RELATIONSHIP BETWEEN SPERM COUNT AND SEMINAL HYPERVISCOSITY AND IUI OUTCOME

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Abstract

Intrauterine insemination (IUI) is a method that has been used for infertile couples in fertility treatment for many years. IUI is the first referenced assisted reproductive technique (ART) for mild to moderate male infertility. The objective of this study was to investigate the effect of increased seminal viscosity and pregnancy outcome in patients undergoing intrauterine insemination (IUI). It was carried out on couples who consecutively attended an infertility clinic and they were grouped into 100 couples with male partner had high seminal viscosity as study group and 100 couples with moderate seminal viscosity as the control group underwent the study. IUI cycles were preceded with ovarian stimulation. Total sperm count and IUI pregnancy rates were evaluated. It was observed that the sperm count was significantly reduced in patients with seminal hyperviscosity and the IUI pregnancy rate was higher in patients with normal seminal viscosity. Thus seminal hyperviscosity is an important parameter for the prediction of successful IUI pregnancy in this study.

Key words:

IUI, seminal hyperviscosity, Assisted reproductive techniques, Ovarian stimulation.

Introduction

Intrauterine insemination (IUI) is frequently used as a first line strategy in the treatment of a high proportion of infertile couples such as male factor infertility or unexplained infertility because of its relatively low cost and simplicity [1]. IUI is a procedure in which spermatozoa are placed directly into the uterine cavity through a catheter near the time of ovulation [2]. Several semen parameters have been shown to correlate with IUI outcome such as number of motile sperm, sperm count and normal morphology [3].

Semen hyperviscosity (SHV) is another condition observed among the infertile patients in some cases and this could be a possible cause of male infertility as it is associated with changes in the physical and chemical characteristics of semen [4]. Seminal hyperviscosity occurs in 12%-29% of ejaculates and hyperviscous seminal fluid has been shown to have a negative impact of sperm motility and semen quality [5], and contributes to a poor outcome with fertilization.

It has been observed that very few studies have been done regarding seminal hyperviscosity and its association with assisted reproductive techniques such as intrauterine insemination (IUI). So the aim and objective of the present study was to investigate the relationship between seminal hyperviscosity and pregnancy outcome in patients undergoing intrauterine insemination (IUI) and to evaluate the association of semen hyperviscosity with sperm count.

Materials and methods

Patients

A prospective study was conducted in patients undergoing IUI at the Disha Fertility and Surgical Center, Saket Nagar, Indore, M. P. They were candidates for IUI because of male factor infertility or unexplained infertility. This study comprised of two groups of patients. In the first group (Group 1 or Control Group), one hundred couples with male partners had normal seminal viscosity. In the second group (Group 2 or Study Group) 100 couples with male partners had moderate or high seminal viscosity. All couples underwent a basic infertility evaluation. A complete semen analysis, after 2-4 days of abstinence, was done according to the WHO criteria, 1999.

In both groups (Group 1 & Group 2), the couples were categorized in to three age groups as 21-25 years, 26-30 years and 31-35 years according to male partners' age. In each age group, there were evaluation between seminal hyperviscosity and other semen parameters and their association with IUI pregnancy rate. Diagnostic work ups for female patients in group 1 and group 2 included physical examination, hormonal assay, hystero-salpingography, base line sonography and laparoscopy within normal limits.

Ovarian stimulation & ovulation induction

In both groups ovarian stimulation / induction, was done by Clomephene citrate (clomid, India) with dose of 100/50 mg was given from Day 2 of menstrual cycle to day 6. The medication is given in tablet form and taken orally. Cycles were monitored by transvaginal ultrasound for the Mean follicular diameter and thickness of the endometrium on days 10, 12, and 14 of the cycle. When at least one or two follicles measured 18 mm or more diameter, 10,000/5000 IU of human chorionic gonadotrophin (hCG; Profasi; Serono Benelux) injection were given intramuscularly to initiate ovulation. Intrauterine insemination was done 36 hours after hCG administration. A repeat USG (ultrasonography) is done 10-12 hours after IUI.

The WHO criteria were considered for normal semen analysis. Semen samples from the male partner were collected after 48-72 hours of sexual abstinence. The semen sample was collected by masturbation one hour and 15 minutes prior to IUI. Specimens were allowed to liquefy for up to 1 hour after collection and the viscosity was estimated by aspirating the sample into a wide-bore plastic disposable pipette, allowing the semen to drop by gravity and observing the length of the thread that is formed. A normal sample leaves the pipette in small drops with very little trailing thread. A semen sample that is abnormally viscous will form a thread more than 2 cm long and estimated the length of the thread formed between two droplets.

Sperm count was expressed as $x10^6$/ml semen with Makler counting chamber.The semen was prepared either by swim-up or density gradient centrifugation based on the quality of the raw semen. The washed sperms are injected directly into the uterus with the help of a fine catheter under ultrasound guidance to bypass the natural cervical mucus barrier. Luteal phase support was given to improve the success of IUI with the help of progesterone capsules (Sustene-VT 400/200 unit) or injections (hCG 1000 IU) started from the day of IUI and continued for 14 days A serum β-hCG after 14 days of IUI will detect pregnancy.

Results and Discussions

In this study it was observed that the Mean values of pre wash sperm count in group 1 were comparable to group 2 of all age groups. There was a highly significant increase in sperm count observed in the age group 31-35 years in group 1 vs. group 2. The Mean pre wash sperm count in the age group 21-25 yrs in group 1 is higher as compared to the same age group in group 2. But this difference was statistically not significant (P>.05). The Mean pre wash sperm count of the patients with normal seminal viscosity (group 1) is statistically higher as compared to patients of abnormal seminal viscosity (group 2).

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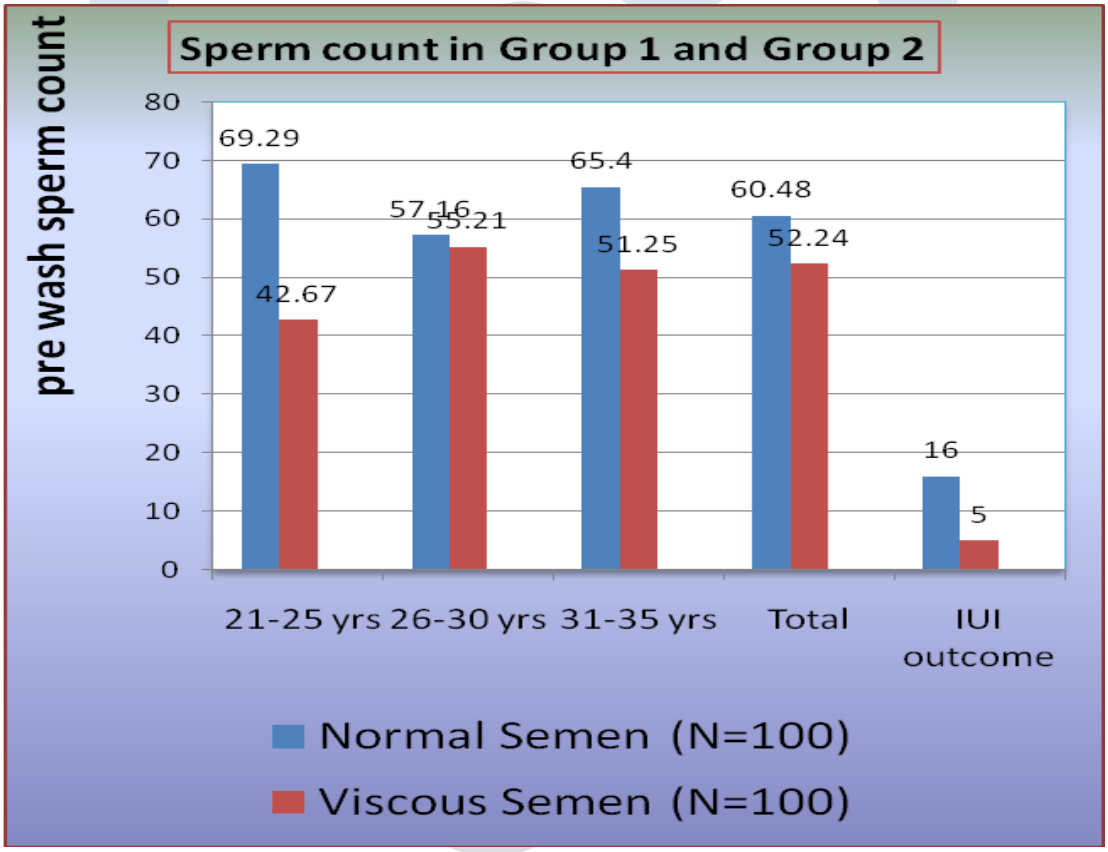

Figure1: Sperm count in Group 1 and 2

This observation is in accordance with previous experimental data which has shown that semen hyperviscosity has an adverse effect on sperm count [6, 7]. It was observed in this study that, in patients with normal seminal viscosity there were no decrease in mean sperm count with increase in age.

But in patients with seminal hyperviscosity the mean sperm count was decreased with increased age (31-35 yrs) may be due to the fact that hyperviscosity increases with increasing age. This observation agrees with previous studies [8,9,10]. This reduced sperm count may also due to the decrease in human seminal antioxidants in patients with seminal hyperviscosity which negatively affects sperm parameters.

The results of this study demonstrated that the patients with sperm count <20m/ml (oligozoospermia), there were no IUI pregnancy observed in group 1 and group 2. While the maximum pregnancy was observed in normospermic (normal ejaculate) patients in both the groups and this pregnancy was 15.46 % in group 1 which was statistically significant as compared to 6.8% in group 2(Table:1)

Sperm Characteristics	**Normal Semen (N=100) (Group 1)**			**Viscous Semen (N=100) (Group 2)**			**P value**
	N	**Pregnancy (N)**	**Success rate (%)**	**N**	**Pregnancy (N)**	**Success rate (%)**	
Oligozoospermia (sperm count <20m/ml)	3	0	0	9	0	0	0.05*
Normozoospermia (sperm ount >20m/ml)	97	15	15.46	91	6	6.6	

Table No: 1 Comparison of Sperm count with IUI pregnancy in Group 1 (Normal Semen) and Group 2 (Viscous Semen)

An important step in IUI is the sperm washing. Washing technique significantly improve sperm motility and the percentage of good grade sperms by removing non sperm cells and sperm count was again calculated. This is the post wash sperm count. The Mean values of post wash sperm count in patients with seminal hyperviscosity (group 2) showed reduced sperm count as compared to patients with normal seminal viscosity (group 1), which is statistically significant (Table:2).

Male Age Group	Post wash Sperm Count (m/ml)				p value
	Normal Semen (N=100) (Group 1)		Viscous Semen (N=100) (Group 2)		
	N	Mean & SD	N	Mean & SD	
21-25 yrs	7	58.14±17.81	6	22.50±19.95	.007*
26-30 yrs	63	36.6±15.53	38	36.97±16.95	.917
31-35 yrs	30	43.77±15.56	56	33.32±15.25	.004*
Total	100	40.27±16.53	100	34.06±16.30	.008*

Table No.2 - Comparison of Post wash Mean Sperm Count in Group 1 (Normal Semen) and Group 2 (Viscous Semen)

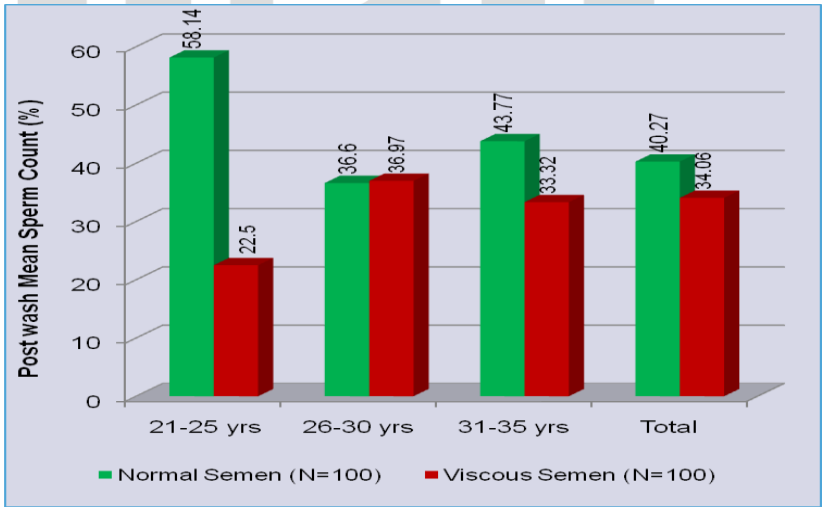

Figure2: Post wash sperm count in Group 1 and group 2

This observation agrees with studies done by Elzanaty et al [11] ,Curi et al [12]and Du Plessis et al [13]. Due to the high viscosity of the seminal fluid the spermatozoa are tangled in the fibrous or mucoid mass in the semen and prevented from migrating properly. Another study [8,14] revealed that decrease in total antioxidant concentration in seminal plasma of patients with hyperviscosity is one of the probable mechanisms for sperm parameters abnormality

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In the present study it was found that seminal hyperviscosity resulted in significantly lower IUI pregnancy rate compared to the normal seminal viscosity groups. Furthermore, hyperviscosity samples were characterized by a significantly lower percentage of sperm count in comparison to the normal seminal viscosity group ($P<0.001$)

It is suggested that the patients with seminal hyperviscosity have antisperm antibodies (ASA) in their seminal plasma which cause infertility in males. Antisperm antibodies were found in men with chronic prostatitis also. It is suggested that the presence of antisperm antibodies in the sperm of the male partner may induce an immune response in the female partner. Antibody induced deficit of the fertilization process will not be completely circumvented by IUI.

Conclusions

Seminal hyperviscosity (SHV) is often found in infertile men and negatively influences IUI pregnancy outcome and other seminal kinetic parameters such as sperm count. In this study it was found that sperm count was significantly decreased in patients with seminal hyperviscosity. This is an important semen characteristic that determine the success rate of intrauterine insemination (IUI). The causes and consequences of SHV have been studied in the past, further research is still necessary in order to better understand the contributors to the development of hyperviscous semen and the mechanism through which hyperviscosity impairs male fertility both in vivo and in vitro.

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