets and vacuoles in the nuclear region of the sperm head can adversely affect the results of ART treatment. The use of ejaculated sperm (EJS) that has completed its transit from the male reproductive tract has better fertilisation potential than surgically retrieved sperm (SRS) like testicular sperm extraction (TESE), percutaneous epididymal sperm aspiration (PESA) and testicular sperm aspiration (TESA). The above-mentioned sperm abnormalities can be a significant occurrence with testicular sperms. Nevertheless, many authors have reported higher fertilisation, implantation and live birth rates (LBR) using SRS-ICSI compared to EJS among men with male factor infertility, including obstructive azoospermia (OA); non-OA (NOA), using testicular sperm of raised DNA fragmentation index; cryptozoospermia, teratozoospermia oligoasthenoteratozoospermia or severe asthenozoospermia.[9-16] Use of ICSI among men with male infertility has enabled men to father a child and complete their dream of parenthood.[6,17,18] Using surgical techniques for the retrieval of sperm either from epididymal or testicular tissues or the use of EJS for ICSI i.e., sperms at different stages of maturation can affect the perinatal outcomes of children born after ICSI. However, concerns about the health of the children born out of SRS have been raised.[19,20] In this study, we examined the data from our IVF centre from 2010 to 2019 to compare reproductive, neonatal outcomes and incidence of congenital malformations in children born after ICSI with different sperm origins.

Subjects and Methods

This is a retrospective study that included infertile couples with azoospermia on semen analysis; based on World Health Organization (WHO) 2010 standard criteria,[21] who presented in our private IVF centre from January 2010 to June 2019.

Azoospermia is diagnosed by the complete absence of spermatozoa in the semen in two different centrifuged samples (3000 × g for 15 min).[22] A total of 989 patients undergoing TESA and conventional ICSI were enrolled. For TESA groups, patients with azoospermia were seen by urologists to determine whether they had OA or NOA, the volume of the testis and hormonal level. On the day of oocyte retrieval, TESA was performed. For the control group, conventional ICSI was conducted with EJS.

All patients in this study have given written informed consent. Ethical waiver for patient consent was obtained from our Institutional Ethical Committee considering the retrospective nature of this study and publishing this data (ECR/1312/Inst/TG/2019/no. 011). The study adhered to the principles of the Helsinki Declaration (2013) for the ethical handling of human subjects.

Sample size

In this study, a total of 989 participants underwent SRS under general anaesthesia. Of these, only 552 couples were included in this study with female partners aged ≤37 and had self-gamete cycles. This was to exclude any influence of advanced female age on neonatal outcomes. Among them, 342 participants (till June 2019) had embryo transfer. Following were the reasons for considering 552 couples from 989 participants who underwent SRS; poor sperm morphology, non-availability of viable sperm at ICSI, use of donor sperm with prior patient consent owing to poor sperms after TESA, non-availability of good quality embryos, poor embryos survivals and cancellation of embryo transfer procedures.

Couples with EJS and self-oocytes acted as the control group for this study (n = 503); among them, 387 participants (till June 2019) had embryo transfer. No power calculation was performed.

Exclusion criteria

Patients with acute systemic diseases, acute urinary tract infections, hepatic function disorders, malignant diseases and hypogonadotropic hypogonadism were excluded from this study. Moreover, couples who had unsuccessful sperm retrievals or donor gamete cycles and couples who still have not had embryo transfers at our clinic were excluded from this study.

Sperm retrieval procedure

All patients underwent surgical sperm retrieval in our private IVF clinic via three techniques: PESA or TESA, and TESE consecutively, until sperm was found. Each procedure was carried out on the right and then left testis. TESA was done by aspirating the testicular parenchyma percutaneously with an 18G or 20G butterfly needle in three different positions on the testis and creating negative pressure with a 1 ml Becton-Dickinson syringe by pulling the plunger while the needle was moved in and out the testis in an oblique plane to disrupt the seminiferous tubules. Then, the specimen was flushed into a dish containing warm HEPES-Human Serum Albumin (HSA) warm media. The surgical procedure was stopped at any point in time once the embryologist found sperms successfully in a given tissue by teasing

under a microscope. TESA or TESE was performed on the contralateral testis if insufficient or no sperm were obtained.[22,23]

All surgical sperm retrievals were performed on the day of OPU and fresh SRS s were used for ICSI. We excluded data from cycles where frozen testicular sperms were used for ICSI. The reason for using only fresh sperms was to avoid confounding factors from frozen testicular sperms on reproductive outcomes, if any.

Intracytoplasmic sperm injection procedure and embryo culture

In the study group, male partners underwent SRS, and female partners underwent controlled ovarian stimulation and transvaginal oocyte retrieval as per our clinic's standard operating protocol. After the oocyte retrieval during the ICSI processing, denudation of oocytes is done by brief exposure to 80 IU hyaluronidase 2 h after oocyte retrieval; metaphase II (MII) oocytes were injected using an inverted microscope; the fertilised oocytes were cultured continuously in SAGE 1-Step media with HSA (Cooper surgical) till blastocyst stage and a freeze all policy was followed. Embryo vitrification was done with Kitazato Media, Japan. Frozen Embryo transfer with two good-grade blastocysts was done in subsequent cycles, and grading of the blastocysts was done as per Istanbul Consensus by Alpha scientists.[24]

Primary outcomes

Primary outcomes of this study were live birth rate (LBR) and perinatal outcome like gestational diabetes mellitus, pregnancy induced hypertension, intra uterine growth restriction, preterm deliveries, birth weights and congenital malformations.

Congenital anomalies

Following the WHO definition of congenital anomalies, the classification of neonatal malformation was done in accordance.[25-27] It is also known as birth defects, congenital disorders, or congenital malformations. It is defined as structural or functional anomalies (for example, metabolic disorders) that occur during intrauterine life and can be identified prenatally, at birth, or sometimes may only be detected later during infancy. A physical defect present in a baby at birth that can involve many different parts of the body, including the brain, heart, lungs, liver, bones and intestinal tract; it can be genetic, and it can result from exposure of the fetus to a malforming agent (such as alcohol), or it can be of unknown origin. Congenital malformations are now the leading cause of infant mortality (death) in the US and many other developed nations.[26]

Secondary outcomes

Reproductive outcomes – fertilisation rate (FR); blastocyst formation rate; implantation rate; clinical pregnancy rate (CPR); miscarriage rate (MR) and multiple pregnancy rates (MPR).

Statistical analysis

The Student's *t*-test was performed for age distribution; the odds ratio (OR) was performed to find the confounding factors.

Results

Demographic details

The flow chart [Figure 1] shows the basic design of the study. A total of 989 patients enrolled for SRS-ICSI and 792 patients enrolled for EJS-ICSI; of these, only 552 TESA-ICSI couples who have fulfilled the criteria of this study with female partners age ≤37 and had self-gamete ICSI cycles were included in the study group. About 503 participants of EJS and self-gamete-ICSI couples were enrolled as the control group. The indications for performing ICSI in the control group with EJS were severe male factor infertility (count <5 million/ml), necrozoospermia, cryptozoospermia, previous failed IVF cycles. The total number of subjects, successful retrieval and own oocytes with adjusted female age ≤37; unsuccessful retrieval of sperms; successful sperm retrieval but OPU not done, successful oocyte and sperm retrieval but no blastocyst formed are included in Table 1.

Reproductive outcomes

The reproductive outcomes of testicular sperm versus EJS are included in Table 2. The number of oocytes retrieved from the TESA group and EJS group were 6728/6010, respectively. Among the oocytes retrieved, the mature oocytes that had undergone ICSI were 5044 MII oocytes using TESA sperm and 4593 MII oocytes using EJS. The FR was 92.62% versus 96.3%; (OR: 5.47; 95% confidence interval [CI], 1.19–25.07)

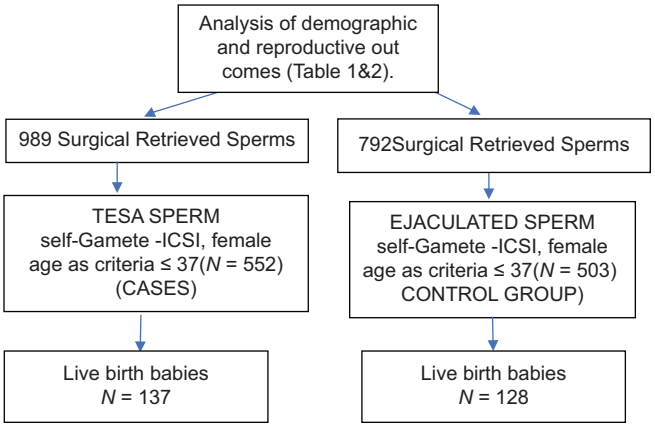

Figure 1: Flow chart shows the details of the study design

Table 1: Demographic and clinical characteristics of intracytoplasmic sperm injection cycle according to sperm origin

Parameter	SRS (TESA) group	EJSs	TESA group versus EJS *P*
Total participants underwent surgical retrieval	989	792	-
Successful retrieval and own oocytes with female age adjusted ≤37	552	503	NA
Age (mean±SD) (years)	33.16±4.85	32.37±1.23	<0.0003*
Unsuccessful retrieval of sperms	7	0	NA
Successful, and OPU not done	1	0	NA
Successful, and cycle cancelled because no blastocysts formed	74	174	NA
Successful and siblings removed from the study	45	0	NA

*Statistically significant. Student's *t*-test was performed for age distribution between SRS (TESA) group and ejaculated (EJS) sperm. EJSs=Ejaculated sperms, SRS=Surgically retrieved sperm, TESA=Testicular sperm aspiration, SD=Standard deviation, OPU=Oocyte pickup, NA=Not available

Table 2: Reproductive outcomes of intracytoplasmic sperm injection cycles according to sperm origin

	TESA sperm	EJS	Fisher's exact test OR (95% CI)	*P*
Parameter of reproductive outcomes				
Number of oocytes retrieved	6728 (12.19±5.78)	6010 (12.02±6.76)	NA	0.66
Number of mature oocytes	5044 (9.14±4.66)	4593 (9.13±5.37)	NA	0.98
The proportion of MII oocytes at ICSI (%)	75.03	76.42	0.981 (0.93-1.03)	0.482
Number of MII oocytes injected (ICSI)	5043 (9.14±4.64)	4523 (9.13±5.37)	NA	0.76
Number of oocytes fertilised	4671 (8.46±4.57)	4347 (8.78±5.11)	NA	0.29
Fertilisation rate (%)	92.62	96.3	5.47 (1.19-25.07)	<0.018
Blastocyst rate (%)	37.18	38.19	3.42 (2.52-4.64)	<0.0001

The parameters of the testicular sperm and EJS groups were compared and analysed using Student's *t*-test to find the mean and Fisher's exact test was done to find the OR, CI, NA, *P* value significance ($P<0.05$). ICSI=Intracytoplasmic sperm injection, TESA=Testicular sperm aspiration, OR=Odds ratio, CI=Confidence interval, NA=Not applicable, EJS=Ejaculated sperm, MII=Metaphase II oocytes (mature Oocytes)

Table 3: Embryonic outcomes of the study

	TESA group	EJS	Fischer exact test OR (95% CI)	*P*
Parameter of embryonic outcomes				
Total number of ET done in the cycle	428 (1.12±0.32)	387 (1.24±0.51)	NA	<0.0001
Total embryos transferred	774 (2.03±0.92)	683 (2.19±1.01)	NA	<0.032
Beta-hCG positive (% per ET)	62.85% (269/428)	71.13% (276/387)	0.68 (0.50-0.91)	0.01
Gestational sac	75.43% (326/428)	79.84% (309/387)	0.81 (0.58-1.13)	0.236
Cardiac activity	70.56% (302/428)	69.5% (269/387)	1.05 (0.78-1.42)	0.760
Implantation rate	42.12% (326/774)	45.24% (309/683)	0.88 (0.72-1.08)	0.244
Biochemical pregnancy rate	2.80% (12/428)	5.17% (20/387)	0.53 (0.25-1.09)	0.104
Clinical pregnancy rate	60.04% (257/428)	66.14% (256/387)	0.76 (0.57-1.02)	0.08
Multiple pregnancy rate	8.64% (37/428)	8.10% (31/387)	2.35 (1.27-4.35)	0.006
Ectopic pregnancy	0	0	0	0
Missed abortion (% per clinical pregnancy)	3.73% (16/428)	3.87 (15/387)	0.96 (0.47-1.98)	1.000
Miscarriage	5.61% (24/428)	7.49% (29/387)	0.73 (0.42-1.28)	0.32
Ongoing Pregnancy	13.7% (59/428)	3.35% (13/387)	4.60 (2.48-8.53)	<0.0001
Lost for follow-up	0	0	0	0
Obstetric complications				
GDM	3.03% (13/428)	3.8% (15/387)	0.77 (0.36-1.65)	0.56
PIH	2.10% (9/428)	1.03% (4/387)	2.06 (0.63-6.73)	0.27
Thyroid disease	2.8% (12/428)	0	Infinity	<0.001
IUGR (%)	0.00	0.25	0	0

The parameters of the testicular sperm and EJS groups were compared and analysed using Fisher's exact test to find the OR, CI, NA, infinity; *P* value significance ($P<0.05$). ET=Embryo transfer, GDM=Gestational diabetes mellitus, PIH=Pregnancy-induced hypertension, OR=Odds ratio, CI=Confidence interval, NA=Not applicable, IUGR=Intra-uterine growth restriction, TESA=Testicular sperm aspiration, EJS=Ejaculated sperm, hCG=Human Chorionic Gonadotropin hormone

and the blastocyst rate was (37.18% vs. 38.19%; OR: 3.42; 95% CI, 2.52–4.64), respectively, and showed no statistical significance.

Embryonic outcome

In Table 3, embryonic outcomes using testicular sperm and EJS showed statistical significance among the total number of embryo transfers done in cycle 428 (1.12 ± 0.32) versus 387 (1.24 ± 0.51); the total number of embryos transferred 774 (2.03 ± 0.92) versus 683 (2.19 ± 1.01); CPR 60.04% versus 66.14% (OR: 0.76; 95% CI, 0.57–1,02); MPR 8.64% versus 8.10% (OR: 2.35,95% CI; 1.27–4.35); Among other conditions, thyroid disease showed 2.8% versus 0% ($P < 0.001$).

Neonatal outcomes

Table 4 shows the neonatal outcomes of testicular sperm and EJS with ICSI cycles. The LBR, according to sperm origin, TESA sperm (137 [32.0%] and EJS were 128 [33.0%]), respectively. Among the live births, the singletons born were (100 [23.36%] vs. 97 [25.06%]) and twins (37 [8.64%] vs. 31 [8.01%]) showed no statistically significant differences. Overall mean birth weight calculated in kilograms (Kg): Mean birthweight was 2.91 Kg in the TESA group and 2.86 Kg in the EJS group, respectively. The normal birthweight >2.5 kg among singletons observed was (247.63/80 vs. 244.77/79); low birth weight (1.5 kg − 2.5 kg birth weight) was (41.58/18 vs. 29.1/15) and very low birth weight (<1.5 kg) was (2/2 vs. 7.76/6), respectively. No statistically significant differences in delivery method were observed.

Congenital malformations

Singletons

Table 5 shows the neonatal outcomes of singleton birth using testicular sperm and EJS. Three babies out of 100 live births of singletons gestation showed congenital malformation using testicular sperm. Angelman syndrome (AS), which is a genetic disorder, was observed in one baby, and two babies had neonatal intensive care unit (NICU) admission; among them, one baby died immediately in NICU due to meconium aspiration and one baby had neonatal jaundice and recovered. Using EJS, the anomalies observed were – one hydrocephalus, one Acute Respiratory Distress Syndrome due to meconium aspiration (baby died after 18 days) and three babies died in NICU after preterm delivery. Incidence of malformation of singletons born out of different sperm origin, testicular sperm and EJS; no statistically significant difference was observed.

Twins

Using testicular sperm with ICSI cycles, it was observed that about seven twin babies were admitted to NICU after preterm delivery; among them, one baby died due to preterm birth; one baby with respiratory distress [Table 6]. In twin babies of full-term delivery, one baby was diagnosed with Ladd bands (died due to gangrene formation after surgery). Nine twin babies showed congenital malformation using EJS with ICSI cycles; among them, five twin babies were of preterm delivery and admitted to NICU; 1 twin baby with respiratory distress and one twin baby showed Ladd bands defect at birth. No significant differences were observed between the two groups ($P > 0.05$).

Discussion

This study included 137 children born after ICSI using testicular sperm and 128 children using EJS. Similar congenital malformations were observed in neonates

Table 4: Neonatal outcomes

Parameters	TESA group		EJS		Fisher's exact test OR (95% CI)	*P*
	Total	Percentage	Total	Percentage		
LBR	137	32.0	128	33.0	0.95 (0.71-1.27)	0.76
Singletons	100	23.36	97	25.06	0.91 (0.66-1.26)	0.62
Twins (% per live delivery)	37	8.64	31	8.01	1.08 (0.66-1.78)	0.80
Overall birth weight (kg)	291.21/100 (2.66±0.65)	2.91 kg	278.13/97 (2.73±0.63)	2.86 kg	-	0.40
Birth weight (>2.5 kg)	247.63/80 (3.00±0.36)	3.09 kg	244.77/79 (3.03±0.35)	3.09 kg	-	0.50
Low birth weight (1.5 kg-2.5 kg)	41.58/18 (2.15±0.34)	2.4 kg	29.1/15 (2.09±0.25)	1.94 kg	-	0.39
Very Low birth weight (<1.5 kg)	2/2 (1.25±0.16)	1 kg	7.76/6 (1.17±0.25)	1.29 kg	-	0.89
Full-term delivery	117/428	27.3	108/387	27.90	0.97 (0.72-1.32)	0.88
Preterm delivery	20/428	4.67	20/387	5.16	0.90 (0.47-1.69)	0.76
Male	93	53.45	88	55.35	-	-
Female	81	46.55	71	44.65	-	-
Sex ratio male/female	1.15		1.24		0.92 (0.60-1.42)	0.74

The parameters of the testicular sperm and EJS groups were compared and analysed using Fisher's exact test to find the OR, CI, NA, infinity; *P* value significance ($P<0.05$). Student's *t*-test was performed to calculate the mean value for birth weight; No significant differences were observed among two groups ($P>0.05$). LBR=Live birth rate, OR=Odds ratio, CI=Confidence interval, NA=Not applicable, TESA=Testicular sperm aspiration, EJS=Ejaculated sperm

Table 5: Congenital malformations in singletons

Congenital malformation in singletons	TESA sperm group		EJS group		OR (95% CI)	*P*
	Total	Percentage	Total	Percentage		
Number of birth defects	9	9	13	13.4	0.64 (0.26-1.57)	0.37
NICU	7	7	8	8.2	0.84 (0.29-2.41)	0.79
Respiratory distress	0	0	0	0	-	-
Jaundice	1	1	2	2.06	0.97 (0.06-15.72)	1.000
Urogenital birth defects	0	0	1	1.03	-	-
Genetic disorders						
Angelman syndrome	1	1	0	0	0.97 (0.06-15.72)	1.000

Incidence of malformations of babies delivered from testicular sperm and EJS groups. The parameters of the testicular sperm and EJS groups were compared and analysed by using Fisher's exact test. No significant differences were observed among two groups ($P>0.05$). TESA=Testicular sperm aspiration, EJS=Ejaculated sperm, OR=Odds ratio, CI=Confidence interval, NICU=Neonatal intensive care unit

Table 6: Congenital malformations in twins

Congenital malformation in twins	TESA sperm group		EJS group		Fischer's exact test OR (95% CI)	*P*
	Total	Percentage	Total	Percentage		
Total number of birth defects in twins	7	18.9	8	29.03	0.57 (0.18-1.76)	0.36
Preterm delivery	5	13.5	6	19.35	0.65 (0.17-2.38)	0.53
Respiratory distress	1	2.7	1	3.2	0.83 (0.06-13.89)	1.000
Jaundice	0	0	1	3.2	-	-
Ladd bands	1	2.7	0	0	-	-

Incidence of malformations of babies delivered from testicular sperm and EJS groups. The parameters of the testicular sperm and EJS groups were compared and analysed by using Fisher's exact test. No significant differences were observed among two groups ($P>0.05$). TESA=Testicular sperm aspiration, EJS=Ejaculated sperm, OR=Odds ratio, CI=Confidence interval

born out of different sperm origins and showed no statistical significance. In terms of birth weight, preterm deliveries, and full-term deliveries, there was no significance, which is in harmony with the other reports.[19,28]

Although there are similar malformations observed between both the groups of TESA sperm and EJS; it was observed that an imprinting gene Ubiquitin Protein Ligase E3A is a protein-coding gene is maternally expressed in the brain and biallelically expressed in other tissues. Maternally inherited deletion of this gene causes AS (OMIM: 105830), which is seen in one child 0.72% (1/137) born out of TESA sperm ICSI which is consistent with *Hattori Hiromitsu* and *Hiura Hitoshi* who have reported AS 1.8% (4/227) LBR frequency in a nationwide epidemiology ART and imprinted disorders.[29] Another group, Amor and Halliday, in a review, has described AS to affect 1 in every 16, 000 children.[30]

Among the total 265 children born of ICSI-TESA sperm and ICSI-EJS it was observed that 2.7% versus 3.2% neonates had respiratory distress and 13.5% versus 19.35%preterm deliveries in twins, which is consistent with the study of *Catarina Ferraz Liza*,[31] where they have compared obstetric therapies and neonatal outcomes in ART. Adding to this, few metanalyses conducted for analysing birth defects after ICSI and other IVF methods were not able to conclude the risk of congenital malformation in children born out of different sperm origin.[32]

Fedder J *et al*., reported no hypospadias seen in their 431 boys conceived using non-EJS, which is in accordance with our study; where no hypospadias was found in 93 boys born out of non-EJS; and a similar trend was noted in 88 boys born out of EJS. Data from this study are conflicting with Fedder *et al*., who have reported a high incidence of hypospadias (1.6%) in 187 conceived by non-EJS.[33] Belva *et al*. reported 2 boys with hypospadias out of 354 (0.5%) conceived by non-EJS, and 0.3% in the EJS which is again a cause of male infertility.[34-36]

This study shows no significance and gender differences in the outcomes of sex ratio after ICSI with testicular sperm and EJS 1.15: 1.24 (OR: 0.92; 95% CI, 0.60–1.42).[23,29] In a meta-analysis, the study compared TESA sperm with EJS showed downtrend of MR after ICSI with TESA sperm.[15,37] Holte *et al*. reported an increased risk of pregnancy loss with testicular sperm compared with epididymal sperm (relative risk 1.47; 95% CI, 1.12–1.93).[27] However, in our study, no significance was observed in miscarriages between testicular sperm and EJS with OR: 0.73; 95% CI, 0.42–1.28.

Based on the data observed in this study, surgically retrieved testicular sperms seem to offer comparable embryonic and reproductive outcomes.

Contrary to the traditional thought that TESA sperms alter reproductive outcomes, this retrospective data from our centre intends to reiterate that origin of sperm from different points of the male reproductive tract seems assuring and encouraging. The ultimate goal of any ART programme should focus on the safety of the offspring and helping every couple to a child from their own gametes. Conception through third-party gametes should be the last option when all the other available interventions have failed to offer successful pregnancy with self-gametes. Improved surgical techniques for sperm retrieval, better technical know-how to handle the surgically retrieved testicular sperm in laboratories, state-of-the-art embryology laboratory culture conditions and a multi-disciplinary approach in ART practice have helped in improving success rates and offering safe conception. In our opinion, these emerging lab aspects seem to have improved reproductive outcomes with testicular sperms.

Major limitation of this study is its retrospective data evaluation. In addition, male partners' demographic information such as age, lifestyle factors influencing reproductive outcomes and hormonal parameters, were not considered in the study design.

Conclusions

Our data suggest no higher incidence of increased risk factors in the outcomes of children born out of TESA-ICSI and no difference in the congenital malformation were observed between the children born out of EJS-ICSI and TESA sperm – ICSI. SRS patients achieved good fertilisation, blastocyst rate and pregnancy outcomes by using testicular sperm, which has provided them the chance of becoming a biological fathers. The outcomes from the study show that SRS does not seem to alter reproductive outcomes.

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Conflicts of interest

There are no conflicts of interest.

Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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