Semen Quality in Infertile Men with a History of Unilateral Cryptorchidism

P. Tzvetkova¹, Wei-Jie ZHU², D. Tzvetkov³

1. Department of Immunoneuroendocrinology, Institute of Biology and Reproductive Immunology, Bulgarian Academy of Science, Sofia, Bulgaria
2. Center for Reproductive Immunology Research, Jinan University, Guangzhou 510632, China
3. Department of Urology, Medical University, Sofia, Bulgaria

Objective To evaluate semen quality in infertile men with a history of unilateral cryptorchidism

Methods Semen samples were obtained from 47 infertile men with a history of unilateral cryptorchidism. Semen analysis and membrane integrity including both eosin Y stain and hypo-osmotic swelling tests were performed using standard procedures. All men were divided into three groups according to their age at surgery of orchidopexy as follows: group A, 2–7 years (n=23), group B, 8–13 years (n=14) and group C, 14–17 years (n=10).

Results There was wide range for sperm count and motility for all the subjects studied. Majority of men had high percentage of abnormal sperm morphology. Among the three groups of men, group A and B had significantly higher sperm count, motility and membrane integrity than that of group C. Group C also had the highest frequency of oligoasthenoteraozoospermia (50%) than group A (17%) and group B (35%).

Conclusion Semen quality of men with a history of unilateral cryptorchidism appears to be related to their age at performing orchidopexy. Surgery at early age of childhood may improve spermatogenesis which results in better semen quality in adulthood.

Key words: cryptorchidism; sperm; infertility; orchidopexy

Cryptorchidism is a common disorder of sexual differentiation that affects about 0.8% to 3% of full term male newborns. Numerous studies have demonstrated that cryptorchidism is also a major risk for male infertility[1,2]. In infertile patients, 5% to 10% infertile men have...
a history of cryptorchidism\textsuperscript{3, 4}. Most of untreated cryptorchidism patients with bilateral maldescent developed azoospermia\textsuperscript{5}. However, for men with unilateral cryptorchidism, their sperm parameters have not fully been evaluated. In the present study, we investigated the semen characteristics of infertile men with a history of unilateral cryptorchidism to evaluate the influence of age at orchidopexy on semen quality.

**Materials & Methods**

**Patients**

Forty-seven men with a history of unilateral cryptorchidism who came to the infertility clinic were included in this study. The age of men were ranged from 22 to 38 years old and they have suffered infertility for 2 to 9 years since marriage. All these patients had undergone a unilateral orchidopexy previously. According to the age at operation, 47 patients were divided into three groups. Group A, B, and C consisted of 23, 14, and 10 cases, respectively. The ranges of their age at surgery were 2–7, 8–13, and 13–17 years, respectively.

**Semen analysis**

Semen samples were obtained by masturbation after 3 to 7 d of sexual abstinence. Semen analysis were performed according to the World Health Organization (WHO) laboratory manual\textsuperscript{6}. Sperm concentration and grading of motility were quantified with a Makler chamber. Sperm morphology was assessed after slide staining with the modified Papanicolaou-staining method and using strict criteria. WHO criteria were used for the classification of oligozoospermia, teratozoospermia, and asthenozoospermia.

**Sperm membrane integrity test**

Sperm membrane integrity of head and tail regions were assessed by the combined hypoosmotic swelling and eosin Y exclusion (HOS-EY) test, as previously described\textsuperscript{7}. After treatment with hypoosmotic medium and eosin solution, the sperm head stained red (EY positive) or unstained (EY negative) was observed, and the swelling phenomena of sperm tail was determined. One hundred sperm were counted and classified into the following four categories according to morphological changes of membrane at both head and tail regions: Type I, head-red (EY+) and tail-non-swollen (HOS-); Type II, head-white (EY-) and tail-non-swollen (HOS-); Type III, head-red (EY+) and tail-swollen (HOS+); Type IV, head-white (EY-) and tail-swollen (HOS+). Type IV is viable sperm with intact membranes at both head and tail regions.

**Data Analyses**

The results were presented as $\bar{x} \pm s$. Difference between two groups was evaluated by the Student’s $t$-test. A difference with $P<0.05$ was considered significant.
**Results**

For three groups, all cases had the previously cryptorchid testis in the scrotum at the time of re-examination. Unilateral reduced testis size of the previously cryptorchid gonad was observed in 1 case in group B, and 3 cases in group C, respectively. No men of reduced consistency of the previously retained testis were found.

Table 1 presents the results of semen analysis and membrane integrity for all the three groups evaluated. In general, most samples had high sperm abnormal morphology rates. In particular, half of patients in group C demonstrated a severe teratozoospermia, their sperm abnormal morphology rates were 96%–100%. All the subjects had motile sperm observed in ejaculate. Sperm motility ranged from 4%–57%. Motility of group C was significantly lower than that of group A or B (P<0.01).

In three groups sperm count ranged from 1–52×10⁶/mL. Five in group A, 6 in group B, and 6 in group C had sperm counts below 20×10⁶/mL, among which 5 cases were below 5×10⁶/mL of severe oligozoospermia. The values of Type IV membrane integrity in group A were highest among three groups. Sperm with Type III membrane integrity ranged from 3%–11%, and sperm with Type II occurred sparsely. Besides, based on the standards of WHO manual[6], 14 patients presented oligoasthenoteratozoospermia (Table 2).

**Table 1 Results (x ± s) of semen analysis and membrane integrity**

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>Motility (%)</th>
<th>Count (×10⁶/mL)</th>
<th>Abnormal morphology (%)</th>
<th>Type IV membrane (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>23</td>
<td>41.3 ± 14.4*</td>
<td>34.6 ± 15.5*</td>
<td>90.6 ± 6.7</td>
<td>55.7 ± 9.2*</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>39.2 ± 11.6*</td>
<td>28.5 ± 14.6*</td>
<td>92.9 ± 4.8</td>
<td>47.2 ± 7.7*</td>
</tr>
<tr>
<td>C</td>
<td>10</td>
<td>25.7 ± 15.2</td>
<td>16.4 ± 9.9</td>
<td>95.2 ± 3.9</td>
<td>32.5 ± 8.2</td>
</tr>
</tbody>
</table>

* P<0.01, compared with group C

**Table 2 Oligoasthenoteratozoospermia (OAT) in three groups**

<table>
<thead>
<tr>
<th>Groups</th>
<th>n</th>
<th>No. of OAT</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>23</td>
<td>4</td>
<td>17.4</td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>5</td>
<td>35.7</td>
</tr>
<tr>
<td>C</td>
<td>10</td>
<td>5</td>
<td>50.0</td>
</tr>
</tbody>
</table>

**Discussion**

Cryptorchidism is a frequent cause of male infertility. Undescended testes have abnormal microenvironment for their spermatogenesis. In cryptorchid testes, maturation arrest of germ cell is most frequently observed, which is related to poor fertility[6,9]. While in unilateral cryptorchid males, much remains to be learned regarding their spermatogenesis.
In the present study, sperm were observed in ejaculate for all men studied. The range of sperm concentrations varied from <1 to $52 \times 10^6$ /mL, and most of them had $<20 \times 10^6$ sperm/mL. In addition, many of them had low sperm motility and defective sperm membrane integrity in head and tail regions. High sperm abnormal morphology was also frequently observed in these men. Therefore, low sperm count, motility, and poor sperm morphology may explain why most of these men with unilateral cryptorchidism have impaired fertility after surgery orchidopexy. Obviously, some men with unilateral cryptorchidism still do not have normal spermatogenesis for the descended testis after the surgery. Histologic studies have also revealed bilateral testicular lesions in most cases of unilateral cryptorchidism. In some 40% of patients with unilateral cryptorchidism, the total number of germ cells from bilateral testicular biopsies do not exceed the numbers found in bilaterally cryptorchid patients, indicating a deficiency in both testes. Besides, cryptorchidism in humans is often associated with inherent defects of spermatogenesis.

A tendency toward an increase on the incidence of cryptorchidism has been noticed over recent decades in many countries. Several studies suggest that two major steps in maturation of the hypothalamo-pituitary testicular axis occurs during the prepubertal period, the first at 2–4 months and the second at 4–5 years of age. Therefore, early correction of an undescended testis would have positive effects on spermatogenesis. In this study, we observed that semen quality were the best in group A, which was in agreement with the results of previous investigations. It indicated that orchidopexy at earlier age of childhood may improve spermatogenesis which results in better semen quality in adulthood.

Surgical correction is a common treatment for men with unilateral cryptorchidism because it does decrease its potential for pathologic deterioration. However, even if the testis is brought into normal scrotal position, orchidopexy in some patients does not guarantee paternity. Some patients, especially in group C with poor semen may require treatment with intracytoplasmic sperm injection (ICSI). Because ICSI only require a single motile sperm to fertilize an oocyte. Thus, ICSI should be a better alternative treatment for those with severe oligospermic semen. However, some men in both group A and B had reasonable semen quality but may still failed to produce pregnancy. Therefore, semen analysis results is still accurate indicator for fertility in these men. It is possible that other subtle sperm defects affecting sperm fertilizing capacity can not be revealed by routine semen analysis.

In conclusion, semen analysis of men with a history of unilateral cryptorchidism appears to relate to the age of orchidopexy. Surgery at early age of childhood may results in better semen quality in adulthood.
References


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Conference Information

The XIXth Asian and Oceanic Congress of Obstetrics and Gynecology
October 01, 2005 – October 05, 2005
Seoul, South Korea
The topic areas of the scientific program will cover gynecologic oncology, gynecologic endocrinology, maternal-fetal medicine, and general gynecology including urogynecology and related subjects to meet the congress objectives.
Some important dates:
Abstract submission Due: April 30, 2005
Acceptance Notice: May 31, 2005
Contact: AOCOG 2005 Secretariat
Fax: +82 2 521 8683
E-Mail: aocog2005@insession.co.kr

1st Beijing International Conference on Obstetrics and Gynecology
October 07, 2005 - October 10, 2005
Beijing, China
The scientific program will explore diverse topics and will provide participants with an exciting forum to exchange views on the latest research and knowledge in obstetrics and gynecology on a global scale. The program will include invited lectures, free paper presentations and posters. Special seminars with distinctive Chinese features, such as Traditional Chinese Medicine in Ob/Gyn, Women’s Health Care in China, etc., will also be held during the conference.
Contact:
For participants from China:
   International Department
   Chinese Medical Association
   Beijing, China
   E-mail: icog2005@cma.org.cn
For international participants:
   International Conference Secretariat
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9th International Union against Sexually Transmitted Infections (IUSTI) World Congress
November 15, 2005-November 18, 2005
Bangkok, Thailand
Fees: USD 350 before May 31, 2005, Expected Attendance: 400
The focus of our conference theme will be “STI/HIV: Multidisciplinary Approaches  East Meet West”.
Contact: Dr. Verapol Chandeying
Fax: (66-2) 286 3013
E-Mail: verapol.c@psu.ac.th