Abstract Details

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★ **Abstract title:**

Effect of accurate temperature regulation during incubation on embryo quality after ICSI: a prospective sibling oocyte study on two incubation temperatures (36.6°C or 37.1°C)

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Study question:

Does accurate and stable incubation temperature at 36.6°C or 37.1°C affect the embryo quality after ICSI?

Summary answer:
Fertilization rates and embryo quality were comparable between the 36.6°C and 37.1°C arm but ongoing pregnancy and implantation rates were higher after incubation at 37.1°C

What is known already:
The primary function of an IVF incubator is to maintain an appropriate microenvironment (temperature and gas composition) for gamete function and embryo development. Although the developmental plasticity of embryos allows them to develop over a wide temperature range, the pre-implantation development is significantly affected in incubators that show a low micro-environment stability. Since most commercial IVF incubators show important temperature variations (up to 1.0°C), reliable studies that accurately determine optimal incubation temperature are scarce. So far, contradicting results on pregnancy data have been obtained when comparing culture temperatures.

Study design, size, duration:
A single-centre prospective randomized controlled trial (100 cycles) was performed between May and November 2016, after approval by the local ethical committee of the university hospital. An electronically generated randomisation list was used to allocate half of the mature oocytes to the 36.6°C or the 37.1°C arm. The primary endpoint was embryo quality on day 3 and day 5/6; secondary endpoints were fertilization and embryo utilization rates. Additionally, pregnancy outcomes were recorded.

Participants/materials, setting, methods:
Ninety-nine ICSI cycles which fulfilled the following criteria were included: at least six mature oocytes, use of ejaculated sperm and extended culture to day 5/6. Sibling oocytes were cultured in the same G210 incubator (K-Systems, Denmark) at 36.6 ± 0.05°C (chamber 1 to 5) or 37.1 ± 0.05°C (chamber 6 to 10) from the time of ICSI up to day 5/6.

Main results and the role of chance:
A total of 1432 cumulus-oocyte-complexes were retrieved of which 1153 were mature and randomised for culture at 36.6°C (n= 572) or 37.1°C (n= 581) after ICSI. Fertilization was comparable in the two groups (80.4% at 36.6°C and 78.3% at 37.1°C) as well as the number of good quality embryos on day 3 (78.3% and 79.6%) and the number of good quality blastocysts on day 5 (53.8% and 55.8%). Embryo utilization rates were also similar (40.0% versus 40.4%).

A fresh embryo transfer (ET) on day 5 was scheduled for 72 patients (two without ET due to insufficient embryo quality) and a freeze all strategy was scheduled for 27 patients (one without freezing). Fifty-nine single ET (SET) (28 from the 36.6°C group and 31 from the 37.1°C group) and 11 double ET were performed. The clinical pregnancy rate after SET was significantly higher when culture was performed at 37.1°C (77.4% versus 46.4%; p=0.029, Chi Square test).**Limitations, reasons for caution:**
This trial was designed to detect a possible effect of incubation temperature on embryo quality and not on the treatment outcome. An RCT (36.6°C versus 37.1°C) with clinical pregnancy rate as primary endpoint is planned in order to confirm the present findings.

Wider implications of the findings:
Modern direct-heat bench-top incubators with individual incubation chambers allow extreme stable temperatures and fast recovery after lid openings, which might be the future for embryo culture. Strict temperature control during incubation is indicated to obtain excellent results.