A new method of biopsying trophectoderm (TE) cells using the latest Saturn 5™ Laser System, offers several potential ways to improve procedures

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ABSTRACT

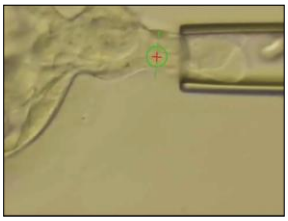
Since its release at ESHRE 2012, the Saturn 5 Active™, combining the software driven "Biopsy Mode" functionality and advanced laser hardware, has successfully been used by clinics for various types of embryo biopsy. Preliminary findings suggest a reduced procedure time and easier ablation of the biopsy cells, potentially causing less trauma to the embryo.

BACKGROUND

Blastocyst biopsy is a popular method employed to get a multiple cell sample for PGD or PGS. As it is still a relatively new technique for most centres, no defined protocols have as yet emerged.

Moreover, individual biopsy procedures can be vastly different, depending on the embryo itself – the quantity of hatched cells and proximity to the ICM have a major influence on the exact biopsy method employed by the practitioner.

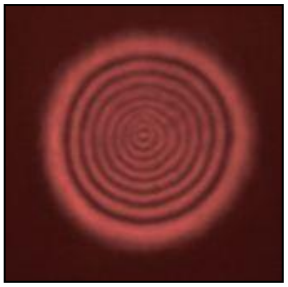
Typically (and ideally), the blastocyst will be held in such a way that the ICM is not close to the herniating cells. Aspiration on the biopsy needle will pull 5-10 TE cells into the pipette and single laser shots fired at cell junctions will steadily release the tension (more often than not, the blastocyst will collapse during this part of the procedure).



Care should be taken not to fire the laser in the same location more than once, as this causes the cells to “plastify” or harden, making an already challenging technique even more difficult.

If the selected cells do not come clean away then the practitioner moves on to a mechanical method of scraping the biopsy needle against the holding pipette to separate the cells (the risks here are causing additional trauma to the embryo and of cells lysing leaving sticky cytoplasm and traces of DNA in the biopsy needle.)

However, recent improvements to the equipment used for this procedure, mean that an alternative method is now available.

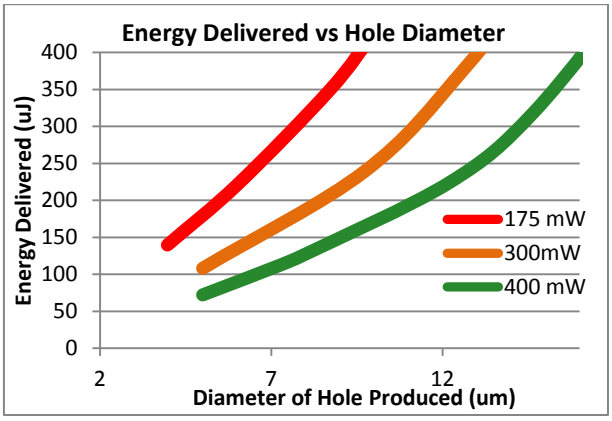


Research Instruments Ltd (RI) manufactures the “Saturn” series of lasers which have been used clinically since 2000. The key design features have always been to increase the speed and ease of procedures and to ensure the safety of the embryo. RI’s Saturn™ Laser systems use fibre optic technology to deliver both an infra red ablation laser, as well as a visible “pilot” laser to guarantee the firing position prior to use. Although these parts of the equipment have not significantly changed, the newer Saturn™ Laser Systems have been improved by increasing the power, and developing the software used to operate the laser.

The original Saturn™ systems brought to market had a fixed power of 140 mW, which was increased periodically to 175, 200, 300 and as they currently stand at 400 mW.

Tests carried out using both the mouse model (in house)[1] and clinical human (donated, spare) samples (CRGH, UCL, London, UK) have shown that with an increase in source power, the total energy needed to make a particular size hole in the ZP, reduces significantly.

Data collected courtesy of CRGH, UCL, London, UK



In addition to this, the latest Saturn™ Laser can fire accurately at any location on the screen due to moving parts.

Advances in the software controlling the laser now also allow the user to define a path for the laser to follow, as well as selecting an optimum pulse time and overlap of shots. This is known as “Biopsy Mode”.

In preliminary clinical procedures using this method for blastocyst biopsy, the laser is first used on day 3 to drill the ZP. On day 5/6, the selected TE cells which have herniated from the ZP are aspirated into the biopsy needle with maximum tension applied. Then a line is drawn across the section where the cells are to be separated from the rest of the blastocyst. The laser is applied and the biopsied cells should be able to come clean away.

Clinics pioneering this technique have suggested this gives a reduced procedure time, fewer incidences of the blastocyst collapsing and less need to mechanically separate the biopsied cells.[2]

DISCUSSION

Although the preliminary findings point to an improved method of TE biopsy, more data needs to be collected before we have absolute figures pertaining to a) the length of procedure time saved and b) the lower incidence of blastocyst collapse and the need to mechanically tear off the cells.

REFERENCES

[1] “A comparison of different power levels used by laser systems” Rob Thompson, White Paper published by RI June 2012.

[2] Initial post market surveillance feedback from “Vitalab”, Johannesburg; “Care Clinic”, Durban; CRGH, London.