ISRCTN22596524 https://doi.org/10.1186/ISRCTN22596524

Effect of transient scrotal hyperthermia on spermatogenesis

Submission date	Recruitment status	[_] Prospectively registered
18/11/2015	No longer recruiting	[_] Protocol
Registration date	**Overall study status**	[_] Statistical analysis plan
21/11/2015	Completed	[X] Results
Last Edited	**Condition category**	[_] Individual participant data
15/10/2020	Other	

Plain English summary of protocol

Background and study aims
The testes of most animals, including humans, are in the scrotum outside the main body cavity and are thus 2–8°C below the core body temperature. Scrotal hyperthermia (elevated temperature) could disrupt sperm production and lead to a decreased sperm count. However, most studies are based on animal models, and we still don't know the relationship between scrotal heat stress and the degree of damage to sperm production. The mechanism of disruption of sperm production is also unclear. Therefore, this study aims to investigate the effect of scrotal hyperthermia on human sperm production and to understand the related mechanism.

Who can participate?
Healthy men aged 22–50 who are married, have fathered at least one child, and do not plan to father another child.

What does the study involve?
Participants are randomly allocated into one of the two groups. All of the participants undergo testicular warming at 43°C in a water bath 10 times, for 30 minutes each time. In brief, the lower half of the body of each participant is soaked in a bathtub in which the water is regulated to be 43°C. For participants in Group 1, this is carried out once a day for 10 consecutive days while for subjects in Group 2, it was once every 3 days, 10 times. The treatment phase is followed by a recovery phase of 16 weeks. Blood samples are collected before and every 3 weeks after the water bath treatment, a total of 6 times. Semen samples are collected twice before the water bath treatment and every 2 weeks after, for a total of 10 times.

What are the possible benefits and risks of participating?
The main benefit for participants in this study is the evaluation of their semen quality and reproductive hormone levels, which are good markers for their health status. The results of this study will improve our understanding of the risks of high scrotal temperature. There are no risks for participants in this study.

Where is the study run from?
Huazhong University of Science and Technology (China)

When is the study starting and how long is it expected to run for?
May 2013 to August 2015

Who is funding the study?
Ministry of Science and Technology of the People's Republic of China

Who is the main contact?
Prof Changhong Zhu
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
N/A

Study information

Scientific Title
Effect of transient scrotal hyperthermia on spermatogenesis

Study objectives
Previous studies have shown that cryptorchidism and varicocele can seriously affect spermatogenesis, mainly due to the elevated temperature of the scrotum. However, those studies were mainly retrospective. The heat stress intensity and exposure time lacked accurate quantification, and the relationship between heat exposure frequency and the degree of spermatogenesis damage was not explored.

Hypothesis: Transient scrotal hyperthermia could reversibly affect spermatogenesis

Ethics approval required
Old ethics approval format

Ethics approval(s)

Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology, 28 /11/2012, No. 20130311

Study design
Single-center interventional randomised controlled trial

Primary study design
Interventional

Study type(s)
Other

Health condition(s) or problem(s) studied
Spermatogenesis

Interventions
Subjects were initially randomized into one of the two groups, each group consisting of 10 volunteers. All of the subjects underwent testicular warming at 43°C in a water bath 10 times, for 30 min each time. In brief, the lower half body of each subject was soaked in the bathtub in which the water was regulated to be 43°C. To maintain the water temperature constant, we continuously added the adjusted hot water (43°C) into the bathtub, and we also drained the water from the bathtub by the same flow rate. For subjects in Group 1, this was carried out once a day for 10 consecutive days while for subjects in Group 2, it was once every 3 days, 10 times. The treatment phase was followed by a recovery phase of 16 weeks.

Intervention Type
Other

Primary outcome(s)
Semen samples were collected twice before treatment and at week 2, 4, 6, 8, 10, 12, 14 and 16 after treatment. The samples were obtained from each subject by masturbation after between 3 and 7 days of sexual abstinence.

1. Sperm concentration, sperm motility and total sperm count were observed under a microscope.
2. Total acrosin activity was measured using a commercially available kit (HuaKang, Shenzhen, China).
3. Seminal plasma biochemical markers including semen plasma fructose, zinc and neutral alpha glucosidase, were all tested by using enzymic and spectrophotometric methods.
4. Semen plasma oxidative stress was evaluated by the markers of superoxide dismutase (SOD), catalase (CAT) activity and malondialdehyde (MDA), these markers were all tested by using a spectrophotometric method.

Venous blood samples were collected before treatment and at week 3, 6, 9, 12, 15 after treatment, 4 ml for each time. Blood samples were used for reproductive hormone assays, including follicle stimulating hormone (FSH), luteinizing hormone (LH), sex hormone binding globulin (SHBG), estradiol (E2), testosterone and free testosterone. All these hormones were tested using a chemiluminescent immunoassay method on the automated UniCel DxI 800 analyzer.

Key secondary outcome(s))
Semen samples were collected twice before treatment and at week 2, 4, 6, 8, 10, 12, 14 and 16 after treatment. The samples were obtained from each subject by masturbation after between 3 and 7 days of sexual abstinence.
1. Sperm DNA integrity was detected using flow cytometry
2. Sperm apoptosis was evaluated using mitochondrial membrane potential commercial assay kit and TdT-mediated dUTP nick-end labeling (TUNEL) assay kit
3. Sperm protein levels were analyzed by using a western blotting method.

Completion date
30/08/2015

Eligibility

Key inclusion criteria
1. Male
2. 22–50 years old
3. Married and having fathered at least one child
4. No plan to father another child
5. Good health without hypertension or trauma

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Sex
Male

Total final enrolment
20

Key exclusion criteria
1. Not married or have no children
2. Plan to have another child
3. Cryptorchidism or varicocele
4. Severe heart, brain or renal disease
5. Could not commit to finishing the experiment

Date of first enrolment
01/05/2013

Date of final enrolment
20/07/2013

Locations

Countries of recruitment
China

Study participating centre
Family Planning Research Institute
Tongji Medical College
Huazhong University of Science and Technology
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Study participating centre
Reproductive Medicine Center
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Sponsor information

Organisation
Chinese Academy of Sciences (China)

ROR
https://ror.org/034t30j35

Funder(s)

Funder type
Government

Funder Name
Ministry of Science and Technology of the People's Republic of China

Alternative Name(s)

Chinese Ministry of Science and Technology, Ministry of Science & Technology, People Republic of China, , Ministry of Science and Technology (China), State Science and Technology Commission, MOST

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
China

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	01/11/2016	15/10/2020	Yes	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes