Relative force of human epididymal sperm

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OBJECTIVE: To assess the relative escape force of human epididymal sperm using a laser generated optical trap and compare it with that of human ejaculated sperm.

DESIGN: Evaluation of the relative force generated by epididymal and ejaculated sperm using an 800-nm laser-generated optical trap system (titanium-sapphire,model 899-01; Coherent Innova, Palo Alto, CA).

SETTING: University-based facility at the Beckman Laser Institute and Medical Clinic and Center for Reproductive Health, University of California, Irvine.

INTERVENTIONS: A total of 2,720 sperm from 28 samples were randomly analyzed.Fifteen were ejaculated samples (1,650 sperm) obtained from men with proven fertilization, and 13 were epididymal samples (1,070 sperm) aspirated microsurgically from patients with obstructive azoospermia. An optical trap equipped with the 100x Neofluar objective was used to analyze an average of 100 sperm per patient.

MAIN OUTCOME MEASURES: Determination of mean relative escape force values in milliwatts for epididymal and ejaculated sperm samples.

RESULTS: The mean relative escape force for epididymal sperm was 32.4 mW,significantly lower than ejaculated sperm, which was 85.1 mW. By correlating epididymal sperm relative force with fertilization in vitro at an arbitrary cutoff value of 30 mW, it was found that no fertilization occurred if a sample had < 13% of sperm at that value.

CONCLUSIONS: [1] The average relative escape force of the epididymal sperm was found to be 60% weaker than that of ejaculated sperm. [2] It is demonstrated that the noncontact laser optical trap is a sensitive tool that can evaluate single sperm force as a new physiological parameter.