

Male factor infertility diagnoses, but not male age, significantly affect the yield of usable embryos in donor oocyte cycles

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Objective: To evaluate the impact of male age and male factor infertility on embryo suitability for transfer in in vitro fertilization cycles in which female factor is controlled.

Design: The national Society for Assisted Reproductive Technology Clinic Outcome Reporting System cycle data were used to evaluate the impact of male age and male factor infertility diagnosis on embryo suitability for transfer in cycles using nonidentified donor oocytes. Male age was primarily analyzed as a categorical variable (<30, 30–39, 40–49, and ≥50 years).

Subjects: All in vitro fertilization cycles using nonidentified donor oocytes with preimplantation genetic testing for aneuploidy between 2017 and 2022 were included.

Exposure: Male age and male factor diagnosis.

Main Outcome Measures: Number of embryos biopsied for preimplantation genetic testing for aneuploidy and number of embryos suitable for transfer.

Results: The median number of embryos biopsied per cycle and the median number of embryos suitable for transfer did not differ across male age groups. When comparing all cycles with and without male factor infertility, regardless of age, there was a similar number of embryos biopsied per cycle (5 [3,8] vs. 5 [3,8]), but a higher median number of embryos suitable for transfer (4 [2,6] vs. 3 [2,5]) in the cycles with no male factor diagnoses. When examining outcomes by specific male factor diagnoses, no differences were seen in the number of embryos biopsied or the number suitable for transfer.

Conclusion: Together, these data suggest that although male age does not significantly impact embryo suitability for transfer, the presence of any male factor diagnoses does decrease the number of embryos available for transfer. (Fertil Steril® 2026;126:640–7. ©2026 by American Society for Reproductive Medicine.)

Key Words: Male age, male factor infertility, embryo quality

Aneuploidy is a major cause of implantation failure, miscarriage, and congenital disorders in assisted reproduction and is strongly associated with increasing maternal age (1). Although most embryo aneu-

ploidies arise from maternal meiotic errors, a smaller proportion originates from the paternal genome. Oocyte-derived aneuploidy occurs in approximately 30% of embryos at age 35 and in more than 85% by age 45 (1);

accordingly, advanced maternal age is consistently defined as 35 years or older (2). In contrast, sperm-derived aneuploidy has a much lower estimated incidence of 3%–5% (3) driven primarily by nondisjunction mecha-

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nisms (4). Unlike maternal age, no standardized definition of advanced paternal age exists. However, as the mean paternal age at first birth has risen from 27.4 to 30.9 years over the past half-century, and the proportion of fathers older than 40 has increased from 4.1% to 8.9% (5), there is a growing imperative to define advanced paternal age and clarify the associated reproductive risks.

The effect of paternal age on embryo ploidy has been examined in multiple studies with conflicting results. Although a 2015 study reported that advanced paternal age was associated with higher aneuploidy rates in embryos derived from donor oocytes (6), more recent studies have found no association between paternal age and aneuploidy rates (7, 8). These studies have been limited by smaller sample sizes and inconsistent cut-offs for defining advanced paternal age. Additionally, not all studies have restricted their analyses to donor oocyte cycles alone and are therefore unable to account for the effect of increasing age of the male partner, independent of the increasing age of the female partner. Given these challenges, to date, no consensus has been established regarding the impact of male age on embryo ploidy.

In addition to the effects of male age on embryo ploidy, it has been suggested that male factor infertility may affect embryo ploidy as well. It is known that male factors contribute to approximately 50% of cases of infertility, with 20% occurring in isolation and 30% occurring in conjunction with female factors (9). However, the effects of male factor infertility on embryo ploidy are not well-established. Although a 2015 retrospective cohort study found that severe oligospermia was associated with a significant increase in sex chromosome abnormalities (10), other studies have found that severe male factor does not affect the euploid rate (11). These studies, too, did not restrict analyses to donor oocyte cycles and preimplantation genetic testing for aneuploidy (PGT-A) was performed using array comparative genomic hybridization rather than next-generation sequencing, limiting the generalizability of these results.

To address this gap in the literature, this study used the national Society for Assisted Reproductive Technology (SART) Clinic Outcome Reporting System (SART CORS) cycle data for 2017–2022 to evaluate the impact of male age and male factor infertility diagnosis on embryo suitability for transfer in cycles using nonidentified donor oocytes. The SART CORS database does not report the number of euploid embryos created from an in vitro fertilization (IVF) cycle with PGT-A; instead, it reports the number of embryos “suitable for transfer”. Therefore, in this analysis, embryos suitable for transfer refer to PGT-A-tested embryos deemed acceptable for transfer. The primary objectives were to evaluate the impact of male age and male factor infertility on embryo suitability for transfer in IVF cycles in which the female factor is controlled. We hypothesized that increasing male age and increasing number and severity of male factor infertility diagnoses would be associated with more abnormal embryos in IVF–PGT-A cycles using nonidentified donor oocytes.

MATERIALS AND METHODS

Data collection

This was a US population-based retrospective cohort study assessing PGT-A embryo biopsy results after fertilization of fresh or frozen-warmed donor oocytes for IVF reported to SART between 2017 and 2022 to determine if there is a difference in the number of embryos suitable for transfer based on male partner age or male factor infertility. Approval was obtained from the Rutgers University Institutional Review Board as well as the SART Research Committee.

The data used for this study were obtained from the SART CORS. Data were collected through voluntary submission, verified by SART, and reported to the Centers for Disease Control and Prevention (CDC) in compliance with the Fertility Clinic Success Rate and Certification Act of 1992 (Public Law 102-493). Society for Assisted Reproductive Technology maintains Health Insurance Portability and Accountability Act (HIPAA)-compliant business associate agreements with reporting clinics. In 2004, after a contract change with the CDC, SART gained access to the SART CORS data system for the purposes of conducting research. Over 90% of all assisted reproductive technology (ART) cycles in the United States are performed at SART-member clinics. Society for Assisted Reproductive Technology annually selects up to 10 clinics, approximately 2.5% of SART clinics, for an on-site validation visit using metrics and a blinded selection process to identify outlier clinics. Medical records are reviewed during the validation visit to verify the designation, outcome, and reporting of cycles. Clinics with significant systematic reporting errors undergo data correction. Six primary metrics and 26 secondary metrics are used for clinic selection. The metrics include low prospective reporting for both egg retrieval cycles and total cycles, high live birth rates in the various age groups, low cancellation rate, high percentage of total fertility preservation cycles, high percentage of embryo banking and oocyte banking cycles, high percentage of fertility preservation cycles where oocytes were warmed or embryos were transferred within a year, high percentage of deleted cycles, high percentage of cycles converted from intrauterine insemination, and low percentage of cycles in which no embryos were suitable for transfer with and without PGT. Society for Assisted Reproductive Technology does not validate the accuracy of data entry fields such as gonadotropin dosage, number of oocytes retrieved, number of fertilized oocytes, number of embryos cryopreserved, PGT results, or demographic fields such as age and diagnosis.

To assess the effect of male age or male factor infertility on embryo suitability for transfer, all IVF cycles using non-identified donor oocytes with PGT-A between 2017 and 2022 were included. Male age was primarily analyzed as a categorical variable (<30, 30–39, 40–49, and ≥50 years). Cycles using autologous oocytes or in which the female donor age was >33 years were excluded because prior studies have demonstrated a decrease in euploid embryo rate above this threshold (12). Cycles in which an oocyte donor was shared across different recipients were excluded as well. Additional exclusion criteria included cycles in which the sperm source

was not clearly listed as either “fresh” or “thawed”, cycles in which the outcome data were missing or in a non-numeric format, cycles in which day 3 embryos were transferred, cycles where the sperm source was listed as a partner who had undergone a prior vasectomy or were denoted as having obstructive azoospermia (OA) and no surgical sperm retrieval was noted, and cycles in which the combinations of male factor-related reasons for ART led to questions of data integrity (for example, severe oligospermia and moderate oligospermia listed together).

In addition to patient age, the following variables were collected: type of male factor infertility (oligospermia [moderate], oligospermia [severe], low motility, low morphology, azoospermia [obstructive], azoospermia [nonobstructive], very severe male factor, and “other” male factor [specified and unspecified]). Additional reasons for ART, such as diminished ovarian reserve, endometriosis, ovulatory dysfunction, tubal factor, uterine factor, polyendocrine metabolic ovarian syndrome, unexplained infertility, or recurrent pregnancy loss, were tabulated as well. The primary outcomes were (1) the number of embryos biopsied per cycle, and (2) the number of embryos suitable for transfer per cycle. Society for Assisted Reproductive Technology does not report on the number of euploid embryos obtained in a cycle, but rather, the number of embryos “suitable for transfer”, which is defined at the discretion of the program. Male factor diagnoses were also grouped and analyzed by severity. A composite of “less severe male factor diagnoses” included cycles in which moderate oligospermia or low morphology were marked. This was compared against a composite of “more severe male factor diagnoses”, cycles in which very severe male factor and severe oligospermia were marked. Missing data were handled using listwise deletion for the primary variables of interest in the study. Variables that were not included in the inclusion or exclusion criteria, or subsequent statistical analyses, were not assessed for missingness. Inclusion and exclusion criteria were applied, and any observations with missing data for variables of interest used in the analyses were excluded from the final dataset; this yielded the final analytic cohort ([Supplemental Fig. 1](#), available online).

Statistical analysis

All pertinent study measures were first summarized using range, mean (SD), and median (interquartile range [IQR]), or frequency with percentage as appropriate. The normality assumption was tested for all continuous numeric study measures using Shapiro-Wilk or Kolmogorov-Smirnov testing, as well as visual inspection via Quantile-Quantile plots. To conduct bivariate group comparison analyses (4 comparison groups listed later), Pearson's χ^2 or Fisher's exact testing was used for categorical measures, and either ANOVA with post hoc Tukey tests or Kruskal-Wallis with post hoc Wilcoxon's rank sum tests were used for continuous measures (depending on normality). Multivariable Poisson regression models were used to evaluate association between the number of embryos suitable for transfer and the following covariates: male partner age (continuous), sperm

status (fresh vs. thawed), and the presence of male factor infertility (0 vs. 1+ factors noted). The association between the number of embryos biopsied and these covariates was also assessed. Sensitivity analyses were performed, excluding only cycles affected by OA and cycles affected by either OA or nonobstructive azoospermia (NOA). All statistical tests were two-sided using a *P* value of $< .05$ to determine statistical significance and all analyses were completed using R version 4.4.2.

RESULTS

Demographics and indications for ART

A total of 9,732 nonidentified donor oocyte ART cycles met criteria for inclusion in this study. Most cycles used oocytes derived from fresh ovarian stimulation cycles ($n = 6,943$), whereas fewer used frozen oocytes ($n = 2,789$). The majority of the cycles were performed in men aged 30–39 and 40–49 (<30 years [$n = 150$], 30–39 years [$n = 2,945$], 40–49 years [$n = 4,902$], and ≥ 50 years [$n = 1,735$]). The mean age of the oocyte donor (26.3 years in the oldest cohort vs. 26.1 years in the others) did not differ across male age groups ($P = .19$). However, the frequency of male factor infertility and the distribution of male factor infertility diagnoses did vary significantly by age group. Overall, younger men were more likely than older men to have no male factor infertility diagnoses (<30 years: 88.7%, 30–39 years: 81.4%, 40–49 years: 78.9%, ≥ 50 years: 77.2%; $P < .01$). Although the rates of NOA and severe oligospermia were low in all groups and did not differ significantly by age, rates of moderate oligospermia did increase slightly with age (<30 years: 0.7%, 30–39 years: 2.3%, 40–49 years: 3.2%, ≥ 50 years 3.3%, $P = .03$).

Unsurprisingly, given the association between male and female partner ages, and the restriction of these analyses to donor oocyte cycles, diminished ovarian reserve and ovulatory dysfunction were the most common reasons for ART, and the highest rates were found in the older male age groups. Conversely, endometriosis and tubal factor were more common in the younger age groups. Given the use of donor oocytes, the indication for PGT-A was categorized as “elective” in the majority of the cycles, across all age groups ([Table 1](#)).

Total embryos biopsied and suitable embryos for transfer by male age and male factor infertility diagnosis

The median [IQR] number of embryos biopsied per cycle was 5 [3–8] and did not differ across age groups ($P = .46$). The median number of suitable embryos for transfer per cycle ranged from 3–4 embryos and did not differ significantly across age groups ($P = .52$) ([Table 2](#)). The median number of embryos from cycles with frozen oocytes was lower than in cycles with fresh oocytes (2 vs. 4–5), although this number did not differ significantly by male age or infertility diagnosis. After stratifying by the presence or absence of male factor infertility diagnoses, no significant differences were

TABLE 1

Demographics					
Characteristics	< 30 y(n = 150)	30–39 y(n = 2,945)	40–49 y(n = 4,902)	≥50 y(n = 1,735)	P value
Male partner age (y), mean (SD)	27.3 (1.9)	35.8 (2.5)	44.2 (2.8)	54.7 (4.8)	NA
Reasons for ART, male factors, n (%)					
Azoospermia (obstructive)	0 (0.0)	3 (0.1)	34 (0.7)	26 (1.5)	< .01 ^a
Azoospermia (nonobstructive)	1 (0.7)	7 (0.2)	16 (0.3)	11 (0.6)	.10 ^a
Oligospermia (moderate)	1 (0.7)	69 (2.3)	159 (3.2)	58 (3.3)	.03 ^a
Oligospermia (severe)	1 (0.7)	32 (1.1)	69 (1.4)	24 (1.4)	.63 ^a
Low motility	3 (2.0)	106 (3.6)	247 (5.0)	121 (7.0)	< .01 ^b
Low morphology	10 (6.7)	297 (10.1)	463 (9.4)	135 (7.8)	.04 ^b
Very severe male factor	0 (0.0)	13 (0.4)	24 (0.5)	18 (1.0)	.06 ^a
Other male factor - specified	0 (0.0)	25 (0.8)	40 (0.8)	19 (1.1)	.57 ^a
Other male factor - unspecified	3 (2.0)	96 (3.3)	230 (4.7)	101 (5.8)	< .01 ^a
No male factors reported	133 (88.7)	2400 (81.4)	3870 (78.9)	1340 (77.2)	< .01 ^b
Reasons for ART, female factors, n (%)					
DOR/POI	106 (70.7)	2202 (74.8)	3973 (81)	1,457 (83.9)	< .01 ^b
Endometriosis	7 (4.7)	196 (6.7)	191 (3.9)	53 (3.1)	< .01 ^a
Need for GC	14 (9.3)	204 (6.9)	250 (5.1)	114 (6.6)	< .01 ^b
Ovulatory dysfunction	116 (77.3)	2342 (79.5)	4149 (84.6)	1512 (87.1)	< .01 ^b
PMOS	6 (4.0)	91 (3.1)	154 (3.1)	47 (2.7)	.69 ^a
RPL	6 (4.0)	184 (6.2)	349 (7.1)	78 (4.5)	< .01 ^a
Tubal factor	15 (10.0)	193 (6.5)	237 (4.8)	74 (4.3)	< .01 ^b
Uterine factor	9 (6.0)	193 (6.5)	395 (8.1)	142 (8.2)	.06 ^b
Indication for PGT-A, n (%)					
Advanced age	7 (4.7)	303 (10.3)	683 (13.9)	281 (16.2)	< .01 ^b
Balanced translocation	10 (6.7)	170 (5.8)	288 (5.9)	114 (6.6)	.68 ^b
Recurrent IVF failure	2 (1.3)	69 (2.3)	88 (1.8)	23 (1.3)	.08 ^a
Recurrent miscarriage	1 (0.7)	47 (1.6)	97 (2.0)	20 (1.2)	.10 ^a
Desired eSET	7 (4.7)	312 (10.6)	443 (9)	146 (8.4)	.01 ^b
Elective PGT-A	105 (70.0)	2,028 (68.9)	3,109 (63.4)	1,007 (58.0)	< .01 ^b
Elective gender determination	9 (6.0)	133 (4.5)	289 (5.9)	147 (8.5)	< .01 ^b
Gender determination, X-linked disease	1 (0.7)	8 (0.3)	14 (0.3)	13 (0.7)	.03 ^a
Carrier for a genetic disorder	3 (2.0)	14 (0.5)	13 (0.3)	5 (0.3)	.02 ^a
Other indication	19 (12.7)	279 (9.5)	599 (12.2)	251 (14.5)	< .01 ^b
Oocyte donor age (y), mean (SD)	26.1 (3.1)	26.1 (3.1)	26.1 (3.1)	26.3 (3.1)	.20 ^c
Sperm status, n (%)					< .01 ^b
Fresh	105 (70.0)	2042 (69.3)	3,132 (63.9)	942 (54.3)	
Thawed	45 (30.0)	903 (30.6)	1770 (36.1)	793 (45.7)	

ART = assisted reproductive technology; DOR = diminished ovarian reserve; eSET = elective single embryo transfer; GC = gestational carrier; IVF = in vitro fertilization; PMOS = polyendocrine metabolic ovarian syndrome; PGT-A = preimplantation genetic testing for aneuploidy; POI = premature ovarian insufficiency; RPL = recurrent pregnancy loss.

^a Fisher's exact test.
^b χ^2 test.
^c Kruskal-Wallis test.

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found across age groups (Supplemental Table 1, available online).

When comparing all cycles by presence or absence of male factor infertility diagnoses regardless of age, there were a similar number of embryos biopsied per cycle (5 [3,8] vs. 5 [3,8]), but a higher median number of embryos suitable for transfer (4 [2,6] vs. 3 [2,5], $P = .01$) (Fig. 1) in the cycles with no male factor diagnoses. No differences were seen when descriptively comparing outcomes across male factor diagnoses (Supplemental Table 2). The median number of embryos biopsied ranged from 4–5 embryos, and the median number of embryos suitable for transfer

ranged from 2–3. A composite of less vs. more severe male factor diagnoses did not lead to significant differences in the number of embryos biopsied ($P = .46$) or suitable for transfer ($P = .08$). There was no significant difference between OA vs. NOA in either embryos biopsied ($P = .90$) or embryos suitable for transfer ($P = .71$). Moderate vs. severe oligospermia in addition did not differ significantly for embryos biopsied ($P = .15$) or suitable embryos ($P = .27$) (Supplemental Table 3).

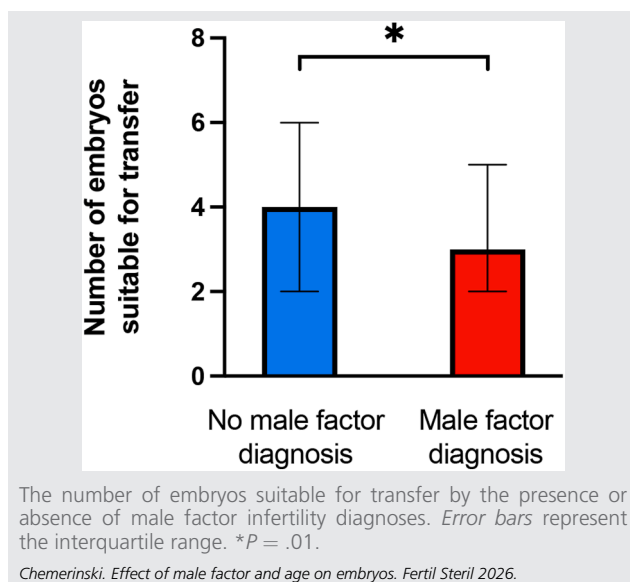
In both of the primary multivariable Poisson regression models used to further examine the expected number of embryos biopsied (Table 3 – Model 1A) and the expected

TABLE 2

Embryologic outcomes by male age group.					
Outcome	Men < 30 y (n = 150)	Men 30–39 y (n = 2,945)	Men 40–49 y (n = 4,902)	Men ≥50 y (n = 1,735)	P value ^a
Number of total embryos biopsied per cycle (median [IQR])	5 [3, 8]	5 [3, 8]	5 [3, 8]	5 [3, 8]	.46
Number of suitable embryos for transfer per cycle (median [IQR])	4 [2, 6]	4 [2, 5]	3 [2, 6]	3 [2, 6]	.52
Note: IQR = interquartile range.					
^a Kruskal-Wallis.					
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number of embryos that were suitable for transfer (Table 3 – Model 2A), the presence of any male factor infertility was associated with a significant decrease in the outcomes (incidence rate ratio [IRR] = 0.959; IRR = 0.963), respectively. However, increasing partner age was only significantly associated with a decrease in the expected number of embryos suitable for transfer (IRR = 0.998); there was no observed effect of age on the expected number of embryos biopsied (IRR = 1.000). Sensitivity analyses were performed for both outcomes, which included refitting similar regression models where cycles affected by OA or cycles affected by OA or NOA were additionally excluded; similar results were noted (Table 3 – Models 1B, 1C, 2B, 2C). Together, these data suggest that the presence of any male factor infertility diagnoses may decrease the number of embryos available for transfer. Male age may have a small and statistically significant, but perhaps not clinically meaningful, impact on embryo suitability for transfer.

FIGURE 1



DISCUSSION

This study examined the relationship between male age and male factor infertility on embryo suitability for transfer in IVF cycles using a large national database and restricting analyses to young nonidentified donor oocyte cycles to isolate the effects of male age and male factor infertility. Our principal findings were (1) male age does not significantly affect the number of usable embryos in an IVF cycle, suggesting that the contribution of the sperm source to embryo suitability for transfer is not age-dependent, and (2) male factor infertility does have a small measurable impact.

The role of paternal contributions to embryo aneuploidy is particularly salient in an era of increasing parental ages and wider adoption of ART. In a study examining more than 168 million live births in the United States over nearly four decades, the average age of new fathers has increased by 3.5 years, from 27.4 to 30.9 years. Notably, the proportion of fathers >40 years of age has doubled in the same period, and fathers >50 years have continued to increase nationally, regardless of demographic variances (5). Increasing paternal age was also noted in a more recent study that observed a mean paternal age of 31.5 years, with a statistically significant increase in fathers ≥50 years over the past decade (13). This increasing paternal age aligns with documented CDC trends of increasing maternal age and the rising use of ART (14).

That maternal age is the primary driver of embryo aneuploidy (15–17) has been noted from early studies (18) and confirmed in more recent analyses (1, 19). The inverse relationship between maternal age and embryo euploidy (12) is well-documented. A primary aim of this study was to examine what contribution, if any, is made by paternal age. We observed no significant association between paternal age and the number of usable embryos. Our findings align with those published by Dviri et al. (7), a retrospective cohort study assessing the association between paternal age and aneuploidy rate in young oocyte donors that found no significant differences in embryo euploidy, aneuploidy, and mosaic rates among three paternal age groups (≤39 years, 40–49 years, ≥50 years). Similarly, Carrasquillo et al. (20) found no effect of advanced paternal age on embryo aneuploidy when controlling for maternal factors. A study conducted by García-Ferreira et al. (6) found that men aged

TABLE 3

Poisson regression and adjusted incidence rate ratio (IRR) results.

Model and covariate	IRR	95% CI	P value
Model 1A: Number of embryos biopsied (full sample)			
Partner age	1.000	0.999–1.001	.839
Any male factor diagnosis	0.959	0.939–0.980	<.001
Model 1B: Number of embryos biopsied (OA excluded)			
Partner age	1.000	0.999–1.001	.900
Any male factor diagnosis	0.964	0.944–0.985	.001
Model 1C: Number of embryos biopsied (OA and NOA excluded)			
Partner age	1.000	0.999–1.001	.955
Any male factor diagnosis	0.967	0.947–0.989	.003
Model 2A: Number of embryos suitable for transfer (full sample)			
Partner age	0.998	0.997–1.000	.024
Any male factor diagnosis	0.963	0.939–0.988	.004
Model 2B: Number of embryos suitable for transfer (OA excluded)			
Partner age	0.999	0.997–1.000	.035
Any male factor diagnosis	0.969	0.945–0.995	.018
Model 2C: Number of embryos suitable for transfer (OA and NOA excluded)			
Partner age	0.999	0.997–1.000	.044
Any male factor diagnosis	0.972	0.947–0.997	.029

Note: All models adjusted for sperm status (fresh/frozen). CI = confidence interval; IRR = incidence rate ratio; NOA = nonobstructive azoospermia; OA = obstructive azoospermia.

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≥50 years had significantly higher aneuploidy rates compared with those aged ≤39 years and 40–49, but this study was smaller and limited to a single site, examining 286 embryos obtained from 32 cycles. A recently published analysis of 5,847 cycles assessing the effects of male age and male factor infertility on embryo ploidy found that lower sperm concentration and increasing male age were associated with lower euploid rates (21). However, this study was limited by the smaller number of men in the >40 to ≤50 and >50 to ≤60 age groups, as well as their use of partner, rather than donor, oocyte cycles.

The second study objective, to assess the relationship between male factor infertility diagnoses and suitable embryos, found an important association between the presence of male factor infertility and the number of embryos suitable for transfer. Some prior studies have found that the proportion of chromosomally abnormal embryos increases with the severity of male factor infertility (22), and that sex chromosome aneuploidy, but not autosomal aneuploidy, is higher in oligospermic men compared with those of normal semen parameters, in both standard insemination and intracytoplasmic sperm injection cycles (10). Others have reported an increase in mosaicism in embryos derived from men with male factor infertility (23). However, these studies are limited in current applicability because they included day 3 embryo biopsies or used fluorescence in situ hybridization or array comparative genomic hybridization for chromosome analyses. Our finding that the presence of any male factor diagnosis decreases the number of usable embryos by 1 is clinically important given the cost associated with donor oocyte IVF cycles, and the high pregnancy and live birth rates (approximately 50%) associated with donor oocyte-derived embryos (24). Although no differences were seen in the number of embryos suitable for transfer between OA and NOA, a similar finding was recently reported by Sadek

et al. (25), who compared IVF outcomes in these two groups. Men with OA had a mean (SD) of 3.02 (3.4) frozen embryos, whereas men with NOA had 3.13 (3.65) frozen embryos.

A strength of this study is the large proportion of men in the 40–49 year group (n = 4,902), and in the ≥50 year old group (n = 1,735), allowing for robust analyses of these older age ranges. Although most of the men included in these analyses had no male factor diagnoses, the frequency of male factor infertility did increase with age. Interestingly, despite the recommendation from American Society for Reproductive Medicine not to perform PGT-A in donor oocyte cycles (26, 27), a majority of the cycles in this analysis (ranging from 70.2% for men <30 to 58.1% for men ≥50 years) were marked as having undergone “elective PGT-A”.

Our study has several additional strengths, including broad generalizability because of the use of standardized data collection through the SART database. This nationally representative database consists of quality-controlled, federally mandated reporting from reproductive endocrinology clinics across the United States, encompassing broad geographic and demographic diversity. Additionally, although prior studies have examined male factor infertility in relation to IVF outcomes, our study restricted analyses to donor oocyte cycles within the SART database, allowing us to isolate the impact of male factor infertility on embryo suitability for transfer. Additionally, we evaluated not only male factor infertility stratified by age group, but also the association between the severity of male factor infertility and embryo outcomes.

Despite these strengths, limitations inherent to the use of the SART database must be acknowledged. Importantly, “euploid embryos” are not a formally defined variable within the database, limiting our ability to directly identify embryos with confirmed euploidy. To address this, we assumed that embryos deemed suitable for transfer met criteria consistent

with euploid status; however, such embryos may include degrees of chromosomal mosaicism that are not captured within SART, precluding confirmation of ploidy. Another limitation is the potential underestimation of the impact of male factor severity on embryo suitability for transfer, because the majority of cycles in our study were reported as having no male factor infertility. This likely reflects under-reporting, as clinics may be more likely to cite diminished ovarian reserve rather than male factor infertility as the primary or secondary indication for ART using donor oocytes. This limits the generalizability of the findings. Furthermore, the categories of male factor infertility were chosen at the discretion of the individual entering data for the member clinic, which may have led to inconsistencies. Male infertility diagnoses can encompass a wide range of parameters (for example, low motility refers to any value <40%; moderate oligospermia refers to 5–15 million sperm/mL). Additionally, given that the analyses were restricted to donor oocyte cycles, this dataset was enriched for severe female factor infertility and may not be representative of the general infertility population. Lastly, the large sample size inherent to the SART database increases the likelihood that statistically significant findings may not always translate into clinical significance. Despite these limitations, our use of a large, validated, and nationally representative dataset with rigorous quality controls strengthens confidence in our findings and supports the robustness and generalizability of our conclusions regarding the association between male factor infertility and embryo suitability for transfer.

CONCLUSION

This study examined the effect of male age and male factor infertility on embryos biopsied and embryos suitable for transfer, in nonidentified donor oocyte IVF cycles with PGT-A testing. Using a large national database, which included a high number of men in the older age categories, and restricting the analysis to blastocysts, we found no effect of male age on the number of embryos suitable for transfer, and a decrease in the number of embryos suitable for transfer in men with one or more male factor infertility diagnoses. These data suggest that male factor infertility, but not male age, may have a clinically meaningful impact on embryo ploidy.

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CRedit Authorship Contribution Statement

Anat Chemerinski: Writing – review & editing, Writing – original draft, Methodology, Conceptualization. Miriam Ibrahim: Writing – original draft. Vanessa Ocon: Writing – original draft. Michael Saad-Naguib: Writing – original draft, Methodology, Conceptualization. Nataki C. Douglas: Writing – review & editing, Supervision, Methodology,

Conceptualization. David Shin: Writing – review & editing, Methodology, Conceptualization. Myra Arshad: Formal analysis. Patricia Greenberg: Writing – review & editing, Supervision, Methodology, Formal analysis. Peter G. McGovern: Writing – review & editing, Supervision, Methodology, Conceptualization. Sara S. Morelli: Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of Interests

A.C. has nothing to disclose. M.I. has nothing to disclose. V.O. has nothing to disclose. M.S.N. has nothing to disclose. N.C.D. has nothing to disclose. D.S. is Director-At-Large for the Society for Male Reproduction, Urology Chair for the Urology Care Foundation Reproductive and Sexual Health Committee, and holds equity in Fellow Health. M.A. reports NIH Award Number UM1TR004789 (New Jersey Alliance for Clinical and Translational Science) supports some of the hourly effort for the Rutgers University Biostatistics & Epidemiology Services Center (RUBIES) student and full-time employees to provide statistical services for clinical and translational research projects. P.G. reports NIH Award Number UM1TR004789 (New Jersey Alliance for Clinical and Translational Science) supports some of the hourly effort for the Rutgers University Biostatistics & Epidemiology Services Center (RUBIES) student and full-time employees to provide statistical services for clinical and translational research projects. P.G.M. is the site investigator for the IBSA PROGRESS Trial (NCT04549116) and the site investigator for May Health Rebalance Device Trial (CR003). S.S.M. is Academic Director-at-Large for the Society for Reproductive Endocrinology and Infertility.

SUPPLEMENTAL MATERIAL

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