Sperm Motility Characteristics and Pregnancy Outcome of Artificial Insemination with Husband's Semen for Male Infertility

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What parameter of semen has influence on the pregnancy outcome of artificial insemination with the husband’s semen (AIH) with washed sperm for male infertility was investigated. Two hundred fifteen cycles in 62 patients of AIH with washed sperm for male infertility were prospectively studied. We compared six parameters (total sperm count, motility rate, sperm motile efficiency (SME) both before and after washing) in pregnant and non-pregnant cycles. SME of washed sperm was significantly higher in the pregnant than in the non-pregnant cycles (241.0±68.0 vs. 169.5±80.0). There were no differences in other five parameters between pregnant and non-pregnant cycles. SME, the parameter of sperm motility characteristics, of washed sperm is closely related to the outcome of AIH for male infertility. Sperm motility characteristics after washing may be one of the important indexes of the result of AIH for male infertility.

Artificial insemination with the husband’s semen (AIH) is one of the representative methods for infertility. Indications for AIH are varied in each facility and have been done by various technic with greatly varying pregnancy rates. As for male infertility, the efficacy of AIH has been discussed (Kerin et al. 1984; Hughes et al. 1987; Ho et al. 1989). There are many parameters of semen and sperm characteristics, and their relationships to fertility are investigated. Total counts of sperm and sperm motility rate do not always predict their fertility (MacLeod and Gold 1951; Sokol and Sparks 1987), therefore, the relationships between sperm motility characteristics and fertility are investigated (Hinting et al. 1988). The criteria of male infertility consisted of many parameters and there is no report...
on what parameter has influence on pregnancy outcome of AIH for male infertility.

The aim of this study is to clarify if there are any relationships between the pregnancy outcome of AIH for male infertility and parameters of semen and sperm motility characteristics. We have analyzed these parameters both before and after washing and compared them in pregnant and non-pregnant cycles in our 215 cases of percoll AIH for male infertility. It may furnish useful information about the efficacy of the methods.

**Materials and Methods**

From March 1, 1992, to May 31, 1994, 62 infertile couples underwent 215 AIH cycles (mean of 3.48 cycles/patient) in Tohoku University Hospital. The mean age of the men was 35.5 years while the mean duration of infertility was 5.3 years. The semen analysis was done at least twice. The criteria of male infertility consisted of patients with poor semen quality according to the World Health Organization guidelines (World Health Organization 1989). The details of it were concentration \( < 20 \times 10^6 / \text{ml} \) and/or motility \( < 50\% \) and/or normal forms \( < 50\% \). The etiological classifications of male infertility patients in this study were varicocele 7, chronic infection 12 and idiopathic 43. Female infertility factors were ruled out by evaluation of basal body temperature (BBT), hysterosalpingography, postcoital test, and laparoscopy.

Among all women, spontaneous ovulation was 130 cycles, induced ovulation by clomiphene was 26 cycles and induced ovulation by human menopausal gonadotropin (HMG; Nikken, Tokyo) or pure follicle stimulating hormone (Fertinomp; Serono, Tokyo) was 59 cycles. Follicular development was assessed by measurement of serum E2 and transvaginal ultrasonography. The timing of insemination was decided by detection of urinary luteinizing hormone (LH) assay (L-check; Nipro, Osaka). AIH was performed 24 hr after the detection of urinary LH \( > 20 \text{ IU/liter} \). In the case of absent urinary LH surge, 10,000 IU of human chorionic gonadotropin (hCG) was administered when the diameter of the dominant follicle was larger than 18 mm. AIH was performed 36 hr after hCG administration. Semen samples were collected by masturbation and liquefied for 30 min. Samples were washed and concentrated by 80% percoll monolayer at 300 G for 20 min. The sperm pellet was resuspended in 0.5 ml of Hank's solution. Intrauterine insemination was performed using a disposable AIH catheter (Sumitomo, Tokyo). Pregnancy was confirmed by detecting elevated levels of hCG in urine on or after day 16 of the luteal phase using hCG test pack (Dainabot, Tokyo).

The parameters of semen are: 1) total sperm count, 2) motility rate and 3) sperm motile efficiency (SME). SME is determined in the following ways: The semen is diluted 20-fold with physiological saline solution and examined in a Thoma's hemocytometer (Erma, Tokyo). The number (N) of spermatozoa pass-
Fig. 1. Sperm motile efficiency (SME) = \( \frac{N}{d} \times 100 \) motile efficiency (ME)/min.
N, Number of spermatozoa passing 0.1 mm equivalent quarter line in one minute.
d, Sperm density in millions per ml.

There were 13 clinical pregnancies of which 3 had spontaneous abortion (all these were blighted ovum). The pregnancy rate was 6.0% per cycle and 21.0% per couple. There was no significant difference between the mean age and mean duration of infertility in pregnant and non-pregnant cycles. Among the pregnant cycles spontaneous ovulation was 4 cycles, induced ovulation by clomiphene was 2 cycles and induced ovulation by HMG or FSH was 7 cycles. The SME of washed sperm was higher in pregnant than in non-pregnant cycles (241.0 ± 68.0 vs. 169.5 ± 80.0). There were no significant differences between the other parameters.

### Table 1. Parameters of semen of pregnant and non-pregnant cycle

<table>
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<tr>
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<th>Pregnant cycle (13)</th>
<th>Non-pregnant cycle (202)</th>
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<tbody>
<tr>
<td></td>
<td>Before washing</td>
<td></td>
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<tr>
<td>Total sperm count (million)^b</td>
<td>43.1 ± 35.7^a</td>
<td>54.16 ± 53.31</td>
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<tr>
<td>Total motility rate (%)</td>
<td>54.2 ± 11.5</td>
<td>51.7 ± 14.1</td>
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<tr>
<td>SME^c (ME/min)</td>
<td>101.0 ± 42.3</td>
<td>71.9 ± 52.5</td>
</tr>
<tr>
<td></td>
<td>After washing</td>
<td></td>
</tr>
<tr>
<td>Total sperm count (million)^d</td>
<td>10.5 ± 8.9</td>
<td>9.7 ± 8.5</td>
</tr>
<tr>
<td>Total motility rate (%)</td>
<td>86.1 ± 6.7</td>
<td>79.4 ± 15.2</td>
</tr>
<tr>
<td>SME (ME/min)</td>
<td>241.0 ± 68.0**</td>
<td>169.5 ± 80.0</td>
</tr>
</tbody>
</table>

^a Values are means ± S.D.
^b Total count of whole ejaculated sperm
^c SME: Sperm Motile Efficiency
^d Total count of collected sperm
**Pregnant cycle is significantly higher (p < 0.01)
in pregnant and non-pregnant cycles (Table 1).

DISCUSSION

The efficacy of AIH for male infertility has been widely discussed; many reports indicated the effectiveness (Kerin et al. 1984) but some concluded that AIH was not effective (Hughes et al. 1987; Ho et al. 1989). The criteria of male infertility consist of many parameters and there is no report on which parameter has an influence on the pregnancy outcome of AIH for male infertility. Clarifying this will furnish useful information to decide on the indication of this method.

In the present study, the relationships between the outcome of AIH for male infertility and the parameter of semen and sperm motility characteristics were evaluated. There was no significant difference of sperm count and sperm motility rate per se between pregnant and non-pregnant cycles. As for SME of washed sperm, significant difference between pregnant and non-pregnant cycles was obvious. SME was first reported by Ishii et al. (1977). SME reflects motile sperm concentration and speed of liner progressive spermatozoa. According to Ishii et al. (1977) the mean SME of fertile cases is 152.7 ME/min and the lowest score of it is 69 ME/min.

Concerning sperm motility and fertility, Aitkin et al. (1982) have shown that in oligozoospermic patients the percentage of motile spermatozoa correlates significantly with the sperm fertilization capacity. H intim g et al. (1988) reported that the rapid liner progressive motility, measured by the computer analyzer, is the most important parameter to evaluate the fertility. As for the relationship between the pregnancy outcome of AIH and the sperm motile characteristics, Arn y and Quagliarello (1987) reported the sperm motility percentage after swim-up had a significant role in the pregnancy outcome in 25 couples of cervical factor infertility. Tarlatzis et al. (1991) have reported in 111 AIH cycles for male infertility, there was no difference of motility rate between in pregnant and in non-pregnant cycles both before and after washing.

We could demonstrate for the first time, from our 215 cycles of AIH for male infertility, SME, the sperm motility characteristics of washed sperm, have influence on the outcome of AIH. The number of AIH cycles are far greater in this study compared with other reports. Clinically, SME is a handy method to assess the sperm motile characteristics, because it can be measured by using only a hemocytometer and in a short time without any costly apparatus. We, therefore, conclude that the motility characteristics of collected sperm after washing may be one of the important factors of AIH for male infertility, and neither sperm count nor sperm motility rate per se predicts the outcome of AIH. To improve pregnancy rate in male infertility patients, other treatment methods should be considered in case of repeated low SME.
Sperm Motility Characteristics and Pregnancy Outcome of AIH

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References


