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Original Article

The sperm parameters and prediction of IUI success

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Abstract

Aim: We aimed to compare the different sperm motility parameters in pregnant and non-pregnant patients who underwent IUI in our tertiary center.

Material and Methods: Total of 110 gonadotrophin plus IUI patients were evaluated between 2017 January and January 2020 in this retrospective study. Some demographic features and infertility time, post-wash sperm parameters and basal hormone levels were compared between pregnant and non-pregnant patients and the regression analysis method was used to evaluate IUI success between other parameters.

Results: Endometrial thickness (9.1±1.4 vs.7.6±1.4) on hCG triggering day and , post-wash progressive sperm motility value together with the a ratio and infertility time were correlated well with IUI success (ie pregnacy result) between 38 pregnant and 72 non pregnant patients.

Conclusion: After wash progressive sperm ratio may predict IUI success with infertility time and endometrial thickness.

Keywords: Intrauterine insemination; infertility; motile sperm

INTRODUCTION

Intrauterine insemination (IUI) is a procedure in which processed and concentrated motile sperms are injected directly to the uterine cavity with the help of a cannula ,36 hours after ovulation and requires at least an open tube, ovulation and sufficient number of sperm (1). Because of its relatively low cost and simplicity, intrauterine insemination (IUI) is frequently used as a first line strategy in the treatment of a high proportion of infertile couples. Endometriosis, ovulatory disorders, male subfertility and unexplained infertility constitute the some of the indications approved for IUI`s efficiency (2).

The presence of various infertility factors, the different sperm preparation techniques, methods of ovarian stimulation, the numbers of cycles performed and patient selection criterias such as age and etc. may explain the different pregnancy rates after IUI (3). For IUI success, there is a debate about semen characteristics. However, some studies showed that the total number of motile inseminated sperm count was correlated well with the pregnancy rate others declared no such correlation (4).

Some researchers detected a positive correlation between after-wash sperm motility and pregnancy rates while others reported that there was no difference between pre or post processing semen analysis parameters in IUI patients (5-7).

Therefore, in the light of the above literature data, it is observed that there is not yet a clear sperm parameter in determining IUI success (8,9). Based on this, we aimed to compare the different sperm motility parameters in pregnant and non-pregnant patients who underwent IUI in our tertiary center.

MATERIAL and METHODS

This retrospective study was performed by using the medical records of 110 couples who applied to the infertility center of Balikesir University Medical Faculty Hospital between 2017 January and 2020 December after ethics approval by the same university. We categorized our 110 IUI patients into two groups: primary and secondary infertile. Only patients with the first IUI trial were included in the study. Age, infertility duration, gonadotropin doses and after washing sperm parameters were obtained from the patient records. We also divided the patients into two main groups as with and without pregnancy and evaluated their relationship in terms of after washing sperm parameters.

Unexplained infertile patients with normal uterus and at least one tubal patency in Hsg were our inclusion criteria. Women with antral follicle count (AFC) <6, FSH >12 mIU/mL, previous ovarian surgery, male infertility, endomet¬riosis, uterine fibroids, systemic diseases, body mass index (BMI) ≥40 kg/m and women age >40 years

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were our exclusion criterias. We also excluded 9 patients with multifollicular development and 7 patients with poor follicle development.

At our infertility clinic, following 3-5 days of sexual abstinence, semen samples were collected from the male partners by masturbation. Sterile plastic containers were used for sperm storage. It was allowed to stand at room temperature for 30 minutes to allow liquefaction to occur. Density centrifugation technique was used for semen preparation. Each specimen was covered with double volume Ham's F10 medium (Merck, Germany) and warmed at 37 C for 45 min. For gonadotropin plus IUI method, all women were given rec-FSH beginning at the second day of menstruation till at least one 18 mm follicle was detected under ultrasonography. At that time subcutaneous hCG were injected for follicle rupture. Thirty-six hours later 0.5-1 mL of the processed fresh sperms was injected in to the uterine cavity slowly and gently. After withdrawing the uterine catheter, patients were allowed to have a rest in the supine position for 30-45 minutes. We gave 200 mgr. daily vaginal progesterone for luteal phase support until 12 weeks of gestation if patient conceived (10) and after 14 days following IUI, we measured serum β-hCG level to confirm clinical pregnancy.

Statistical analysis

We used SPSS version 25 for statistical analysis. We used Anova test for multiple regression analysis in order to compare our parameters with pregnancy results.

The differences were considered to be statistically significant if P value was less than 0.05 at a confidence interval of 95%.

RESULTS

A total of 110 infertile patients who met the study criteria were included in this study. In the whole group the clinical pregnancy rate was calculated as 30 (27.0 %). The age of the patients ranged from 19-40 years and BMI values

Table 1. Some demographic characteristics of the patients

	Yes pregnancy (38)	No pregnancy (72)	P value
Age	28.8±4.2	28.6±4.9	0.073
İnfertility Time	2.4±1.6	4.1±1.7	**0.001**
BMI(Body Mass Index)	23±2.3	24±3.3.2	0.084
Estradiol	44.5±20.0	47.3±21.0	0.057
FSH	8.6±3.2	7.3±2.0	0.061
LH	6.6±3.5	5.8±3.0	0.053
TSH	2.1±1.0	2.5±1.4	0.061
Endometrial thickness	9.1±1.4	7.6±1.4	**0.023**
Total gonadotrophin dose	726±332	729±336	0.087
Duration of treatment	11.9±3.8	12.1±4.2	0.641
TPMSC (10^6) (Pretreatment)	30.7±14.6	29.7±14.4	0.058
İnfertility type			0.068
Primary	23 (60.5)	50 (69.4)	
Secondary	15 (39.4)	22 (30.5)	
Sperm concentration	92.0±80.0	93.3±90.1	0.053
Total sperm count	274.1±88.1	294.1±198.0	0.070
Semen Volume	3.0±1.3	3.3±1.5	0.082
Sperm Concentration After Washing	48.3±40.1	49.5±45.9	0.056
Afterwash a	72.3±15.4	68. ±24.0	**0.032**
Afterwash b	7.7±5.0	6.7±5.6	0.067
Afterwash c	7.6±7.5	10.4±7.5	0.059
Afterwash d	12.3±10.0	13.5±14.0	0.065
Afterwash progressive motility	80.1±13.6	75.0±20.1	0.069

Table 2 . Regression Analysis: Pregnancy Status versus Sperm and other parameters Method (Analysis of Variance)

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression		17	3.0169	0.17747	0.76
Sperm concentration ()	1		0.730	0.11	0.011
Total sperm count	1	0.1832	0.18318	0.79	0.379
Semen Volume (ml)	1	0.0144	0.01441	0.06	0.804
A value after washing (%)	1	0.0710	0.07096	0.30	0.038
B value after washing (%)	1	0.0715	0.07146	0.31	0.582
C value after washing (%)	1	0.2049	0.20492	0.88	0.352
D value after washing (%)	1	0.0465	0.04648	0.20	0.657
Total motility after washing (%)	1	0.2129	0.21291	0.91	0.343
Progressive motility after washing	1	0.1590	0.15899	0.68	0.412
Sperm Concentration After Washing	1	0.0881	0.08808	0.38	0.541
Women Age	1	0.0957	0.09568	0.41	0.524
Total gonadotrophin dose	1	0.0181	0.01811	0.08	0.821
Basal FSH	1	0.4826	0.48255	2.07	0.155
Basal E2	1	0.2687	0.26871	1.15	0.287
Basal TSH	1	0.0644	0.06443	0.28	0.601
Infertility Duration	1	0.2986	0.29857	1.28	0.042
Infertility Type	1	0.3821	0.38211	1.64	0.205
Total	85	18.8837			

[A ratio: fast forward movement ,B ratio :(slow, nonlinear motion), C ratio : (move in place), D ratio :(immobile)]

were between 20-33 kg/m^2. There were no statistically significant differences between pregnant and non-pregnant patients in terms of age. Infertility duration was significantly shorter in the preg¬nant group than in the nonpregnant group (2.4±1.6 years vs. 4.1±1.7 years; p<0.001).

Demographic characteristics are shown in Table 1. No statistically significant differences were observed between the groups regarding those parameters (p>0.05) with the exception of endometrial thickness (9.1±1.4 vs.7.6±1.4.; p<0.001) on hCG triggering day and post-wash progressive sperm motility value together with the a value. (p< 0,041) (Table 1)

Since many factors can affect the chance of conception, we added all parameters to the multivariable analysis table to investigate which of the parameters will affect pregnancy rates the most.Total gonadotrophin doses and duration of treatments were shown in table 1.

We demonstrated that there is a postitive correlation between sperm concentrations (p< 0.011post-wash a value (p<0.038) and infertility duration (p< 0.042) with pregnancy results (Table 2). We did not find any significant differences between other sperm parameters, BMI, total sperm count, basal hormone levels, totally used gonadotropin dose and infertility type with pregnancy result in regression analyses.

DISCUSSION

The purpose of this retrospective study was to clarify the elements influencing IUI results in order to manage for a preferable patient selection and estimation of success rates after IUI treatment. We studied multiple parameters such as endometrial thickness, after wash sperm mobility ratios, total gonadotropin dose, infertility type and duration with their relation of IUI success and pregnancy result. At the end of our study, we detected that endometrial thickness and progresive sperm motility parameter significantly correlated with IUI success. We also detected that there was a significant correlation with infertility duration and the pregnancy result.

In our study we found that endometrial thickness had an effect on IUI success.In some studies, it was showed that endometrial thickness were higher in patients who conceived. In two of studies performed by Esmailzadeh and Faramarzi it was showed that on the day of ovulation

trigger, mean endometrial thickness were higher in IUI cycles when pregnancy were reached.(10.1 mm vs. 7.7 mm) (11,12). On the contrary, Masrout MJ et al did not find any correlation between endometrial thickness and pregnancy (13).

In studies, total progressively motile sperm count has various effects on IUI and pregnancy success. When the studies related to sperm parameters are analyzed, the most significant deficiency is that there is no standard regarding when and how researchers calculate the sperm motility and its contribution to becoming pregnant. For example, some researchers use the ratio of progressively motile sperm count and other researchers use total motile sperm count (14).

Ombelet et al claimed that total progressive motile sperm count greater than 10 million may be accepted as a threshold in terms of pregnancy success in IUI cycles. In our study we found post-wash sperm fast forward movement ratio(A-ratio) significantly correlated with the pregnancy success. Considering that the motile sperm will reach the oocyte faster, we can say that our result is in a logical way suitable for normal physiology and with Ombelet`s study (15).

Female age is another parameter influencing the IUI success rate. It is showed in studies that more the women`s age more the deterioration in oocyte numbers and quality (16). We also find a significant decrease in IUI success as the duration of infertility is prolonged. Since there are contradictory results on this subject in the literature, it is clear that the etiology and severity of infertility such as endometriosis or male factors are more critical than the duration of infertility but in our study we did not find any significant differences between primary and secondary infertile groups in terms of pregnancy. This may be due to the many factors such as socioeconomic, pharmacologic and lifestyles which we did not take into account (17).

Although age is very important in women reproductivity, we did not find any correlation with post-wash sperm parameters and IUI success in terms of age. This result can be explained by the young age of our patient group, ie, 28 of the average age. Ejzenberg et al. and Erdem et al in their studies indicated that there were no correlation between women age and pregnancy rate compatible with our study (18,19). If the number of our patients from the older age group was relatively higher, we could have determined a cut off age for IUI success. According to the basal hormone levels such as FSH and E2 concentrations (p: 0.15 and p:0.28) we did not detect any significant differences in terms of pregnancy success. In literature,two of the studies performed by Merviel et al and Mullin et al found the same correlation like our study but on the other hand Dinelli et al determined a significant decrease of IUI success rate with the basal FSH levels greater than 7 mIU/mL unlike our study (20-22).

In our study, we may not have found a meaningful result as we excluded some factors that will cause a decrease in ovarian reserve such as older age, previous surgery and endometriosis patients (23).

Total used gonadotropin dose did not correlate with our pregnancy results. In order to avoid OHSS and multiple pregnancy, we tried not to give high doses of gonadotrophins and that`s why we did not find any significant differences in our study like Scchieri et al and Wu et al (24,25). In present study our IUI success rate (% 30) is above the average success rate. (% 15-20). This may be due to the younger age and good ovarian reserve of our patient group, and also applying the density centrifugation technique to all patients and frequent follow up. The retrospective feature and low number of samples can be accepted as the disadvantages of our study. Future researches with prospective nature and larger samples size may confirm our results.

CONCLUSION

In this study, we wanted to investigate various factors that may affect IUI success, especially sperm parameters after washing. As a result of our study, we calculated our IUI success rate as 30%. Although there are many factors in predicting IUI success, we found that the rate of post-wash advanced motile sperm; the endometrial thickness and the duration of infertility affect the IUI success rate mostly. Large-scale studies with a larger number of patients may increase our treatment success by enabling us to evaluate factors affecting IUI success more clearly.

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Ethical approval: This study was approved by the Institutional Ethics Committee and conducted in compliance with the ethical principles according to the Declaration of Helsinki.

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