

**P-156 Automatic pronuclear detection based on deep learning technology has clinical utility**

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**Study question:** Does the performance of an automatic pronuclear detection system based on deep learning technology have clinical utility?

**Summary answer:** Output results for 2PN detection using the automatic system powered by deep learning technology has clinical utility.

**What is known already:** In order to establish a more objective embryo evaluation system, we have been developing an automatic pronuclear detection system that utilizes deep learning technology based on Time- Lapse (TL) images. We have previously reported that the accuracy of pronuclei detection was improved by introducing an analysis method using 11 slices in the Z axis. In this study, we evaluated the potential clinical practicality of the automatic pronuclear detection system.

**Study design, size, duration:** Embryos clinically evaluated between May 2018 and December 2019 by embryologists were chosen for this study. We prepared for analysis TL videos of 995 embryos that had been evaluated as having 0, 1, 2, and 3PN.

**Participants/materials, setting, methods:** Part1: We compared the outputs of the automatic pronuclear detection system with these embryologists (three junior embryologists (1a), three intermediate embryologists (1b), and three senior embryologists (1c)) who had judged the pronuclei number from TL videos from 40 embryos each having 0, 1, 2, and 3PN.

Part2: The automatic pronuclear detection system determined the pronuclei number from the TL videos of 955 embryos scored as either 1, 2, and 3PN, (different from those used in Part1), and the detection rate for 2PN was calculated.

**Main results and the role of chance:** Part1: The sensitivities for embryologist groups 1a), 1b), 1c) and the automatic pronuclear detection system were 80.0%, 100%, 100%, 100% for 2PN, 60.0%, 83.3%, 86.7%, 100% for 0PN, 46.7%, 80.0%, 86.7%, 10.0% for 1PN, and 73.3%, 96.7%, 96.7%, 10.0% for 3PN.

Part2: The precision for 2PN by the automatic pronuclear detection system was 99%.

**Limitations, reasons for caution:** In order to further improve the performance of the automatic pronuclear detection system, further adjustment of the algorithm and more training images will be utilised.

**Wider implications of the findings:** The detection of 2PN by the automatic pronuclear detection system was highly reliable, and the performance of the system was comparable to that of embryologists. These first results are reassuring and support the clinical use of the system as a further aid for embryologists, in routine laboratory practice.

**Trial registration number:** 'not applicable'