

Standard protocol definition for human oocytes selection based on morphological and structural data and preliminary scoring algorithm results

Vaccina A³, Alviggi C¹, Pivonello R², Colao A², Cariati F², Doronzo V³, Leo P³

Motivation

In recent years, the number of couples requesting for assisted fertilization is increasing. This is due not only to genetic and environmental factors but also to socio-economic ones leading to pregnancy in more advanced age. Recently, both scientific and legislative aspects (Italian law 40/2004) prompted researcher to focus on effective oocyte selection methods in order to choose gametes with highest quality and potential for good embryo development. In this scenario, it is of a great importance the development of a decision support system able to classify oocytes according to a score based on morphological features and patients' clinical data. The system will support biologists in oocyte non-invasive selection for fertilization in order to identify the ones with the highest probability of grade 1 embryos generation. Moreover, it is important to underline that the system will offer a more effective and objective selection method because it will not depend from embryologist experience or from "at first sight" impression.

Methods

In order to reach this goal, as a first step, it was necessary to closely work with doctors and biologists in order to identify main morphological features influencing oocyte quality, assign them a weight and find the better way to measure them from high quality images analysis. After that, it was developed a standard data format collecting in an organized way all oocytes morphological features, zygote and embryo ones and patients' clinical data. At the same time, an image acquisition protocol was identified and a standard way of capturing them was defined. This was done by detecting optimal standard microscope settings in order to maximize measure extraction efficiency. Finally, oocyte images were collected for eight months and used as a first data set to test a preliminary version of the score algorithm and to discover unknown co-relations among clinical patient data/oocyte morphological features/embryo quality.

¹ DIPARTIMENTO DI SCIENZE OSTETRICO-GINECOL. UROLOGICHE E MEDICINA DELLA RIPRODUZ. Università degli Studi di Napoli Federico II ² DIPARTIMENTO DI ENDOCRINOLOGIA ED ONCOLOGIA MOLECOLARE E CLINICA Università degli Studi di Napoli Federico II ³ IBM GBS BAO Advanced Analytics Services and Molecular Biodiversity LABoratory

Results

As a first result, more than 150 oocytes images, taken in standard and comparable conditions, from 35 women were collected. Starting from them it was possible to keep the morfological features extraction and organization according to the standard format previously developed. All the oocyte images data were also enriched with clinical data and post fertilization zigote and embryo quality parameters. This standard data acquisition format has been evaluated very helpful by doctors and fertilization technicians of the Naples Federico II Hospital so that it is currently used by them in their daily activities to have a clear idea of clinical senario before and after fertilization. As a next result, a preliminary version of the scoring alghoritm was tested on these data. At the moment, the score effectiveness is under evaluation by medical experts. Anyway, it is possible to concluce that the results of this activities are important for doctors and fertilization experts because, they are now able to acquire images in a more consistent and standard conditions, to quikly collect all data in a structured format, to have a clear picture of all medical data and a quantitative metric that is actullay supporting their experience in oocyte selection.

Contact e-mail

antonella_vaccina@it.ibm.com

Supplementary information

The idea of oocyte selection methodology was conceived by medical doctors (CA, CAM, PR) and biologists (CF) of University of Naples Federico II, whereas bioinformatic analisys has been designed by IBM Researchers (LP, VA, DV).