

Assisted Reproduction

Annual Report 2020



Department of Obstetrics and Gynaecology
Queen Mary Hospital, The University of Hong Kong

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Introduction

The year two thousand and twenty marks the thirty-fourth year of the Assisted Reproduction Program at Queen Mary Hospital.

A total of 714 assisted reproduction treatment (ART) cycles were initiated in 650 couples during this period. The numbers of treatment cycles and of patients were less than those in previous years in view of the COVID pandemic. The number of frozen embryo transfer cycles was also lesser in 2020. The mean number of embryos replaced remained at 1.0 per transfer in both conventional IVF and ICSI cycles as we have continued to promote elective single embryo transfer. The mean number of embryos replaced in frozen embryo transfer cycles was also 1.0 per transfer because most of our patients agreed to replace a single frozen embryo. This year, we encountered no triplet after ART.

This year we continued to implement a single embryo transfer policy for all women unless for those older than or equal to 38 years old or not pregnant after 2 cycles of IVF. The ongoing pregnancy rate per transfer cycle were 24.1% and 42.6% respectively in Day 2 and Day 5 elective single embryo transfer whereas the corresponding rates in non-elective single embryo transfer cycles were 9.7% and 25.0% respectively.

In 2020, preimplantation genetic testing was performed in 101 (99 stimulated) and 2 frozen embryo transfer cycles in 85 women at risk of having babies with serious chromosomal or genetic disorders.

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Ms Wong, Yuk Ping Candy (from March 2020)



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Second Row: (Left to Right)

Ms. Yick Siew TAN, Mr. Tommy TONG, Ms. Zaolan YANG, Ms. May DO, Ms. Crystal LOCK, Ms. Jenny Jin, Mr. Charles HUANG

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Mr. TM CHEUNG, Ms. Yueming LIANG, Ms. Chun Kin CHAN, Ms. Fung Yee CHOW

Work-Load Statistics

Table 1: Workload Statistics I

No. of Cycles	IVF	IVM	Oocyte Donation	Sperm donation	Vitrified oocyte	ICSI	MESA	TESE	PGT	TOTAL
Initiated	383	1	1	5	1 With donated sperm	209	9	4	99 Fresh OPU+ 2 FET	714
Cancelled	8 (2.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.0%)	9 (1.3%)
With Oocyte Retrieval	375 (97.9%)	1 (100%)	1 (100%)	5 (100%) [#]	1 (100%)	209 (100%)	9 (100%)	4 (100%)	98 (99%) ^{##}	703 (98.7%)^{##}
With Fresh Embryo Transfer	178 (46.5%)	0 (0%)	0 (0%)	4 (80.0%)	1 (100%)	96 (45.9%)	6 (66.7%)	2 (50.0%)	0 (0%)	287 (40.2%)

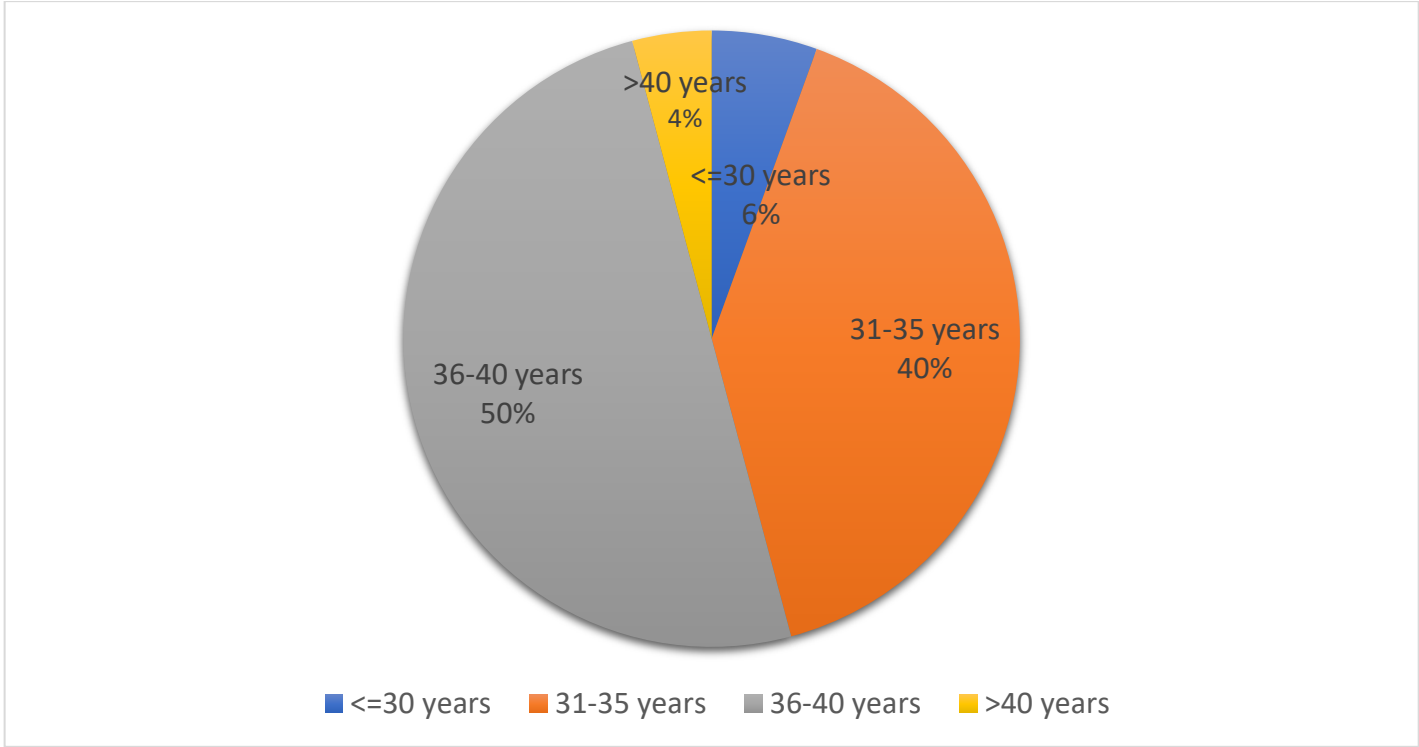
(“IVF”: Conventional IVF-ET; “IVM”: In vitro maturation; “ICSI”: ICSI with ejaculated sperm; “MESA”: MESA + ICSI; “TESE”: TESE + ICSI; “PGT”: Preimplantation genetic testing; “FET”: frozen embryo transfer)

(): % of initiated cycle, *: denominator does not include FET cycle; #: vitrified-oocyte cycles are excluded

Table 2: Workload Statistics II

No. of cycles	IVF	IVM	Oocyte donation	Sperm Donation	Vitrified oocyte	ICSI	MESA	TESE	Fresh-PGT	Total
Without Oocyte Retrieved	4 (1.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (1.0%)	0 (0%)	0 (0%)	1 (1.0%)	7 (1%)
Without insemination	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (2.4%)	0 (0%)	0 (0%)	0 (0%)	5 (0.7%)
Without Normal Fertilization	23 (6.1%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	15 (7.2%)	0 (0%)	0 (0%)	5 (5.1%)	44 (6.3%)
Without Normal Cleavage	3 (0.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.5%)	0 (0%)	0 (0%)	0 (0%)	4 (0.6%)
Without embryos suitable for transfer	2 (0.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1.4%)	0 (0%)	0 (0%)	29 (29.6%)	34 (4.9%)
With ET Postponed	165 (44.0%)	0 (0%)	1 (100%)	1 (20.0%)	0 (0%)	87 (41.6%)	3 (33.3%)	2 (50.0%)	63 (64.3%)	322 (46.4%)
Without Fresh Embryo Transfer	197 (52.5%)	1 (100%)	1 (100%)	1 (20.0%)	0 (0%)	113 (54.1%)	3 (33.3%)	2 (50.0%)	98 (100%)	416 (59.9%)

() % of oocyte retrieval cycle (including vitrified-oocyte cycles)



α

Table 3: Ongoing Pregnancy Rates in Different Age Groups

Age (yrs)	IVF	ICSI	IVM	Sperm donation	Vitrified oocyte	MESA	TESE	Total
<= 30	1/2 (50.0%)	0/2 (0%)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	1/4 (25.0%)
31 – 35	21/55 (38.2%)	10/36 (27.8%)	0/0 (-)	0/1 (0%)	0/0 (-)	1/4 (25.0%)	0/1 (0%)	32/97 (33.0%)
36 - 40	26/111 (23.4%)	17/55 (30.9%)	0/0 (-)	1/3 (33.3%)	0/1 (0%)	0/2 (0%)	0/1 (0%)	44/173 (25.4%)
> 40	0/10 (0%)	0/3 (0%)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	0/13 (0%)
Total	48/178 (27.0%)	27/96 (28.1%)	0/0 (-)	1/4 (25.0%)	0/1 (0%)	1/6 (16.7%)	0/2 (0%)	77/287 (26.8%)

() % of transfer cycles

In Vitro Fertilization and Embryo Transfer~ IVF-ET

Stimulated cycle IVF-ET

During 2020, 357 couples underwent a total of 383 conventional stimulated IVF cycles at our center. Unexplained cause (43.9%) was the commonest indication, which was followed by tuboperitoneal problem (15.7%), male factor (13.1%) and endometriosis (10.7%). (Table 4)

Table 4: Indications for IVF-ET

Indications	No of Initiated cycles	No of Pregnancies	Ongoing pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Tuboperitoneal	60 (15.7%)	16	11	55.2%	37.9%
Endometriosis	41 (10.7%)	7	6	35.0%	30.0%
Male Factor	50 (13.1%)	9	8	36.0%	32.0%
Anovulation	28 (7.3%)	2	2	20.0%	20.0%
Unexplained	168 (43.9%)	22	17	28.2%	21.8%
Others/Mixed	36 (10.2%)	6	4	46.2%	30.8%
Total	383 (100%)	62	48	34.8%	27.0%

* Per transfer cycle

A total of 8 cycles (2.1%) were cancelled: 4 due to poor ovarian response, 3 due to premature luteinization and 1 due to other reason. Oocytes were not obtained in 4 planned retrieval cycles. There were 23 cycles without normal fertilization, 3 cycles without normal cleavage and 2 cycles with only embryos not suitable for transfer. Therefore, no embryo was transferred in these 32 cycles. Embryo transfer was postponed in 165 cycles because of the risk of developing ovarian hyperstimulation syndrome (OHSS), high serum progesterone level or other reasons.

The **oocyte retrieval rate** was 75.2% with an average of 11.1 oocytes obtained per retrieval cycle. The **fertilization rate** was 63.4% and the **cleavage rate** was 95.6%. The oocyte retrieval rate, fertilization rate and cleavage rate were similar to the figures in previous years. The results are summarised in Table 5.

Table 5: Results of Conventional IVF-ET

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
Number of Oocyte Retrieval Cycles	375				
Number of Follicles Aspirated	5550	14.8			
Number of Oocytes Retrieved	4171	11.1	75.2%		
Number of Oocytes Fertilized	2646	7.1		63.4%	
Number of Fertilized Oocytes Cleaved	2530	6.7			95.6%
Number of Embryos Transferred	180	0.5 (1.0 / ET)			
Number of Pregnancies	62				
Number of Embryos Frozen	961	2.6			

Most (99.7%) of patients used GnRH antagonist protocol. (Table 6)

Table 6: Ovarian Stimulation Protocols Used

Protocol	No. of Initiated Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
GnRH antagonist	382 (99.7%)	62	34.8%	27%
GnRHa (long)	1 (0.3%)	0	-	-
Progesterone	0 (0%)	0	-	-
Others	0 (0%)	0	0%	0%
Total	383 (100%)	62	34.8%	27%

* Per transfer cycle

All oocyte retrievals were successfully performed under transvaginal ultrasound guidance using intravenous sedation and analgesia. The degree of difficulty of embryo transfer and the corresponding pregnancy rate are shown in Table 7.

Table 7: Difficulty of Transfer

Difficulty	No. of ET Cycles	No. of Pregnancies	Ongoing pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#
Easy	178 (100%)	62	48	34.8%	27.0%
Vulsellum	0 (0%)	0	0	-	-
Vulsellum & Sound Dilatation	0 (0%)	0	0	-	-
	0 (0%)	0	0	-	-
Total	178 (100%)	62	48	34.8%	27.0%

Per transfer cycle

Among the 375 oocyte retrieval cycles, 3 had moderate to severe OHSS. (Table 8)

Table 8: Complications of Conventional IVF-ET Treatment

Complications	No of Retrieval* Cycles
Nil	372 (99.2%)
Infection	0 (0%)
Significant haemoperitonem	0 (0%)
Moderate to severe OHSS	3 (0.8%)

There were 62 pregnancies resulting from stimulated IVF-ET cycles. The **pregnancy rate** was 16.2% per initiated cycle and 34.8% per transfer cycle (Table 9). The **miscarriage rate** was 19.3%. The **ongoing pregnancy rate** was 12.5% per initiated cycle and 27.0% per transfer cycle. The average number of fresh embryos transferred was 1.0 per transfer. The **multiple pregnancy rate** was 0%. The **implantation rate** was 32.8%.

Table 9: Pregnancy Rates of Conventional IVF-ET

	Pregnancy Rate	Ongoing pregnancy Rate
per Cycle Initiated	62/383 (16.2%)	48/383 (12.5%)
per Oocyte Retrieval Cycle	62/375 (16.5%)	48/375 (12.8%)
per Transfer Cycle	62/178 (34.8%)	48/178 (27.0%)

Table 10: Outcome of Pregnancies

Outcome	Number of Cycles
Preclinical abortion	3 (4.8%)
Clinical abortion	9 (14.5%)
Ectopic Pregnancy	2 (3.2%)
Lost to follow up	0 (0%)
Ongoing Pregnancy	48 (77.4%)
Total Pregnancies	62
No. of Fetuses	48
No. of Multiple Pregnancies	0

The outcome in relation to the number of embryos transferred is shown in Tables 11 and 12.

Table 11: Number of Embryos Transferred & the Outcome

No. of Embryos	No. of ET Cycles	No. of Pregnancies	No. of Ongoing pregnancies	Pregnancy Rate [#]	Ongoing Pregnancy Rate [#]	Multiple Pregnancy Rate ⁺
1	176 (98.9%)	62	48 (0)	35.2%	28.4%	0%
2	2 (1.1%)	0	0 (0)	0%	0%	-
Total	178 (100%)	62	48 (0)	33.3%	28.1%	0%

#Per transfer cycle
+Per pregnancy cycle

Table 12: Outcome of Single Embryo Transfer

Elective	Day of ET	Average Age of Women (years)	No. of ET cycles	Pregnancy Rate [#]	Ongoing Pregnancy Rate [#]	Multiple Pregnancy Rate ⁺
Yes	2	36.6	53	17 (32.1%)	14 (26.4%)	0 (0%)
	5	36.0	67	33 (49.3%)	28 (41.8%)	0 (0%)
No	2	37.3	49	8 (16.3%)	4 (8.2%)	0 (0%)
	5	37.1	7	4 (57.1%)	2 (28.6%)	0 (0%)

#Per transfer cycle
+Per pregnant cycle

Intracytoplasmic Sperm Injection~ICSI (with ejaculated sperm)

Two hundred and nine treatment cycles were initiated in one hundred and ninety eight couples (excluding preimplantation genetics testing). ICSI was decided in 175 treatment cycles because of severe male factor infertility. It was also performed in those who had either failed fertilization or poor fertilization rate (less than 30%) in a previous conventional IVF cycle. This latter group accounted for 28 of the cycles initiated (Table 13).

Table 13: Indications for ICSI

Indications	No. of Initiated Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Severe male factor	175 (83.7%)	26	33.8%	31.2%
Fertilization problem	28 (13.4%)	6	35.3%	17.6%
Others	6 (2.9%)	0	0%	0%
Total	209 (100%)	32	33.3%	28.1%

*Per transfer cycle

GnRHa antagonist protocol for ovarian stimulation was used in 207 cycles (99.0%) (Table 14)

Table 14: Ovarian Stimulation Protocols Used

Protocol	No. of Initiated Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
GnRH antagonist	207 (99.0%)	32	33.3%	28.1%
GnRHa (long)	1 (0.5%)	0	-	-
Others	1 (0.5%)	0	-	-
Total	209 (100%)	32	33.3%	28.1%

*Per transfer cycle

The results are summarized in Table 15.

Table 15: Results of ICSI

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
No. of Oocyte Retrieval Cycles	209				
No. of Follicle Aspirated	2971	14.2			
No. of Oocytes Retrieved	2203	10.5	74.2%		
No. of Oocytes Fertilized	1157	5.5		52.5% (68.3% per oocyte injected)	
No. of Fertilized Oocytes Cleaved	1129	5.4			97.6%
No. of Embryos Transferred	97	0.5 (1.0/ET)			
No. of Pregnancies	32				
No. of Embryos Frozen	476	2.3			

Oocytes were not obtained in 2 planned retrieval cycles. Insemination was not performed in 5 cycles. Normal fertilization was not achieved in 15 cycles, 1 did not have normal cleavage and 3 did not have embryos suitable for transfer. Therefore, no embryo was transferred in these 26 cycles. Embryo transfer was postponed in another 87 cycles because of the risk of developing OHSS, high serum progesterone concentration or other reasons. The fertilization rate was 68.3% per oocyte injected this year and was similar to that of last year. The mean number of embryos transferred was only 1.0 per transfer and was comparable to that of conventional stimulated IVF cycles. The degree of difficulty of embryo transfer is shown in Table 16.

Table 16: Difficulty of Transfer

Difficulty	No. of ET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#
Easy	96 (100%)	32	33.3%	28.1%
Vulsellum	0 (0%)	0	-	-
Vulsellum + Sound	0 (0%)	0	-	-
Total	96(100%)	32	33.3%	28.1%

Per transfer cycle

There were 32 pregnancies and 27 were ongoing (Tables 17 & 18). The **multiple pregnancy rate** was 0%. The **implantation rate** was 28.7%. None had moderate or severe OHSS.

Table 17: Pregnancy Rates of ICSI

	Pregnancy Rate	Ongoing Pregnancy rate
per Cycle Initiated	32/209 (15.3%)	27/209 (12.9%)
per Oocyte Retrieval Cycle	32/209 (15.3%)	27/209 (12.9%)
per Transfer Cycle	32/96 (33.3%)	27/96 (28.1%)

Table 18: Outcome of Pregnancies

Outcome	Number of Cycles	
Miscarriage	5	(15.7%)
Ectopic Pregnancy	0	(0%)
Ongoing Pregnancy	27	(84.4%)
Total Pregnancies	40	
No. of Fetuses	27	
No. of Multiple Pregnancies	0	
	32/96 (33.3%)	

The outcome in relation to the number of embryos transferred is shown in Table 19 and Table 20.

Table 19: Number of Embryos Transferred & the Outcome

No. of Embryos	No. of ET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#	Multiple Pregnancy Rate⁺
1	95 (99.0%)	32	33.7%	28.4%	0%
2	1 (1.0%)	0	0%	0%	0%
Total	96 (100%)	32	33.3%	28.1%	0%

Per transfer cycle
+ Per pregnant cycle

Table 20: Outcome of Single Embryo Transfer

Elective	Day of ET	Average Age of Women (years)	No. of ET cycles	Pregnancy Rate[#]	Ongoing Pregnancy Rate[#]	Multiple Pregnancy Rate⁺
Yes	2	36.2	26	8 (30.8%)	5 (19.2%)	0 (0%)
	5	35.7	41	20 (48.8%)	18 (43.9%)	0 (0%)
No	2	36.3	23	3 (13.0%)	3 (13.0%)	0 (0%)
	5	36.0	2	1 (20.0%)	1 (20.0%)	0 (0%)

#Per transfer cycle
+Per pregnant cycle

Microsurgical Epididymal Sperm Aspiration - MESA

Eight couples underwent 9 treatment cycles in 2020. The urological team at Queen Mary Hospital performed a total of 5 MESA procedures, which were arranged before ovarian stimulation or the oocyte retrieval. Indications for MESA cycles are given in Table 21.

Table 21: Indications for MESA

Indications	No. of OPU Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Congenital Absence of Vas deferens	1 (11.1%)	0	0%	0%
Obstructive Azoospermia	4 (44.4%)	1	33.3%	33.3%
Severe male factor	0 (0%)	0	0%	0%
Ejaculatory problem	4 (44.4%)	0	0%	0%
Total	9 (100%)	1	16.7%	16.7%

***Per transfer cycle**

The antagonist protocol was used in all 9 cycles. Oocyte retrieval was performed under transvaginal ultrasound guidance in all 9 cycles and oocytes were obtained in the retrieval cycles. An average of 116.1 oocytes was retrieved in these 9 cycles. The fertilization rate was 74.2% per oocyte injected (Table 22). Embryo transfer was performed in 6 cycles and embryo transfer was postponed in 3 cycles.

Table 22: Results of MESA+ ICSI

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
Number of Oocyte Retrieval Cycles	9				
Number of Follicles Aspirated	145	16.1			
Number of Oocytes Retrieved	106	11.8	73.1%		
Number of Oocytes Fertilized	66	7.3		62.3% (74.2% per oocyte injected)	
Number of Fertilized Oocytes Cleaved	63	7.0			95.5%
Number of Embryos Transferred	6	0.7 (1.0/ET)			
Number of Pregnancies	1				
Number of Embryos Frozen	28	3.1			

No patient developed complications.

Table 23: Pregnancy Rates of MESA + ICSI

	Pregnancy Rate	Ongoing pregnancy rate
per Cycle Initiated	1/9 (11.1%)	1/9 (11.1%)
per Oocyte Retrieval Cycle	1/9 (11.1%)	1/9 (11.1%)
per Transfer Cycle	1/6 (16.7%)	1/6 (16.7%)

There was one pregnancy resulting from MESA + ICSI procedures. The **pregnancy rate** was 11.1% per initiated cycle and 16.7% per transfer cycle (Table 23). The **ongoing pregnancy rate** was 11.1% per initiated cycle and 16.7% per transfer cycle. The **implantation rate** was 16.7%. There was no multiple pregnancy (Table 24).

Table 24: Outcomes of Pregnancies

Outcome	Number of cycles
Miscarriage	0 (0%)
Ectopic Pregnancy	0 (0%)
Ongoing Pregnancy	1 (100%)
Total Pregnancies	1
No. of Fetuses	1
No. of Multiple Pregnancies	0 (0%)

The pregnancy rate in relation to the number of embryos transferred is shown in Table 25.

Table 25: Number of Embryos Transferred & the Outcome

#Per transfer cycle

No. of Embryos	No. of ET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#	Multiple Pregnancy Rate⁺
1	6 (100%)	1	16.7%	16.7%	0%
2	0 (0%)	0	-	-	-
Total	6 (100%)	1	16.7%	16.7%	0%

+Per pregnancy cycle

Testicular Sperm Extraction - TESE

During 2020, four treatment cycles were initiated in three couples (Table 26). The urological team at Queen Mary Hospital carried out seven testicular sperm biopsies. Sperms was found in 3 testicular biopsies and frozen in 1 testicular biopsy prior to start of ovarian stimulation.

Table 26: Indications for TESE

Indications	No. of OPU Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Non-obstructive Azoospermia	2 (50.0%)	0	0%	0%
Obstructive Azoospermia	2 (50.0%)	0	0%	0%
Ejaculatory problem	0 (0%)	0	0%	0%
Total	4 (100%)	0	0%	0%

* Per transfer cycle

Four IVF-TESE cycles were initiated. The antagonist protocol was used in all 4 cycles. No cycle was cancelled before oocyte retrieval. Oocyte retrieval was performed in 4 cycles under transvaginal ultrasound guidance and oocytes were obtained in all cycles. An average of 8.0 oocytes were retrieved. The overall fertilization rate was 52.4% per oocyte injected (Table 27). Embryo transfer was postponed in 2 cycles.

Table 27: Results of TESE+ ICSI

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
No. of Oocyte Retrieval Cycles	5				
No. of Follicles Aspirated	49	12.3			
No. of Oocytes Retrieved	32	8.0	65.3%		
No. of Oocytes Fertilized	11	2.8		34.4% (52.4%per oocyte injected)	
No. of Fertilized Oocytes Cleaved	11	2.8			100%
No. of Embryos Transferred	2	0.5 (1.0/ET)			
No. of Pregnancies	2				
No. of Embryos Frozen	7	1.8			

There was no complications.

Preimplantation Genetic Testing - PGT

We continue to provide preimplantation genetic testing (PGT) to women at risk of having babies with serious chromosomal or genetic disorders. In 2020, PGT was performed in 98 stimulated cycles for 85 couples and indications for PGT were shown in Table 28.

Table 28: Summary of PGT cycles

Indication	No. of patients	No. of cycles	No. of embryo	
			PGT	Normal
Numerical chromosomal abnormalities	0	0	0	0 (-)
Reciprocal translocation	14	15	45	12 (26.7%)
Robertsonian translocation	4	5	16	8 (50.0%)
α Thalassaemia	7	8	40	28 (70.0%)
β Thalassaemia	9	10	45	29 (64.4%)
β Thalassaemia/ single gene defect + HLA typing	1	1	4	3 (75.0%)
Others single gene defects	20	25	90	45 (50.0%)
Others	2	2	5	3 (60.0%)
PGT-A#	28	32	105	64 (61.0%)
Total	85	98	350	192 (54.9%)

#PGT for aneuploidy (PGT-A) is done for advanced maternal age, repeated implantation failure or recurrent miscarriage. PGT-A was also performed in suitable blastocysts following PGT-M (monogenic diseases).

Frozen embryo transfer after PGT

All blastocysts for PGT were frozen after biopsy and transfer of the frozen blastocysts was arranged after the results were available for counselling. Next generation sequencing was used in PGT-A (aneuploidy) and PGT-SR (structural rearrangement). Each blastocyst was frozen in one straw after biopsy and patients were allowed to replace one blastocyst each time following PGT.

A total of 72 thaw cycles after PGT were initiated. 74 frozen blastocysts were thawed and 72 frozen blastocysts were replaced.

There were altogether 44 **pregnancies** (61.1% per transfer) and 38 **ongoing pregnancies** (52.8% per transfer) resulting from transfer of frozen blastocysts. The overall **miscarriage rate** was 13.6%. The **multiple pregnancy rate** was 0%. The **implantation rate** was 56.9%.

Embryo Cryopreservation and Frozen Embryo Transfer

The results of embryo cryopreservation are summarized in Table 29. As was our experience from previous years, there were excess embryos suitable for cryopreservation in 524* / 703 (74.5%) of the retrieval cycles in 2020.

Table 29: Results of Embryo Cryopreservation

Method of Treatment	IVF	ICSI	MESA	TESE	Others	PGT	Total
No. of Oocyte Retrieval Cycles	375	209	9	4	8	98	703
No. of Cycles with Embryo Cryopreservation	285	158*	9	3	6	63	524*
Total No. of Embryos Cryopreserved	961	476*	28	7	32	189	1693*
Average No. of Embryos Cryopreserved	3.4	3.0*	3.1	2.3	5.3	3.0	3.2*
Range of Embryos Cryopreserved	1-19	1-12*	1-9	1-3	1-12	1-11	1-19*

*** with oocyte freezing**

Five hundred and fifty eight women planned to have replacement of frozen embryos (FET). A total of 736 thaw cycles were initiated. Embryo transfer was not done in 4 cycles because of lysis of all frozen embryo(s) or blastocysts during thawing. Five hundred thirty nine frozen embryo replacements were performed in natural (spontaneous ovulatory) cycles, one was in clomiphene citrate-induced cycle, one hundred sixty three were in letrozole-induced cycles, twenty eight were in total hormone replacement artificial cycles and one was in a stimulated cycle.

The pregnancy rates of these different types of transfer cycles are shown in Table 30.

Table 30: Outcome of FET Cycles

Cycle Type	Number of Cycles		Number of Pregnancies	Pregnant Rate	Ongoing pregnancy rate
Natural	539	73.6%	219	40.6%	30.8%
Clomid	1	0.1%	1	100.0%	100.0%
Letrozole	163	22.3%	87	53.4%	42.3%
Artificial	28	3.8%	11	39.3%	21.4%
Stimulated	1	0.1%	1	100.0%	100.0%
Total	732	100.0%	319	43.6%	33.2%

Table 31: Outcome of Pregnancies in FET

Outcome	No. of Pregnancies	Natural	Clomid	Letrozole	Artificial	Stimulated
Miscarriage	73 (22.9%)	50	0	18	5	0
Ectopic Pregnancy	3 (0.9%)	3	0	0	0	0
Molar Pregnancy	0 (0%)	0	0	0	0	0
Lost to follow up	0 (0%)	0	0	0	0	0
Ongoing Pregnancy	243 (76.2%)	166 (75.8%)	1 (100%)	69 (79.3%)	6 (54.4%)	1 (100%)
Total Pregnancies	319	219	1	87	11	1
No. of Fetuses	245	168	1	69	6	1
No. of Multiple Pregnancies	2 (0.6%) All twins	2	0	0	0	0

The average number of embryos/blastocysts transferred per FET cycles was 1.0. There were altogether 219 pregnancies resulting from transfer of frozen embryos/blastocysts. The overall **miscarriage rate** was 22.9%. The **multiple pregnancy rate** was 0.6% (Table 31). The **implantation rate** was 39.4%.

Table 32: Number of Embryos Transferred & the Outcome

No. of Embryos	No. of FET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy rate#	Multiple Pregnancy Rate⁺
1	725 (99.0%)	318	43.9%	33.4%	0.8%
2	7 (1.0%)	1	14.3%	14.3%	0%
Total	732 (100%)	319	41.4%	33.2%	0.8%

Per transfer cycle
+ Per pregnant cycle

Ovulation Induction and Ovarian Stimulation & Intrauterine Insemination

Ovulation Induction

One patient underwent 1 cycle of ovulation induction by gonadotrophin therapy. The age of the patient was 31.0 years. The cycle characteristics are detailed in Table 33. She got pregnant and the pregnancy rate was 100% per initiated cycle. There was one ongoing singleton pregnancy.

Table 33: Characteristics of Ovulation Induction Cycles

Parameters	Mean \pm Standard Deviation
Amount of gonadotrophin used (IU)	1012.5 \pm 0.0
Number of follicles \geq 14mm	2.0 \pm 0.0
Number of follicles \geq 16mm	1.0 \pm 0.0
Number of follicles \geq 18mm	1.0 \pm 0.0
Oestradiol on the day of hCG (pmol/l)	1320 \pm 0.0

Ovarian Stimulation & Intrauterine Insemination

Seventy-nine women underwent 179 cycles of ovarian stimulation by letrozole or clomiphene citrate in conjunction with intrauterine insemination. Thirteen cycles were cancelled: 7 cycles for excessive response, 2 cycles for premature luteinization and 4 for other reasons.

The mean age of patients was 33.8 years. The indications and cycle characteristics are shown in Tables 34 and 35 respectively. Twelve pregnancies were achieved and the **pregnancy rate** was 6.7% per cycle initiated. There were 8 ongoing singleton pregnancies.

Table 34: Indications for Ovarian Stimulation & Intrauterine Insemination

Indications	Number of Cycles
Male factors	47
Unexplained	71
Endometriosis	0
Coital	25
Anovulation	33
Miscellaneous	3

Table 35: Cycle Characteristics of Ovarian Stimulation & Intrauterine Insemination

Parameters	Mean \pm Standard Deviation	
	Clomid	Letrozole
Amount of gonadotrophin used (IU)	0 \pm 0.0	0 \pm 0.0
Number of follicles \geq 12mm	1.8 \pm 0.8	1.2 \pm 0.5
Number of follicles \geq 14mm	1.4 \pm 0.6	1.2 \pm 0.4
Number of follicles \geq 16mm	1.2 \pm 0.4	1.1 \pm 0.3
Number of follicles \geq 18mm	1.1 \pm 0.4	1.1 \pm 0.3
Number of follicles \geq 20mm	1.0 \pm 0.4	1.1 \pm 0.2
Oestradiol on the day of hCG (pmol/l)	1220 \pm 1706	NA

NA = not applicable

Natural Cycle Intrauterine Insemination

Fourteen patients underwent 32 cycles of intrauterine insemination during natural cycles because of coital problems (n=30) or other reasons (n=2).

The mean age of patients was 35.6 years. Six pregnancies were achieved and the **pregnancy rate** was 18.8% per cycle initiated. There were five ongoing singleton pregnancies.

Miscellaneous Statistics

	Number
Diagnostic laparoscopy +/- chromotubation	7
Laparoscopic ovarian cystectomy	7
Laparoscopic salpingostomy	1
Laparoscopic adhesiolysis	11
Laparoscopic salpingectomy	9
Laparoscopic segmental resection	2
Laparoscopic ovarian drilling	1
Laparoscopic ablation of endometriosis	3
Laparoscopic salpingo-oophorectomy	0
Myomectomy	0
Diagnostic hysteroscopy	34
Hysteroscopic polypectomy	30
Hysteroscopic adhesiolysis	7
Hysteroscopic lysis of uterine septum	2
Hysteroscopic myomectomy	0
Hysteroscopic proximal tubal cannulation	0
Uterine curettage and insertion of Mirena	7
Others	6

Outpatient Clinics

	New	Follow-up
Infertility Clinics	531	520
Nurse Triage Clinic	291	0
Male infertility Clinics*	7	10
Reproductive Genetic Clinic	44	34
Recurrent Miscarriage Clinic	58	55
Sexual Counselling	28	7
Private Clinic – Reproductive Medicine	232	109

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Cumulative Statistics

Table 36: Comparative Results of Conventional IVF-ET

	2020	2019	2018	2017	2016
Number of Patients	357	415	419	304	266
Number of Cycles Initiated	383	448	444	326	284
Number of Cycles Cancelled	8	14	11	17	12
Number of Cycles with Oocyte Retrieval	375	434	433	309	272
Number of Oocyte Retrieved	4171	3872	4572	3142	2454
Mean No. of Oocytes / Oocyte Retrieval	11.1	8.9	10.6	10.2	9.0
Number of Oocyte Fertilized	2646	2600	3282	2317	1701
Fertilization Rate	63.4%	72.4%	71.8%	73.7%	69.3%
Number of Cleaving Embryos	2530	2476	3150	2231	1622
Mean No. of Cleaving Embryos/ Retrieval	6.7	5.7	7.3	7.2	6.0
Number of Cycles with Transfer	178	230	250	201	196
Number of Embryos Transferred	180	231	287	277	298
Mean No. of Embryos / Transfer	1.0	1.0	1.1	1.4	1.5
Range	1-2	1-2	1-2	1-2	1-2
Number of Pregnancies	62	91	97	74	88
Pregnancy Rate / Transfer	34.8%	39.6%	38.8%	36.8%	44.8%
Ongoing Pregnancy Rate / Transfer	27.0%	30.4%	30.4%	33.3%	35.2%
Number of Embryos Frozen	961	1050	1303	839	615

Table 37: Comparative Results of ICSI (Ejaculated sperm), excluding PGT

	2020	2019	2018	2017	2016
Number of Patients	198	236	236	197	240
Number of Cycles Initiated	209	255	264	214	214
Number of Cycles Cancelled	0	1	0	0	0
Number of Cycles with Oocyte Retrieval	209	254	264	214	214
Number of Oocytes Retrieved	2203	2643	3714	2094	2164
Mean No. of Oocytes / Retrieval	10.5	10.4	10.0	9.8	10.1
Number of Oocyte Fertilized	1157	1504	1541	1268	1316
Fertilization Rate	68.3%	70.4%	74.3%	74.4%	73.1%
Number of Cleaving Embryos	1129	1472	1503	1268	1298
Mean No. of Cleaving embryos/ Retrieval	5.4	5.8	5.7	5.9	6.1
Number of Cycles with Transfer	96	126	153	147	149
Number of Embryos Transferred	97	129	187	200	243
Mean No. of Embryos / Transfer	1.0	1.0	1.2	1.4	1.6
Number of Pregnancies	32	40	47	61	58
Pregnancy Rate / Transfer	33.3%	31.7%	30.7%	41.5%	39.8%
Ongoing Pregnancy Rate / Transfer	28.1%	26.2%	21.6%	32.0%	28.2%
Number of Embryos Frozen	476	656	719	580	567

Table 38: Comparative Results of Frozen Embryo Transfer (FET)

	2020	2019	2018	2017	2016
Number of Patients	558	693	636	513	420
Number of Thaw Cycles	736	936	885	670	520
Number of Transfer Cycles	732	925	874	659	509
Total Number of Embryos Thawed	791	1015	1090	1000	852
Number of Embryos Replaced	739	936	992	852	753
Mean Number Replaced	1.0	1.0	1.1	1.3	1.5
Type of Transfer Cycle:					
Natural	539	685	602	482	342
Clomid-/ Letrozole-Induced	164	1	1	6	30
Hormone Replacement	28	152	266	170	135
Stimulated	1	2	2	1	2
Number of Pregnancies	319	383	364	265	208
Pregnancy Rate / Transfer	43.6%	41.4%	41.6%	40.2%	30.7%
Ongoing Pregnancy Rate / Transfer	33.2%	33.3%	29.2%	31.3%	22.4%

