Echographic guided embryo transfer

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Embryo transfer – historical perspective

- 1891 W. Heape – transfer from one uterine cavity to another (rabbit)
- 1955 M.C.Chang - embryotransfer after IVF (rabbit)
- 1978 P.Steptoe, R.Edwards - first successful ET in humans
- 1991 R.Asch – doubled success rates with tubal embryo transfers (GIFT) for the right indications compared to IVF

Embryo transfer – historical perspective

- 1987 P. Devroey - ZIFT (zygote intrafallopian transfer) – fertilization of the oocyte could be verified before embryo transfer
- GIFT, ZIFT, TET – have gradually disappeared since the work-up of the patients prior to IVF does not always give the detailed knowledge about tubal patency or peritubal conditions

- Embryo transfer procedure – apart from embryo quality and endometrial receptivity – is one of the basic factors determining the final outcome of an IVF cycle
- ± 30% of failure in ART is due to the poor performance in the procedure of embryo transfer

Factors that may affect the success of ET

- The ease of procedure
- The embryo transfer catheter type
- The use ultrasound guidance
- The position of embryo insertion in the uteus
- The experience of the physician
- The use of cervical introducers or obturators
- The value of resting after ET

Factors that may affect the success of ET

- The presence or absence of the blood on the catheter
- Flushing of the cervical canal to remove the mucus
- Microbiological factors in the cervix and bacterial contamination of the catheter
- Retention of embryos in the catheter
- Position of the air-medium content in the catheter

Catheter Types
(classificatin according to)

- Tip characteristics
- Flexibility
- Presence of fixed or detachable outher sheet
- Malleability
- Shape memory of the material
- Gauge and length

Ideal Catheter

- Soft and flexible (avoiding any trauma to cervix and endometrium but finding its way to the uterine cavity)
- Non embryo-toxic
- Free of bacterial endotoxins
- Must give full control in positioning the catheter tip in the uterine cavity
- Must be clearly visible on ultrasound

Catheter

Commercially available catheters can be divided into two major groups:

- Soft ET catheters
  (subgroup – echogenic catheters)
- Firm (rigid) ET catheters

Metaanalysis of the prospective RCTs trials comparing soft versus rigid ET catheters
(Abou-Setta,A.M. et al.: Hum Reprod., 2005, 20. str.3114-3121)

- CPR: soft (30,49%) vers. rigid (24,02%)
- BTR: soft (29,65%) vers. rigid (25,32%)

Both differences are statistically significant

Catheter

- „Soft“ catheters are the catheters of choice and should be routinely used for IVF.
- Echo tip catheters, which enable them to be easily visualised with ultrasound, further facilitate their use.

The human factor

- No matter how good the IVF laboratory culture environment is, the physician can ruin everything with a carelessly performed embryo transfer.
- The entire IVF cycle depends on the delicate placement of embryos at the proper location near the middle of the endometrial cavity.

The human factor

- Karande (F&S 1999) reported significant difference in pregnancy rates among 11 clinicians, even though uniform protocol for IVF was used
- Hearns-Stokes (F&S 2000) found different pregnancy rates among 11 physicians performing 854 transfers

The human factor

Experience needed to perform efficient embryo transfer

- Trial transfer is performed
- The initiation of uterine contractility is avoided by the use soft catheters, gentle manipulation and by avoiding touching the fundus
- Cervical mucus is removed
- Ultrasound guided ET with full bladder is performed
- Embryos are deposited 2cm below fundus
- The catheter is examined after ET for retained embryos

The human factor

- A holistic approach to IVF on the part of both embryologists and clinicians will serve to maximize pregnancy rates and plan good or ideal embryo transfers.

Trial Embryo Transfer

- A mock embryo transfer can facilitate the management of difficult situations during actual ET
- Mock ET is strongly advised for cases where difficulty is anticipated, repeated unexplained failure and patients in whom ET has previously been described as „difficult“

Trial Embryo Transfer

- Wilson, A. et al.: Techniques for intrauterine embryo transfer (protocol). The Cochrane Database of Systemic Reviews 2000, Issue 3, CD 003202.

The role of uterine straightening by passive bladder distension

- Uterine straightening by passive bladder distension provides a smooth insertion through the internal os, and the supplement of abdominal ultrasound through the bladder window , helps to navigate the ET catheter through the cervix and into the uterine cevity, where the optimal site for the deposition of the embryo(s) can be chosen

Pregnancy outcome according to the distance between fundus an catheter tip

Coroleu et al.: Hum Reprod. 2002,17, 341-346

Pregnancy outcome	Cath. Tip 10mm	Cath. Tip 15mm	Cath. Tip 20mm
Pregnancy rate	37,1%	48,6%	58,6%
Implantation rate	18,2%	28,6%	31,8%

Minimizing the retention of embryos during embryo transfer

Practical steps to minimize the retention of embryos

- Avoid blood at the tip of the inner ET catheter
- Remove mucus from external os and cervical canal before ET
- Keep the volume of ET media 10-15 microliters
- Maintain adequat pressure on the syringe
- Withdraw the catheter slowly after ET

Ultrasound guided embryo transfer

- Transabdominal ultrasound-guided ET was first suggested by Strickler in 1985 (Fertil Steril., 1985, 43, pp54-61)
- Various reasons have been advanced to justify the use of this technique

Reasons for ultrasound guided embryo transfer

- To exclude any newly developed contraindications to ET (hydrometra..)
- To measure endometrial thickness
- To measure the uterocervical angle and bend the tip of the catheter accordingly
- To confirm that the embryo(s) was deposited inside the uterine cavity
- To deposit the embryo(s) in the area of maximum implantation potential
- To confirm that the embryos(s) was not displaced from the uterine cavity

Ultrasound guided embryo transfer Pronatal

- Retrospective evaluation of 4000 transfers of fresh and frozen-thawed embryos
  (2000 „clinical touch“, 2000 ultrasound-guided)
- ET „clinical touch“ – catheter COOK Soft-Pass
- ET US-guided – catheter COOK Echotip Soft-Pass

- Monitoring: transabdominal, full bladder technique

Ultrasound guided embryo transfer Sanatorium Pronatal (all cycles)

	No. of ET	**Pregn.±SD (%)**
Clinical touch	**2000**	**24,0±3,78**
US-guided	**2000**	**29,3±2,27**

Ultrasound guided embryo transfer
Sanatorium Pronatal (ET vers. FER)

	ET	KET
Clinical touch	**29,2±5,67**	**17,5±5,21**
US-guided	**32,1±3,71**	**25,9±3,9**

The objective of the study was to investigate in a prospective, descriptive, noncomparative study if there are factors detectable during transabdominal ultrasound-guided ET influencing the results of in vitro fertilization and ICSI.

Statistics: multivariate logistic regression analysis

Ultrasound-guided ET (phase II)
factors affecting ET results

- Quality of embryotransfer
- Catheter visualisation
- „Jet“ phenomenon
- „Fresh“ vers. frozen-thawed embryos
- Influence of transferring physician

Overview and results of univariate analysis

No. of transfers	Pregnancies	%
1623	498	30,7

- „fresh“ ET 1005 (61,8%) 330 pregn. (32,8%)
- „frozen“ET 618 (38,2%) 168 pregn. (27,2%)

p=0,015

The influence of quality of ET on IVF results

- **Quality 1** = easy ET with soft catheter only
- **Quality 2** = outer sheet necessary to introduce soft catheter
- **Quality 3 = tenaculum ot blood on catheter tip**
- **p=0,131**

Quality	No.ET	%	Pregn.	%
1	1208	74,7	374	30,9
2	314	20,3	98	31,2
3	71	5,0	14	19,7

The influence of catheter visualisation on IVF results

- 1 - excellent visualisation duting the whole ET
- 2 - problematic visualisation, but tip identification possible
- 3 – poor visualisation

p=0,413

Visual.	No.ET	%	Pregnancies	%
1	1253	77,4	390	31,1
2	276	17	82	29,7
3	64	3,9	15	23,4

The influence of „jet-phenomenon“ on IVF results

- „Jet“ + : free flow
- „Jet“ - : only „depot“ visible

p=0,413

JET	No. ET	%	Pregnancies	%
+	1366	84,2	427	31,3
-	227	15,8	58	25,7

The influence of physician factor on IVF results
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Physician	No.ET	PR (%)
1	60	**72**
2	123	54
3	106	45
4	107	53
5	40	55

Conclusions

The introduction of ultrasound-guided soft catheter embryotransfer technique improved results and lowered the variability of the results.

(less traumatic, standardized and technically precise transfers of embryos)

Difficult embryo transfer

- A difficult embryotransfer significantly affects implantation and pregnancy rates after IVF
- Differences in the angulation of the endocervical canal and the endometrial cavity are the most common reasons for difficult ET

Difficult embryo transfer

- Cervical dilatation
- Hysteroscopic correction of cervical stenosis
- Laminaria
- Transabdominal transmyometrial transfer
- Transvaginal transmyometrial transfer
- Transtubal embryo transfer