

# Assisted Reproduction

Annual Report 2018



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

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## ***Introduction***

**The year two thousand and eighteen** marks the thirty-second year of the Assisted Reproduction Program at Queen Mary Hospital.

A total of 831 assisted reproduction treatment (ART) cycles were initiated in 754 couples during this period. The numbers of treatment cycles and of patients were similar to those in previous years. The number of frozen-thawed embryo transfer cycles was similar in 2017 and in 2018. The mean number of embryos replaced reduced to 1.1 per transfer and 1.2 per transfer in conventional IVF and ICSI cycles respectively as all our patients agreed to replace at most two fresh embryos and we have further promoted elective single embryo transfer. The mean number of embryos replaced in frozen-thawed embryo transfer cycles also reduced to 1.1 per transfer because our patients are requested to freeze at most two embryos per straw and some prefer to replace a single frozen embryo first. This year, we encountered no triplet after ART.

This year we implemented a strict 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 31.5% and 34.1% respectively in Day 2 and Day 5 elective single embryo transfer whereas the corresponding rates in non-elective single embryo transfer cycles were 13.2% and 25.0% respectively.

In 2018, preimplantation genetic testing was performed in 80 (79 stimulated, 1 cycle of vitrified oocytes) cycles in 60 women at risk of having babies with serious chromosomal or genetic disorders.

## ***Staff list***

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Ms. JIN Zhan Qun, Jenny

Mr. KWAN Siu Lun Tristan (Till Mar 2018)

Miss KWONG Fung Mei Venise (Till Feb 2018)

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Ms. LOCK Hiu Yan, Crystal

Mr. NG Kwok Hung, Victor

Mr. TSANG Chi Kit, Percy

Ms. HO Wing Tak, Sharon

Ms. LAU Hong Ting, Sharon (from Apr 2018)

Mr. LEUNG Ka Chun, Tim

**Hormone Assay**

Mr. CHAN Chan Keung, Milton  
Ms. WONG Po Chau, Benancy

**Laboratory Assistants**

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Ms. KO Yuk Chun, Jennie  
Ms. NG Hoi Suet  
Ms. WONG Lai Ngor, Lisa



**Front Row:** (Left to Right)

Miss HS NG, Miss May DO, Dr. Raymond LI, Professor William YEUNG, Professor Ernest NG, Dr. Estella LAU, Ms. Carrie LEE

**Second Row:** (Left to Right)

Ms. WM CHEUNG, Miss CP DO, Dr. Jennifer KO, Dr. Sofie YUNG, Ms. Jane CHAN, Dr. Vivian LEE, Ms. Ms. Celia NG, Judy CHOW, Ms. Jennie KO

**Third Row:** (Left to Right)

Miss Sandy LEE, Miss Connie CHAN, Miss Veta WANG, Ms. Jenny JIN, Mr. TM CHEUNG, Miss SH CHAN

**Back Row:** (Left to Right)

Ms. Loretta CHIANG, Miss Wylie WONG, Ms. Amy CHEUNG, Miss Venise KWONG, Dr. Kevin LAM, Ms. Gloria CHUNG, Miss Doris HUNG, Ms. SL CHUNG

# Work-Load Statistics

**Table 1: Workload Statistics I**

No. of Cycles	IVF	Natural cycle IVF	Oocyte donation	Sperm donation	Vitrified oocyte	ICSI	MESA	TESE	IVM	PGT	TOTAL
<b>Initiated</b>	444	1	1	6	6	264	15	15*	0	79**	<b>831</b>
<b>Cancelled</b>	11 (2.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	-	1 (1.3%)	<b>12 (1.4%)</b>
<b>With Oocyte Retrieval</b>	433 (97.5%)	1 (100%)	1 (100%)	6 (100%)	-	264 (100%)	15 (100%)	15 (100%)	-	77 (98.7%) <sup>#</sup>	<b>812 (97.8%)<sup>#a</sup></b>
<b>With Fresh Embryo Transfer</b>	250 (56.3%)	0 (0%)	0 (0%)	5 (83.3%)	5 (83.3%)	153 (58.0%)	9 (60.0%)	6 (40.0%)	-	0 (0%)	<b>428 (51.5%)</b>

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

( ) % of initiated cycles

\*14 fresh + 1 vitrified oocyte cycles

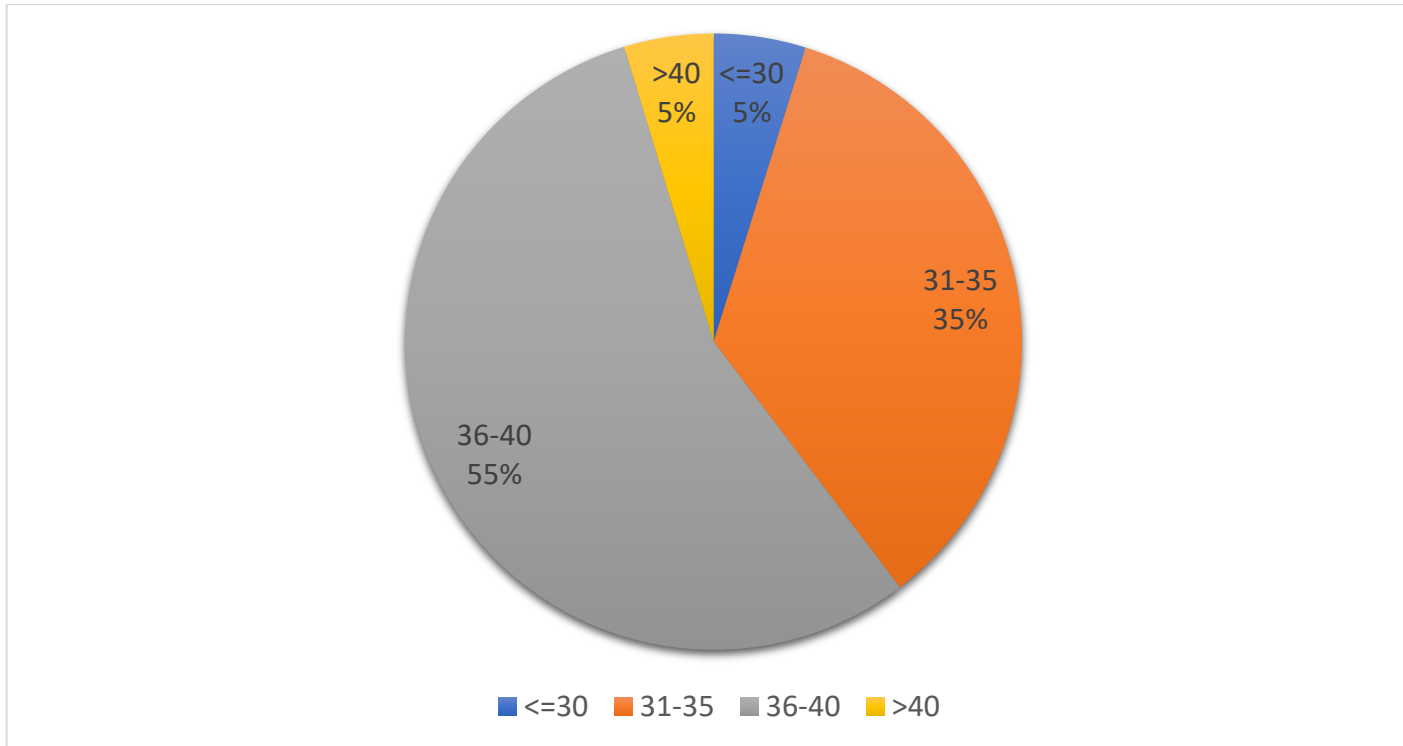
\*\*78 fresh + 1 vitrified oocyte cycles

<sup>#</sup>vitrified oocyte cycles are excluded

**Table 2: Workload Statistics II**

<b>No. of cycles</b>	<b>IVF</b>	<b>Natural cycle IVF</b>	<b>Oocyte donation</b>	<b>Sperm donation</b>	<b>Vitrified oocyte<sup>#</sup></b>	<b>ICSI</b>	<b>MESA</b>	<b>TESE</b>	<b>IVM</b>	<b>Fresh-PGT</b>	<b>TOTAL</b>
<b>Without Oocyte Retrieved</b>	3 (0.7%)	0 (0%)	0 (0%)	0 (0%)	-	2 (0.8%)	0 (0%)	0 (0%)	-	0 (0%)	<b>5</b> <b>(0.6%)</b>
<b>Without insemination</b>	3 (0.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (2.7%)	0 (0%)	3 (20.0%)	-	2 (2.6%)	<b>15</b> <b>(1.8%)</b>
<b>Without Normal Fertilization</b>	13 (3.0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	10 (3.8%)	0 (0%)	1 (6.7%)	-	0 (0%)	<b>25</b> <b>(3.1%)</b>
<b>Without Normal Cleavage</b>	2 (0.5%)	0 (0%)	0 (0%)	0 (0%)	1 (16.7%)	1 (0.5%)	0 (0%)	0 (0%)	-	0 (0%)	<b>4</b> <b>(0.6%)</b>
<b>Without embryos suitable for transfer</b>	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	-	24 (31.2%)	<b>24</b> <b>(3.0%)</b>
<b>With ET Postponed</b>	162 (37.4%)	0 (0%)	1 (100%)	1 (33.3%)	0 (0%)	92 (34.8%)	6 (40.0%)	5 (33.3%)	-	51 (66.2%)	<b>318</b> <b>(39.2%)</b>
<b>Without Fresh Embryo Transfer</b>	183 (42.3%)	1 (100%)	1 (100%)	1 (16.7%)	1 (16.7%)	111 (42.0%)	6 (40.0%)	9 (60.0%)	-	77 (100%)	<b>390</b> <b>(48.0%)</b>

( ) % of oocyte retrieval cycles, #vitrified oocyte cycles are excluded



**Figure 1: Age Distribution of Patients**

**Table 3: Ongoing Pregnancy Rates in Different Age Groups**

Age (yrs)	No. of ongoing pregnancies / No. of transfer cycles										
	IVF	ICSI	Natural cycle IVF	IVM	Oocyte donation*	Sperm donation <sup>#</sup>	Vitrified oocyte	MESA	TESE	PGT <sup>*</sup>	Total
<b>&lt;= 30</b>	4 / 8 (50.0%)	0 / 5 (0%)	0 / 0 (-)	0 / 0 (-)	0 / 1 (0%)	0 / 0 (-)	0 / 0 (-)	0 / 0 (-)	0 / 0 (0%)	0 / 0 (0%)	4 / 13 (30.8%)
<b>31 - 35</b>	35 / 83 (42.2%)	14 / 46 (30.4%)	0 / 1 (0%)	0 / 0 (-)	0 / 0 (-)	1 / 2 (50.0%)	0 / 3 (100%)	2 / 2 (100.0%)	1 / 3 (33.3%)	0 / 0 (0%)	53 / 139 (38.1%)
<b>36 - 40</b>	36 / 147 (24.5%)	19 / 92 (20.7%)	0 / 0 (-)	0 / 0 (-)	0 / 0 (-)	1 / 3 (33.3%)	0 / 1 (0%)	1 / 7 (14.3%)	1 / 3 (33.3%)	0 / 0 (0%)	58 / 253 (22.9%)
<b>&gt; 40</b>	1 / 12 (8.3%)	0 / 10 (0%)	0 / 0 (-)	0 / 0 (-)	0 / 0 (-)	0 / 0 (-)	0 / 1 (0%)	0 / 0 (-)	0 / 0 (-)	0 / 0 (0%)	1 / 23 (4.3%)
<b>Total</b>	76 / 250 (30.4%)	33 / 153 (21.6%)	0 / 1 (0%)	0 / 0 (-)	0 / 1 (0%)	2 / 5 (40.0%)	0 / 5 (0%)	3 / 9 (33.3%)	2 / 6 (33.3%)	0 / 0 (-)	116 / 428 (27.1%)

( ) % of transfer cycles, \*no embryo transfer

## ***In Vitro Fertilization and Embryo Transfer~ IVF-ET***

### ***Stimulated cycle IVF-ET***

During 2018, 419 couples underwent a total of 444 conventional stimulated IVF cycles at our center. Unexplained cause (41.7%) was the commonest indication, which was followed by tuboperitoneal problem (18.0%), male factor (16.4%) and endometriosis (9.5%). (Table 4)

**Table 4: Indications for IVF-ET**

<b>Indications</b>	<b>No of Initiated cycles</b>	<b>No of Pregnancies</b>	<b>Pregnancy Rate*</b>	<b>Ongoing Pregnancy Rate*</b>
<b>Tuboperitoneal</b>	80 (18.0%)	23	45.1%	33.3%
<b>Endometriosis</b>	42 (9.5%)	6	30.0%	20.0%
<b>Male Factor</b>	73 (16.4%)	12	27.3%	20.5%
<b>Anovulation</b>	32 (7.2%)	5	41.7%	16.7%
<b>Unexplained</b>	185 (41.7%)	44	40.7%	34.3%
<b>Others/Mixed</b>	32 (7.2%)	7	55.6%	55.6%
<b>Total</b>	<b>444 (100%)</b>	<b>97</b>	<b>38.8%</b>	<b>30.4%</b>

**\* Per transfer cycle**

A total of 11 cycles (52.5%) were cancelled: 7 due to poor ovarian response, 3 due to premature luteinization and 1 due to other reasons. Oocytes were not obtained in 3 planned retrieval cycles and no insemination in 3 cycles. There were 13 cycles without normal fertilization and 2 cycles without normal cleavage. Therefore, no embryo was transferred in these 21 cycles. Embryo transfer was postponed in 162 cycles because of the risk of developing ovarian hyperstimulation syndrome (OHSS), high serum progesterone level or other reasons.

The **oocyte retrieval rate** was 72.4% with an average of 10.6 oocytes obtained per retrieval cycle. The **fertilization rate** was 71.8% and the **cleavage rate** was 96.0%. 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)
<b>Number of Oocyte Retrieval Cycles</b>	433				
<b>Number of Follicles Aspirated</b>	6311	14.6			
<b>Number of Oocytes Retrieved</b>	4572	10.6	72.4%		
<b>Number of Oocytes Fertilized</b>	3282	7.6		71.8%	
<b>Number of Fertilized Oocytes Cleaved</b>	3150	7.3			96.0%
<b>Number of Embryos Transferred</b>	287	0.7 (1.1 / ET)			
<b>Number of Pregnancies</b>	97				
<b>Number of Embryos Frozen</b>	1303	3.0			

All our patients used GnRH antagonist protocol. (Table 6)

**Table 6: Ovarian Stimulation Protocols Used**

<b>Protocol</b>	<b>No. of Initiated Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate*</b>	<b>Ongoing Pregnancy Rate*</b>
<b>GnRH antagonist</b>	444 (100.0%)	97	38.8%	30.4%
<b>GnRHa (long)</b>	0 (0%)	0	0%	0%
<b>GnRHa (short)</b>	0 (0%)	0	0%	0%
<b>Total</b>	<b>444 (100%)</b>	<b>97</b>	<b>38.8%</b>	<b>30.4%</b>

\* 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**

<b>Difficulty</b>	<b>No. of ET Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate#</b>	<b>Ongoing Pregnancy Rate#</b>
<b>Easy</b>	246 (98.4%)	94	38.2%	29.7%
<b>Vulsellum</b>	4 (1.6%)	3	75.0%	75.0%
<b>Vulsellum &amp; Sound Dilatation</b>	0 (0%)	0	-	-
<b>Total</b>	<b>250 (100%)</b>	<b>97</b>	<b>38.8%</b>	<b>30.4%</b>

# Per transfer cycle

Among the 433 oocyte retrieval cycles, 1 had moderate to severe OHSS. (Table 8)

**Table 8: Complications of Conventional IVF-ET Treatment**

Complications	No of Retrieval* Cycles
Nil	431 (99.5%)
Infection	1 (0.2%)
Significant haemoperitonem	0 (0%)
Moderate to severe OHSS	1 (0.2%)

There were 97 pregnancies resulting from stimulated IVF-ET cycles. The **pregnancy rate** was 21.8% per initiated cycle and 38.8% per transfer cycle (Table 9). The **miscarriage rate** was 19.6%. The **ongoing pregnancy rate** was 17.1% per initiated cycle and 30.4% per transfer cycle. The average number of fresh pre-embryos transferred was 1.1 per transfer. The **multiple pregnancy rate** was 6.2%. Six sets of twins were encountered (Table 10). The **implantation rate** was 32.8%.

**Table 9: Pregnancy Rates of Conventional IVF-ET**

	Pregnancy Rate	Ongoing pregnancy Rate
per Cycle Initiated	97 / 444 (21.8%)	76 / 444 (17.1%)
per Oocyte Retrieval Cycle	97 / 433 (22.4%)	76 / 433 (17.6%)
per Transfer Cycle	97 / 250 (38.8%)	76 / 250 (30.4%)

**Table 10: Outcome of Pregnancies**

Outcome	Number of Cycles
Miscarriage	19 (19.6%)
Ectopic Pregnancy	2 (2.1%)
Lost to follow up	0 (0%)
Ongoing Pregnancy	76 (78.4%)
<b>Total Pregnancies</b>	<b>97</b>
<b>No. of Fetuses</b>	<b>82</b>
<b>No. of Multiple Pregnancies</b>	<b>6 (6.2%) - all twins</b>

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	Pregnancy Rate <sup>#</sup>	Ongoing Pregnancy Rate <sup>#</sup>	Multiple Pregnancy Rate <sup>+</sup>
1	213 (85.2%)	82	38.5%	29.6%	1.2%
2	37 (14.8%)	15	40.5%	35.1%	33.3%
<b>Total</b>	<b>250 (100%)</b>	<b>97</b>	<b>38.8%</b>	<b>30.4%</b>	<b>6.2%</b>

#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 <sup>#</sup>	Ongoing Pregnancy Rate <sup>#</sup>	Multiple Pregnancy Rate <sup>+</sup>
Yes	2	35.7	103	39.8%	34.0%	0%
	5	35.9	54	50.0%	35.2%	3.7%
No	2	36.4	52	23.1%	15.4%	0%
	5	36.3	4	50.0%	25.0%	0%

#Per transfer cycle  
+Per pregnant cycle

## ***Intracytoplasmic Sperm Injection~ICSI (with ejaculated sperm)***

Two hundred and sixty-four treatment cycles were initiated in two hundred and thirty-six couples (excluding preimplantation genetics testing). ICSI was decided in 246 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 14 of the cycles initiated (Table 13).

**Table 13: Indications for ICSI**

<b>Indications</b>	<b>No. of Initiated Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate*</b>	<b>Ongoing Pregnancy Rate*</b>
<b>Severe male factor</b>	246 (93.2%)	45	25.0%	12.5%
<b>Fertilization problem</b>	14 (5.3%)	2	31.3%	22.2%
<b>Others</b>	4 (1.5%)	0	0%	0%
<b>Total</b>	<b>264 (100%)</b>	<b>47</b>	<b>30.7%</b>	<b>21.6%</b>

\*Per transfer cycle

GnRHa antagonist protocol for ovarian stimulation was used in 263 cycles (99.6%) (Table 14), except Medroxyprogesterone acetate was used for ovulation suppression.

**Table 14: Ovarian Stimulation Protocols Used**

<b>Protocol</b>	<b>No. of Initiated Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate*</b>	<b>Ongoing Pregnancy Rate*</b>
<b>GnRH antagonist</b>	263 (99.6%)	47	30.9%	21.7%
<b>GnRHa (long)</b>	0 (0%)	0	0%	0%
<b>GnRHa (short)</b>	0 (0%)	0	0%	0%
<b>Others</b>	1 (0.4%)	0	0%	0%
<b>Total</b>	<b>264 (100%)</b>	<b>47</b>	<b>30.7%</b>	<b>21.6%</b>

\*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)
<b>No. of Oocyte Retrieval Cycles</b>	264				
<b>No. of Follicle Aspirated</b>	3714	14.1			
<b>No. of Oocytes Retrieved</b>	2641	10.0	71.1%		
<b>No. of Oocytes Fertilized</b>	1541	5.8		58.3% (74.3% per oocyte injected)	
<b>No. of Fertilized Oocytes Cleaved</b>	1503	5.7			98.4%
<b>No. of Embryos Transferred</b>	187	0.7 (1.2/ET)			
<b>No. of Pregnancies</b>	47				
<b>No. of Embryos Frozen</b>	719	2.7			

Oocytes were not obtained in 2 planned retrieval cycles and insemination was not performed in another 7 cycles. Normal fertilization was not achieved in 10 cycles and none have normal cleavage. Therefore, no embryo was transferred in these 19 cycles. Embryo transfer was postponed in another 92 cycles because of the risk of developing OHSS, high serum progesterone concentration or other reasons. The fertilization rate was 74.3% per oocyte injected this year and was similar to that of last year. The mean number of embryos transferred was only 1.2 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	150 (98.0%)	47	31.3%	22.0%
Vulsellum	3 (2.0%)	0	-	-
Vulsellum + Sound	0 (0%)	0	-	-
<b>Total</b>	<b>153 (100%)</b>	<b>47</b>	<b>30.7%</b>	<b>21.6%</b>

# Per transfer cycle

There were 47 pregnancies and 33 were ongoing (Tables 17 & 18). The **multiple pregnancy rate** was 2.1%. One set of twins was encountered. The **implantation rate** was 23.5%. One patients (0.4%) had moderate or severe OHSS.

**Table 17: Pregnancy Rates of ICSI**

	Pregnancy Rate	Ongoing Pregnancy rate
per Cycle Initiated	47 / 264 (17.8%)	33 / 264 (12.5%)
per Oocyte Retrieval Cycle	47 / 264 (17.8%)	33 / 264 (12.5%)
per Transfer Cycle	47 / 153 (30.7%)	33 / 153 (21.6%)

**Table 18: Outcome of Pregnancies**

<b>Outcome</b>	<b>Number of Cycles</b>	
<b>Miscarriage</b>	13	(27.6%)
<b>Ectopic Pregnancy</b>	1	(2.1%)
<b>Ongoing Pregnancy</b>	33	(70.2%)
<b>Total Pregnancies</b>	<b>47</b>	
<b>No. of Fetuses</b>	34	
<b>No. of Multiple Pregnancies</b>	1 (2.1%)	1 twin

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**

<b>No. of Embryos</b>	<b>No. of ET Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate#</b>	<b>Ongoing Pregnancy Rate#</b>	<b>Multiple Pregnancy Rate+</b>
<b>1</b>	119 (77.8%)	37	31.1%	22.7%	2.7%
<b>2</b>	34 (22.2%)	10	29.4%	17.6%	0%
<b>Total</b>	<b>153 (100%)</b>	<b>47</b>	<b>30.7%</b>	<b>21.6%</b>	<b>2.1%</b>

# Per transfer cycle  
+ Per pregnant cycle

**Table 20: Outcome of Single Embryo Transfer**

<b>Elective</b>	<b>Day of ET</b>	<b>Average Age of Women (years)</b>	<b>No. of ET cycles</b>	<b>Pregnancy Rate#</b>	<b>Ongoing Pregnancy Rate#</b>	<b>Multiple Pregnancy Rate<sup>+</sup></b>
<b>Yes</b>	2	36.2	46	32.6%	26.1%	0%
	5	35.4	34	38.2%	32.4%	7.7%
<b>No</b>	2	36.8	39	23.1%	10.3%	0%
	5	-	-	-	-	-

#Per transfer cycle

+Per pregnant cycle

# **Microsurgical Epididymal Sperm Aspiration - MESA**

Fourteen couples underwent 15 treatment cycles in 2018. The urological team at Queen Mary Hospital performed a total of 13 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**

<b>Indications</b>	<b>No. of OPU Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate*</b>	<b>Ongoing Pregnancy Rate*</b>
<b>Congenital Absence of Vas deferens</b>	6 (40.0%)	1	33.3%	0%
<b>Obstructive Azoospermia</b>	8 (53.3%)	4	50.0%	50.0%
<b>Severe male factor</b>	0 (0%)	0	0%	0%
<b>Ejaculatory problem</b>	1 (6.3%)	0	0%	0%
<b>Total</b>	<b>15 (100%)</b>	<b>4</b>	<b>44.4%</b>	<b>33.3%</b>

\*Per transfer cycle

The antagonist protocol was used in all 15 cycles. Oocyte retrieval was performed under transvaginal ultrasound guidance in all 15 cycles and oocytes were obtained in the retrieval cycles. An average of 11.5 oocytes was retrieved in these 15 cycles. The fertilization rate was 77.5% per oocyte injected (Table 22). Embryo transfer was performed in 10 cycles and embryo transfer was postponed in 6 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)
<b>Number of Oocyte Retrieval Cycles</b>	15				
<b>Number of Follicles Aspirated</b>	231	15.4			
<b>Number of Oocytes Retrieved</b>	172	11.5	74.5%		
<b>Number of Oocytes Fertilized</b>	107	7.1		62.2% (77.5% per oocyte injected)	
<b>Number of Fertilized Oocytes Cleaved</b>	105	7.0			98.1%
<b>Number of Embryos Transferred</b>	10	0.7 (1.1 / ET)			
<b>Number of Pregnancies</b>	4				
<b>Number of Embryos Frozen</b>	46	3.1			

No patient developed moderate to severe OHSS.

**Table 23: Pregnancy Rates of MESA + ICSI**

	Pregnancy Rate	Ongoing pregnancy rate
<b>per Cycle Initiated</b>	4 / 15 (26.7%)	3 / 15 (20.0%)
<b>per Oocyte Retrieval Cycle</b>	4 / 15 (26.7%)	3 / 15 (20.0%)
<b>per Transfer Cycle</b>	4 / 9 (44.4%)	3 / 9 (33.3%)

There were three pregnancies resulting from MESA + ICSI procedures. The **pregnancy rate** was 26.7% per initiated cycle and 44.4% per transfer cycle (Table 23). The **ongoing pregnancy rate** was 20.0% per initiated cycle and 42.9% per transfer cycle. The **implantation rate** was 33.3%. There was no multiple pregnancy (Table 24).

**Table 24: Outcomes of Pregnancies**

<b>Outcome</b>	<b>Number of cycles</b>
<b>Miscarriage</b>	1 (25.0%)
<b>Ectopic Pregnancy</b>	0 (0%)
<b>Ongoing Pregnancy</b>	3 (75.0%)
<b>Total Pregnancies</b>	<b>4</b>
<b>No. of Fetuses</b>	3
<b>No. of Multiple Pregnancies</b>	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**

<b>No. of Embryos</b>	<b>No. of ET Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate<sup>#</sup></b>	<b>Ongoing Pregnancy Rate<sup>#</sup></b>	<b>Multiple Pregnancy Rate<sup>+</sup></b>
<b>1</b>	8 (88.9%)	4	50.0%	37.5%	0%
<b>2</b>	1 (11.1%)	0	0%	0%	0%
<b>Total</b>	<b>9 (100%)</b>	<b>4</b>	<b>44.4%</b>	<b>33.3%</b>	<b>0%</b>

**#Per transfer cycle**

**+Per pregnancy cycle**

## Testicular Sperm Extraction - TESE

During 2018, fifteen treatment cycles were initiated in thirteen couples (Table 26). The urological team at Queen Mary Hospital carried out fourteen testicular sperm biopsies.

**Table 26: Indications for TESE**

Indications	No. of OPU Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
<b>Non-obstructive Azoospermia</b>	12 (80.0%)	2	66.7%	66.7%
<b>Obstructive Azoospermia</b>	2 (13.3%)	0	0%	0%
<b>Ejaculatory problem</b>	1 (6.7%)	0	0%	0%
<b>Total</b>	<b>15 (100%)</b>	<b>2</b>	<b>40.0%</b>	<b>40.0%</b>

\* Per transfer cycle

Fifteen IVF-TESE cycles were initiated. The antagonist protocol was used in 14 cycles and the remaining one involved use of donor oocytes. No cycle was cancelled before oocyte retrieval. Oocyte retrieval was performed in 15 cycles under transvaginal ultrasound guidance and oocytes were obtained in all cycles. An average of 11.7 oocytes were retrieved. Insemination was not performed in 3 cycles because of the absence of spermatozoa found in TESE or asynchrony of oocyte retrieval and TESE. Oocytes were retrieved in all cycles. In the cases of asynchrony of oocyte retrieval and TESE, the oocytes were frozen first and TESE re-arranged in hormonal replacement cycles, with thawing of the frozen oocytes for fertilization if sperms were found in TESE. ICSI was performed in eight fresh cycles with spermatozoa retrieved from TESE procedures and the overall fertilization rate was 66.7% per oocyte injected (Table 27). Embryo transfer was postponed in 5 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)
<b>No. of Oocyte Retrieval Cycles</b>	15				
<b>No. of Follicles Aspirated</b>	232	13.8			
<b>No. of Oocytes Retrieved</b>	178	11.7	76.7%		
<b>No. of Oocytes Fertilized</b>	72	2.3		40.4% (66.7% per oocyte injected)	
<b>No. of Fertilized Oocytes Cleaved</b>	68	2.3			94.4%
<b>No. of Embryos Transferred</b>	8	0.5 (1.3/ ET)			
<b>No. of Pregnancies</b>	2				
<b>No. of Embryos Frozen</b>	69	4.6			

There was no case of moderate to severe OHSS recorded.

## 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 2018, PGT was performed in 79 stimulated cycles, 1 vitrified oocyte cycle and no frozen cycles for 61 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
<b>Chromosomal abnormalities</b>				
Numerical chromosomal abnormalities	0	0	0	0 (0%)
Reciprocal translocation	10	13	55	18 (32.7%)
Robertsonian translocation	0	0	0	0 (0%)
$\alpha$ Thalassaemia	10	11	55	24 (43.6%)
$\beta$ Thalassaemia	7	8	32	13 (40.6%)
$\beta$ Thalassaemia/ single gene defect + HLA typing	3	7	19	7 (36.8%)
Others single gene defects	11	15	52	20 (38.5%)
PGT-A#	20	24	82	34 (41.5%)
<b>Total</b>	<b>61</b>	<b>78</b>	<b>295</b>	<b>116 (39.3%)</b>

#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).

### ***FET after PGT***

All blastocysts for PGT were frozen after biopsy and frozen-thawed transfer of the 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 80 thaw cycles after PGT were initiated. 80 frozen embryos were thawed and all frozen-thawed embryos were replaced.

There were altogether 44 **pregnancies** (55.0% per transfer) and 34 **ongoing pregnancies** (42.5% per transfer) resulting from transfer of frozen-thawed embryos. The overall **miscarriage rate** was 22.7%. The **multiple pregnancy rate** was 0%. The **implantation rate** was 48.8%.

# **Embryo Cryopreservation and Frozen-thawed 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 628 / 819 (76.7%) of the retrieval cycles in 2018.

**Table 29: Results of Embryo Cryopreservation**

<b>Method of Treatment</b>	<b>IVF</b>	<b>ICSI</b>	<b>MESA</b>	<b>TESE</b>	<b>Others</b>	<b>PGT</b>	<b>Total</b>
<b>No. of Oocyte Retrieval Cycles</b>	433	264	15	15	14	78	<b>819</b>
<b>No. of Cycles with Embryo Cryopreservation</b>	345*	196*	14	12*	9	52	<b>628*</b>
<b>Total No. of Embryos Cryopreserved</b>	1303*	719*	46	69*	48	139	<b>2324*</b>
<b>Average No. of Embryos Cryopreserved</b>	3.8*	3.7*	3.3	5.8*	5.3	2.7	<b>3.4*</b>
<b>Range of Embryos Cryopreserved</b>	1-32*	1-19*	1-12	1-24*	2-12	1-23	<b>1-32*</b>

**\* with oocyte freezing**

Six hundred and thirty-six women planned to have replacement of frozen-thawed embryos (FET). A total of 885 thaw cycles were initiated. Embryo transfer was not done in 11 cycles because of lysis of all frozen embryo(s) during thawing. Six hundred and two frozen-thawed embryo replacements were performed in natural (spontaneous ovulatory) cycles, one were in clomiphene citrate-induced cycles, three were in letrozole-induced cycles, 266 were in total hormone replacement artificial cycles and two was in stimulated cycles.

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	602	<b>68.9%</b>	247	<b>41.0%</b>	<b>31.4%</b>
Clomid	1	<b>0.1%</b>	1	<b>100%</b>	<b>0%</b>
Letrozole	3	<b>0.3%</b>	2	<b>66.7%</b>	<b>66.7%</b>
Artificial	266	<b>30.4%</b>	114	<b>42.9%</b>	<b>24.1%</b>
Stimulated	2	<b>0.2%</b>	0	<b>0%</b>	<b>0%</b>
<b>Total</b>	<b>874</b>	<b>100%</b>	<b>364</b>	<b>41.6%</b>	<b>29.2%</b>

**Table 31: Outcome of Pregnancies in FET**

Outcome	No. of Pregnancies	Natural	Clomid	Letrozole	Artificial	Stimulated
Miscarriage	106 (29.1%)	57	0	0	49	0
Ectopic Pregnancy	3 (0.8%)	1	1	0	1	0
Molar Pregnancy	0 (0%)	0	0	0	0	0
Ongoing Pregnancy	255 (70.1%)	189 (76.5%)	0 (0%)	0 (0%)	64 (56.1%)	0 (-)
<b>Total Pregnancies</b>	<b>364</b>	<b>247</b>	<b>1</b>	<b>2</b>	<b>114</b>	<b>0</b>
<b>No. of Fetuses</b>	270	201	0	2	67	0
<b>No. of Multiple Pregnancies</b>	15 (4.1%) all twins	12	0	0	3	0

The average number of embryos transferred per FET cycles was 1.1. There were altogether 270 pregnancies resulting from transfer of frozen-thawed embryos. The overall **miscarriage rate** was 29.1%. The **multiple pregnancy rate** was 4.1% (Table 31). The **implantation rate** was 34.0%.

**Table 32: Number of Embryos Transferred & the Outcome**

<b>No. of Embryos</b>	<b>No. of FET Cycles</b>	<b>No. of Pregnancies</b>	<b>Pregnancy Rate#</b>	<b>Ongoing Pregnancy rate#</b>	<b>Multiple Pregnancy Rate<sup>+</sup></b>
<b>1</b>	756 (86.5%)	308	40.7%	28.7%	2.3%
<b>2</b>	118 (13.5%)	56	47.5%	32.2%	14.3%
<b>Total</b>	<b>874 (100%)</b>	<b>364</b>	<b>41.6%</b>	<b>29.2%</b>	<b>4.1%</b>

# Per transfer cycle  
+ Per pregnant cycle

# ***Ovulation Induction and Ovarian Stimulation & Intrauterine Insemination***

## ***Ovulation Induction***

Eleven patients underwent 25 cycles of ovulation induction by gonadotrophin therapy. The mean age of patients was 32.9 years. The cycle characteristics are detailed in Table 33. Four cycles were cancelled because of excessive ovarian response and 1 for other reasons. Two women got pregnant and the pregnancy rate was 8.0% per initiated cycle. There were two ongoing singleton pregnancies.

**Table 33: Characteristics of Ovulation Induction Cycles**

<b>Parameters</b>	<b>Mean ± Standard Deviation</b>
<b>Amount of gonadotrophin used (IU)</b>	1,469 ± 1,429
<b>Number of follicles ≥ 14mm</b>	1.6 ± 0.6
<b>Number of follicles ≥ 16mm</b>	1.3 ± 0.5
<b>Number of follicles ≥ 18mm</b>	1.2 ± 0.4
<b>Oestradiol on the day of hCG (pmol/l)</b>	1,720 ± 1,162

## ***Ovarian Stimulation & Intrauterine Insemination***

Eighty-seven women underwent 167 cycles of ovarian stimulation by gonadotrophin or clomiphene citrate in conjunction with insemination. Four cycles were cancelled: 1 cycle for excessive response, 1 for premature LH surge, and 2 for other reasons.

The mean age of patients was 33.4 years. The indications and cycle characteristics are shown in Tables 34 and 35 respectively. Eight pregnancies were achieved and the **pregnancy rate** was 4.8% per cycle initiated. There were 4 ongoing singleton.

**Table 34: Indications for Ovarian Stimulation & Intrauterine Insemination**

Indications	Number of Cycles
Male factors	66
Unexplained	85
Endometriosis	4
Coital	5
Anovulation	2
Miscellaneous	5

**Table 35: Cycle Characteristics of Ovarian Stimulation & Intrauterine Insemination**

Parameters	Mean $\pm$ Standard Deviation		
	hMG/ FSH	Clomid	Letrozole
Amount of gonadotrophin used (IU)	3,3337 $\pm$ 106	-	-
Number of follicles $\geq$ 12mm	3.0 $\pm$ 0.0	1.8 $\pm$ 0.8	1.3 $\pm$ 0.5
Number of follicles $\geq$ 14mm	1.5 $\pm$ 0.7	1.4 $\pm$ 0.6	1.3 $\pm$ 0.5
Number of follicles $\geq$ 16mm	1.0 $\pm$ 0.0	1.3 $\pm$ 0.5	1.3 $\pm$ 0.5
Oestradiol on the day of hCG (pmol/l)	3,903 $\pm$ 2,584	1,822 $\pm$ 782	1,157 $\pm$ 697

### *Natural Cycle Intrauterine Insemination*

Fourteen patients underwent 40 cycles of intrauterine insemination during natural cycles because of coital problems (n=39) or male factor (n=7).

The mean age of patients was 36.4 years. Two pregnancies were achieved and the **pregnancy rate** was 5.3% per cycle initiated. There were two ongoing singleton pregnancies.

## ***Miscellaneous Statistics***

	<b>Number</b>
Diagnostic laparoscopy +/- chromotubation	14
Laparoscopic ovarian cystectomy	7
Laparoscopic salpingostomy	6
Laparoscopic adhesiolysis	17
Laparoscopic salpingectomy	3
Laparoscopic segmental resection	42
Laparoscopic ovarian drilling	1
Laparoscopic ablation of endometriosis	5
Salpingo-oophorectomy	0
Myomectomy	4
Diagnostic hysteroscopy	18
Hysteroscopic polypectomy	57
Hysteroscopic adhesiolysis	8
Hysteroscopic lysis of uterine septum	7
Hysteroscopic myomectomy	3
Hysteroscopic proximal tubal cannulation	2
Tubal reanastomosis	0
Semen cryopreservation for cancer patients	

## Outpatient Clinics

	<b>New</b>	<b>Follow-up</b>
Infertility Clinics	761	618
Male infertility Clinics*	0	0
Reproductive Genetic Clinic	44	39
Recurrent Miscarriage Clinic	18	34
Sexual Counselling	46	0
Private Clinic – Reproductive Medicine	306	170

\*Only those cases seen under Department of Obstetrics and Gynaecology were counted here (mainly cases requiring counselling or treatment on male endocrine problems). Those requiring assessment and management by urologists were seen in the Department of Surgery and were not counted here.

# ***Publications and Conference Reports***

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## Cumulative Statistics

**Table 36: Comparative Results of Conventional IVF-ET**

	2018	2017	2016	2015	2014
<b>Number of Patients</b>	419	304	266	357	400
<b>Number of Cycles Initiated</b>	444	326	284	390	432
<b>Number of Cycles Cancelled</b>	11	17	12	21	15
<b>Number of Cycles with Oocyte Retrieval</b>	433	309	272	369	417
<b>Number of Oocyte Retrieved</b>	4572	3142	2454	3401	3912
<b>Mean No. of Oocytes / Oocyte Retrieval</b>	10.6	10.2	9.0	9.2	9.4
<b>Number of Oocyte Fertilized</b>	3282	2317	1701	2395	2814
<b>Fertilization Rate</b>	71.8%	73.7%	69.3%	70.4%	71.9%
<b>Number of Cleaving Embryos</b>	3150	2231	1622	2306	2705
<b>Mean No. of Cleaving Embryos/ Retrieval</b>	7.3	7.2	6.0	6.2	6.5
<b>Number of Cycles with Transfer</b>	250	201	196	279	308
<b>Number of Embryos Transferred</b>	287	277	298	466	505
<b>Mean No. of Embryos / Transfer</b>	1.1	1.4	1.5	1.7	1.6
<b>Range</b>	1-2	1-2	1-2	1-2	1-2
<b>Number of Pregnancies</b>	97	74	88	114	133
<b>Pregnancy Rate / Transfer</b>	38.8%	36.8%	44.8%	40.9%	43.2%
<b>Ongoing Pregnancy Rate / Transfer</b>	30.4%	33.3%	35.2%	31.2%	33.8%
<b>Number of Embryos Frozen</b>	1303	839	615	963	1226

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

	<b>2018</b>	<b>2017</b>	<b>2016</b>	<b>2015</b>	<b>2014</b>
<b>Number of Patients</b>	236	197	240	272	250
<b>Number of Cycles Initiated</b>	264	214	214	297	268
<b>Number of Cycles Cancelled</b>	0	0	0	1	2
<b>Number of Cycles with Oocyte Retrieval</b>	264	214	214	296	266
<b>Number of Oocytes Retrieved</b>	3714	2094	2164	3180	2432
<b>Mean No. of Oocytes / Retrieval</b>	10.0	9.8	10.1	10.7	9.1
<b>Number of Oocyte Fertilized</b>	1541	1268	1316	2004	1501
<b>Fertilization Rate</b>	74.3%	74.4%	73.1%	76.1%	61.7
<b>Number of Cleaving Embryos</b>	1503	1268	1298	1966	1457
<b>Mean No. of Cleaving embryos/ Retrieval</b>	5.7	5.9	6.1	6.6	5.5
<b>Number of Cycles with Transfer</b>	153	147	149	216	202
<b>Number of Embryos Transferred</b>	187	200	243	349	324
<b>Mean No. of Embryos / Transfer</b>	1.2	1.4	1.6	1.6	1.6
<b>Number of Pregnancies</b>	47	61	58	86	87
<b>Pregnancy Rate / Transfer</b>	30.7%	41.5%	39.8%	39.8%	43.1
<b>Ongoing Pregnancy Rate / Transfer</b>	21.6%	32.0%	28.2%	29.2%	35.6
<b>Number of Embryos Frozen</b>	719	580	567	837	698

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

	2018	2017	2016	2015	2014
<b>Number of Patients</b>	636	513	420	532	511
<b>Number of Thaw Cycles</b>	885	670	520	671	640
<b>Number of Transfer Cycles</b>	874	659	509	660	634
<b>Total Number of Embryos Thawed</b>	1090	1000	852	1187	1196
<b>Number of Embryos Replaced</b>	992	852	753	1025	1037
<b>Mean Number Replaced</b>	1.1	1.3	1.5	1.6	1.6
<b>Type of Transfer Cycle:</b>					
<b>Natural</b>	602	482	342	484	458
<b>Clomid-Induced</b>	1	6	30	115	116
<b>Hormone Replacement</b>	266	170	135	59	57
<b>Stimulated</b>	2	1	2	2	3
<b>Number of Pregnancies</b>	364	265	208	271	243
<b>Pregnancy Rate / Transfer</b>	41.6%	40.2%	30.7%	41.1%	38.3%
<b>Ongoing Pregnancy Rate / Transfer</b>	29.2%	31.3%	22.4%	32.0%	30.6%

