Comparative Study of Predictive Value of 2D Ultrasonography, Doppler of the Endometrium before and after HCG Injection on the Outcome of IVF/ICSI Cycles

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Abstract

Objective: Is to compare the value of measuring endometrial thickness and sub-endometrial blood flows by 2D ultrasound and Doppler to predict pregnancy during IVF/ICSI treatment.

Study Design: 50 women candidate for IVF. Two D ultrasound and color, Doppler of blood flow and endometrial thickness were studied on the day of HCG administration in the sub-endometrial zone and remeasured at day of embryo transfer. Patients were divided into two groups: Group A included 21 women with successful outcome (pregnancy) and Group B included 29 women with failure of pregnancy.

Results: There was no significant difference between endometrial thickness measured before and after HCG triggering and between pregnant and non pregnant women (p>0.5). The mean RI in patients before HCG injection was higher than that after HCG injection, the difference is statistically significant (p-value 0.025). The mean RI in no pregnancy group is higher than in pregnancy group, the difference, is statistically significant (p-value <0.01). The mean PI in patients before HCG injection was higher than that after HCG injection the difference is statistically significant (p-value 0.034).

The mean PI in no pregnancy group is higher than in pregnancy group, the difference is statistically significant (p-value 0.02). The mean S/D ratio is higher in patients before HCG injection than that after HCG injection, the difference is statistically significant (p-value 0.041).

The mean S/D ratio is lower in pregnancy group, the difference is statistically significant (p-value 0.04).

Conclusion: Assessment of sub-endometrial blood flow by 2D colour Doppler ultrasound performed before and after HCG injection in patients undergoing IVF/ICSI cycle is a good predictor of pregnancy rate.

Key Words: Endometrial thickness – Sub-endometrial vascularity – Doppler – IVF outcome – Pregnancy rate.

Introduction

ASSISTED Reproductive Techniques (ART) are important addition to the armamentarium against infertility, and are now within reach of the mass population, even in developing countries [1].

Recent developments in ART have led to enhanced embryo quality however, improving the all-important implantation rate has so far proven elusive; even on transfer of 'good' embryos the pregnancy and "take-home baby" rates have not improved dramatically [2].

The success of implantation relies on fetal, endometrial and uterine factors. Clinical assessment of the endometrial and uterine factors can be performed by ultrasound. Imaging techniques such as ultrasound and colour Doppler have helped increase our understanding of normal endometrial physiology, and various scoring systems and grading have been suggested based on such measurements to predict endometrial receptivity to the transferred embryos [3].

Successful implantation depends on a close dialog between the blastocyst and the receptive endometrium. Different strategies have been developed to evaluate endometrial receptivity, such as the histological dating of an endometrial biopsy [4].


Ultrasound examination of the endometrium is a commonly used non-invasive method to assess endometrial receptivity during IVF/ICSI treatment. A good blood supply towards the endometrium is usually considered to be an essential requirement.
for implantation and therefore assessment of endometrial blood flow in IVF/ICSI treatment has attracted a lot of attention in recent year [7].

Doppler study of uterine arteries does not reflect the actual blood flow to the endometrium. Endometrial and sub-endometrial blood flows can be more objectively and reliably measured using Doppler ultrasound.

Resistance Index (RI), Pulsatility Index (PI) and Systolic/Diastolic ratio (S/D) express the resistance to flow from the point of measurement downstream. The value increases when resistance increases, and vice versa. The diastolic flow is considered to be influenced by resistance to a greater extent than the systolic flow.

However, conflicting results are reported with regard to the role of endometrial thickness, pattern, endometrial and sub-endometrial blood flows in the prediction of pregnancy in IVF/ICSI treatment [8].

Ultrasound parameters including endometrial thickness, endometrial pattern, Doppler study of uterine arteries and endometrial blood flow have been used to assess endometrial receptivity during IVF/ICSI treatment. Assessment of endometrial blood flow adds a physiological dimension to the anatomical ultrasound parameters and has drawn a lot of attention in recent years [9].

The aim of our study is to compare the value of measuring endometrial thickness and sub-endometrial blood flows by 2D ultrasound and Doppler on the day of triggering with HCG and on the day of embryo transfer to predict pregnancy during in-vitro fertilization IVF/ICSI treatment.

Material and Methods

This prospective observational study was undertaken at the IVF Unit of Department of Obstetrics and Gynecology Kasr El-Ainy Hospital in the period from July 2012 to July 2013.

The study was approved by local ethical committee and informed written consent was obtained from all participants. Fifty women indicated for IVF-ET/ICSI for primary or secondary infertility with various etiologies like tubal, male, unexplained factors. All participants were not less than 20 years old and not more than 38 years old. They all received the long agonist protocol and a preliminary office hysteroscopy before the IVF cycle to exclude intrauterine pathology and uterine factors of infertility. Women with uterine anomalies such as: Septate or bicornate uterus or previous uterine surgery and those having any uterine pathology such as myomas, intrauterine adhesions were excluded from the study. Women with pelvic or ovarian endometriosis and women who needed the short agonist or antagonist protocols and poor responders were also excluded.

The patients were subjected to history taking, including age, duration, type and cause of infertility and medical history. Full examination including general and abdominal and vaginal examination was done followed by ultrasound evaluation for presence of 3 or more pre-antral follicles and exclusion of ovarian cysts.

Basal day 3 hormonal evaluation for FSH, LH and E2 in a natural cycle was done.

All participants underwent long protocol. Daily SC injection of Triptorelin 0.1mg (Ferring, Switzerland) 0.1mg started at day 21 of the cycle prior to stimulation cycle and continued till the day of hCG injection. Gn stimulation started after fulfilling stimulation start criteria of thin endometrium <5mm and low E2 <50 and LH <5IU/l [10]. With either HMG (Menogon; Ferring, Switzerland) or rFSH (Gonal-f; Merck Serono, Germany) in a starting dose of 150-300IU/day depending on patients age and previous gonadotropin response then the dose was adjusted according to ovarian response monitored by serum E2 and ultrasound evaluation. All patients were followed-up by transvaginal ultrasound scan daily or on alternate days according to the ovarian response to treatment starting on treatment cycle day [7] for folliculometry and endometrial thickness and pattern.

When there were at least two leading follicles, patients were examined after spontaneous emptying of the urinary bladder, lying supine with the knees slightly bent (lithotomy position) and with a small pillow under the buttocks, using a transvaginal transducer with colour Doppler facility, when a longitudinal view of the uterus was obtained, the colour Doppler mode was activated. Sub-endometrial blood flow was studied. The blood flow and endometrial thickness was recorded on the day of HCG administration in the sub-endometrial zone using a model GE Voluson 730 ultrasound apparatus at the Fetal Medicine Unit.

After a true longitudinal view of the uterus was obtained, the endometrial thickness was measured as the maximum thickness between the highly reflective interfaces of the endometrial-myometrial junction. The measurement includes both layers of the endometrium. The surrounding low-amplitude echo layer was excluded, because it represents the inner layers of the myometrium.
The zones of vascular penetration into the sub-endometrial and endometrial regions have been defined as: Zone I i.e. the sub-endometrial zone, Zone II is the outer hyperechogenic zone and Zone III is the inner hypoechogenic zone.

After completion of the B-mode examination a pulsed Doppler system was used for blood-flow analysis. The blood-flow velocity waveforms from the sub-endometrial vessels were obtained by placing the Doppler gate over the colour area and activating the pulsed Doppler function Fig. (3).

A recording was considered satisfactory when at least five consecutive waveforms were obtained, each demonstrating the maximum Doppler shift.

The resistance index (RI=peak systolic velocities-peak diastolic velocities/peak systolic velocities) Fig. (1), pulsatility index (peak systolic velocities-peak diastolic velocities/mean flow throughout the cycle (S-D/mean) Fig. (2) and S/D ratio, all were calculated on three consecutive uniform waveforms. Patients had two or three embryos replaced into the uterine cavity 3 or 5 days after the retrieval. Surplus good quality embryos were frozen.

Triggering by HCG 10000 IU IM (Pregnyl, Organon, the Netherlands) when at least 2 follicles reached a mean diameter of 18mm [10].

Cycle cancellation was decided when transvaginal ultrasound scan on cycle day [9] revealed no adequate follicular growth (<3 mature follicles).

Ovum Pick-Up (OPU) was done 34-36 hours after hCG injection under transvaginal ultrasound guide.

Metaphase II oocytes were analyzed. ICSI procedure was performed in all cases. Fertilization was assessed 16-18h after ICSI and embryo quality was evaluated 2 and 3 days after ICSI was determined according to the number of blastomeres and the degree of fragmentation and multinucleation (Brinsden 2005). Oocytes were collected and embryos were cultured in ISM 1 culture medium (Origio medicult media, Denmark).

Transfer of cleaving embryos was done on day 3 after oocyte retrieval (using Labotect semi-rigid catheter; labotect GmbH, Germany). The blood flow and endometrial thickness were recorded again on the day of embryo transfer.

Luteal phase support was given by 100mg intramuscular progesterone daily (Prontogest, Amsa, Italy). A blood pregnancy test (quantitative 0- HCG) was done 14 days after embryo transfer and if positive, ultrasound examination was performed three weeks after embryo transfer to confirm intrauterine pregnancy and to determine the number of gestational sacs present. Only clinical pregnancies were defined by the presence of one or more gestational sacs.

Patients were divided into two groups: Group A included 21 women with successful outcome (pregnancy), documented by positive pregnancy test, documented by Serum P-hCG levels measured 14 days after Embryo Transplantation (ET), and ultrasound showing intrauterine gestational sac, six weeks following ET and Group B included 29 women with failure of pregnancy, documented by a negative serum pregnancy test.

Fig. (1): RI of sub-endometrial blood flow=0.63 before (A) and 0.49 after (B) HCG in pregnancy group.
Fig. (2): PI of sub-endometrial blood flow=1.2 before (A) and 1.02 after (B) HCG in pregnancy group.

Fig. (3): Colour Doppler showing no sub-endometrial vascularity.

Fig. (4): High RI (A) and PI (B) of sub-endometrial blood flow in no pregnancy group.
Statistical analysis:

Data were statistically described in terms of mean Standard Deviation (SD), median and range, or frequencies (number of cases) and percentages when appropriate. Comparison of numerical variables between the study groups was done using Mann Whitney U-test for independent samples. For comparing categorical data, Chi square test was performed. Exact test was used instead when the expected frequency is less than 5. \( p \)-values less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

Results

The study included 50 patients suffering from various durations of both primary and secondary infertility, and undergoing IVF/ICSI, endometrial thickness was measured and sub-endometrial blood flow was assessed by Doppler ultrasound on the day of HCG triggering (before triggering) and on the day of embryo transfer (after triggering).

There was no difference between the two study groups regarding age, parity, body mass index (Table 1).

Table (1): Demographic and clinical characteristics of the study population.

<table>
<thead>
<tr>
<th></th>
<th>Pregnancy (n=21)</th>
<th>No pregnancy (n=29)</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years).</td>
<td>25±4.5</td>
<td>30.19±5.4</td>
<td>0.357</td>
</tr>
<tr>
<td>BMI (kg/m(^2))#</td>
<td>27.9±5.1</td>
<td>28.6±5.4</td>
<td>0.241</td>
</tr>
<tr>
<td>Parity*:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nullipara</td>
<td>31 (91.2%)</td>
<td>15 (93.8%)</td>
<td>0.825</td>
</tr>
<tr>
<td>Para 1</td>
<td>1 (2.9%)</td>
<td>1 (6.3%)</td>
<td></td>
</tr>
<tr>
<td>Para 2</td>
<td>1 (2.9%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Para 3</td>
<td>1 (2.9%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Duration of infertility (years)</td>
<td>4.35±4.1</td>
<td>6.7±4.6</td>
<td>0.162</td>
</tr>
<tr>
<td>Type of infertility*:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>18 (36%)</td>
<td>24 (48%)</td>
<td>0.724</td>
</tr>
<tr>
<td>Secondary</td>
<td>3 (6%)</td>
<td>5 (10%)</td>
<td></td>
</tr>
<tr>
<td>Previous IVF cycles*:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 (33.3%)</td>
<td>10 (34.5%)</td>
<td>0.162</td>
</tr>
<tr>
<td>No</td>
<td>14 (66.7%)</td>
<td>19 (65.5%)</td>
<td></td>
</tr>
</tbody>
</table>

\# BMI: Body Mass Index.

* Data are presented as number (percent).

Table (2): Outcome parameters among study groups.

<table>
<thead>
<tr>
<th></th>
<th>Pregnancy (n=21)</th>
<th>No pregnancy (n=29)</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endometrial thickness:</td>
<td>9.1±1.7</td>
<td>8.6±1.8</td>
<td>0.433</td>
</tr>
<tr>
<td>PI:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before HCG</td>
<td>1.456±0.87</td>
<td>1.989±0.89</td>
<td>0.034</td>
</tr>
<tr>
<td>After HCG</td>
<td>1.198±0.86</td>
<td>1.792±0.84</td>
<td></td>
</tr>
<tr>
<td>RI:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before HCG</td>
<td>0.599±0.08</td>
<td>0.998±0.09</td>
<td>0.025</td>
</tr>
<tr>
<td>After HCG</td>
<td>0.573±0.07</td>
<td>0.856±0.069</td>
<td></td>
</tr>
<tr>
<td>S/D ratio:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before HCG</td>
<td>2.456±1.13</td>
<td>2.824±1.25</td>
<td>0.041</td>
</tr>
<tr>
<td>After HCG</td>
<td>2.245±1.24</td>
<td>2.632±1.23</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD.

Discussion

A favorable endometrial environment is necessary for successful implantation. The endometrium has no adhesive qualities until the implantation window phase, during which for a very short time, the endometrium allows the implantation of gestational sacs. This feature is referred to as endometrial receptivity [11].

With the advance of diagnostic ultrasonography, clinical use of ultrasonic technology has increased as a way to measure possible predictors of endometrial receptivity, among them are uterine predictors.
of implantation, such as endometrial thickness. With the increased resolving power and sensitivity of ultrasonography, more studies were conducted on the use of endometrial blood flow and blood flow in the sub-endometrial arteries in predicting endometrial receptivity [12,13].

In our study, we concluded that endometrial thickness had no relationship with IVF/ICSI outcomes, because those whose endometrial thickness was less than 7mm were not accepted for transferring their embryos. The endometrial thickness in the pregnancy group was higher than that in the no pregnancy group and the difference is statistically insignificant.

The mean RI in patients before HCG injection was higher than that after HCG injection, the difference, is statistically significant ($p$-value: 0.025).

The mean RI in no pregnancy group was higher than in pregnancy group, the difference, is statistically significant ($p$-value for pregnancy group: 0.01).

The mean PI in patients before HCG injection was higher than that after HCG injection, the difference is statistically significant ($p$-value: 0.034).

The mean PI in no pregnancy group was higher than in pregnancy group, the difference is statistically significant.

Ng et al., [14], recruited 451 patients in their first IVF cycle who received a standard long protocol of pituitary down-regulation, they determined endometrial thickness, endometrial pattern, PI and RI of uterine vessels, endometrial volume, Vascularization Index (VI), Flow Index (FI) and Vascularization Flow Index (VFI) of endometrial and sub-endometrial regions, they found that the pregnant group had significantly lower uterine RI, endometrial VI and VFI than the non-pregnant group, however, receiver operator characteristic curve analysis revealed that the area under the curve was ~0.5 for all ultrasound parameters for endometrial receptivity, thus they concluded that endometrial and sub-endometrial blood flows measured by 3D power Doppler ultrasound were not good predictors of pregnancy if they were measured at one time-point during IVF treatment.

Kupesic et al., [15], recruited 89 patients undergoing first or repeated (three or less) IVF attempts following a long protocol of pituitary suppression. They found that sub-endometrial FI was significantly higher and RI resistance index was significantly lower in pregnant cycles on the day of embryo transfer whereas no significant difference is found in endometrial thickness, endometrial volume, sub-endometrial VI and VFI between pregnant and non-pregnant patients.

Wu et al., [16], also demonstrated by using 3D US in 54 patients that sub-endometrial (the sub-endometrial region included 5mm of the myometrial-endometrial interface) VFI on the day of HCG was significantly higher in the pregnant group and was superior to endometrial volume, sub-endometrial VI and FI in predicting the pregnancy rate, the best prediction rate was achieved by a VFI cutoff value of >0.24.

Chien et al., [17], examined 623 IVF cycles using transvaginal color Doppler US on day of ET, they found that endometrial sub-endometrial blood flow distribution pattern is correlated with the implantation and pregnancy rate of IVF treatment, the presence of both endometrial and sub-endometrial blood flow is indicative of good endometrial receptivity, whereas the absence of both represents a poor uterine environment. Non-detectable endometrial sub-endometrial flow was associated with women who were older, had a thinner endometrium, and had higher uterine arterial resistance compared with those women who had detectable flow, no significant difference was found in endometrial thickness between two groups.

Aghahoseini et al., [18], investigated the role of measurement of endometrial thickness and assessment of sub-endometrial blood flow in prediction of pregnancy rate in 175 patients undergoing IVF/ICSI cycles by long protocol, by color Doppler ultrasound on the day of ET, they found no significant difference found in endometrial thickness or the zone of vascular penetration between pregnant and non pregnant groups.

Schild et al., [12], examined 135 cycles using long protocol, they examined PI, endometrial thickness, endometrial volume of spiral and uterine arteries, on day of Oocyte retrieval, no difference in spiral artery PI and endometrial thickness, endometrial volume was found between pregnant and non-pregnant cycles, non-detectable spiral vascularity was not associated with a lower implantation rate.
Schild et al., [13], also examined 75 patients using long protocol, on the first day of ovarian stimulation, when down regulation confirmed (endometrium <5mm; no ovarian cyst of >2.5mm; serum estradiol <60pg/ml), 3D power Doppler US was performed, in this study they found that all sub-endometrial 3D indices (VI, FI, and VFI) were higher in conception than non-conception cycles, and that sub-endometrial FI is the strongest predictor for IVF, neither endometrial thickness nor uterine blood were correlated with the likelihood of successful implantation.

Mercé et al., [1], using three-dimensional ultrasonography and power Doppler angiography, on the day of HCG, to examine 80 cycles found that in the pregnant group, endometrial volume EV, vascularization index VI, flow index FI, and flow vascularization index FVI were statistically significantly higher than in non pregnant, but triple-line pattern and endometrial thickness were not statistically significantly correlated. 3D power Doppler indices seem to be useful for evaluating endometrial receptivity.

Yang et al., [19], examined 95 IVF cycles using 2D power Doppler US on day of oocyte retrieval, only women with endometrial thickness 10mm or more were enrolled in the study, women with an intra-Endometrial Power Doppler Area (EPDA) <5mm² achieved a significantly lower pregnancy rate and implantation rate than those with an EPDA 5mm² or more.

Contart et al., [20], examined 185 cycles undergoing ICSI, using a long protocol on day of HCG triggering, by 2D power Doppler US, they examined fundal region along transverse plane: Grades 1, 2, 3, and 4 according to visualization of power Doppler in the quadrants, endometrial thickness and pulsatility index in uterine artery were similar in four grades, implantation and pregnancy rates were similar in all grades.

Maugey-Laulon et al., [21], examined 144 IVF cycles, on the day of embryo transfer for the presence of intra-endometrial, sub-endometrial and peri-endometrial vascularity, absent intra-endometrial and sub-endometrial vascularity on the day of embryo transfer was associated with a lower pregnancy rate.

Raine-Fenning et al., [22], examined menstrual blood flow in 27 non pregnant women by 3D ultrasound; they found that endometrial and sub-endometrial blood flow vascularization index and vascularization flow index VFI increased during the proliferative phase, peaking around 3 days prior to ovulation before decreasing to a nadir 5 days post-ovulation.

Thereafter, both vascular indices gradually increased during the transition from early to mid-secretory phase. The Flow Index (FI) showed a similar pattern but with a longer nadir post-ovulation.

Raine-Fenning et al., [23], demonstrated that endometrial and sub-endometrial vascularity are significantly reduced (decrease in endometrial perfusion, and possible endometrial receptivity) in 29 women with unexplained sub-fertility during the mid-late follicular phase irrespective of estradiol or progesterone concentrations and endometrial morphometry.

Mansour et al., [24], studied the effect of HCG on endometrium without using Doppler ultrasonography, they studied the endometrium via an endometrial biopsy. They reported the first time use of an intrauterine injection of HCG before the embryo transfers, and they found a significant improvement in the pregnancy rates of the IVF cycles. These improvements could be explained by various changes that are produced in the endometrium which is where human chorionic gonadotropin has an effect on implantation.

**Conclusion:**

Assessment of sub-endometrial blood flow by 2D colour Doppler ultrasound (to measure pulsatility index, resistance index, and S/D ratio) performed before and after HCG injection in patients undergoing IVF/ICSI cycle is a good predictor of pregnancy rate.

There is still no consensus when the ultrasound examination for assessing endometrial receptivity in IVF/ICSI treatment should be done. However, one point of time measurement may not predict implantation and pregnancy rate; it is proposed that measurement of sub-endometrial blood flow during the follicular phase and early luteal phase to determine the changes may reflect better the role of sub-endometrial blood flows.

The endometrial vascularity has a useful predictive value on the implantation rate in IVF/ICSI cycles irrespective of the morphological appearance of the endometrium. This will be of value in optimizing the number of embryos transferred and reducing multiple gestation without compromising the pregnancy rate.


الملخص العربي

الهدف من هذه الدراسة هو بحث تأثير حقن هرمون المشيمى البشري على سمن بطاقة الرحم، والتفاق الدموع في الأوعية الدموية ما بين بطاطا الرحم، عن طريق الموجات فوق الصوتية باتجاه دوائر في قوى تحدث في النساء المصابات بالعقم الذين يっとن إجراء الحقن المجهرى/ أطفال الأمهات.

شملت هذه الدراسة خمسين مريضة مصابة بالعقم من النساء مميتين لعمليات حقن مهجري من بينهن من العمر من 20 إلى 28 عاماً. أما من أجل تحصينهن من حämما وشكاوى طبيعية للرحم، فقد اعتمد من الدراسة المريضات اللاتى تضيف من العمر أكثر من 38 سنة وأقل من 20 سنة، وكان لديهم مرضى بالعقم (وجود ورم ليمي أو من خضع لجراحة سابقة في الرحم). في المرحلة الأولى، على أساس دراسة اختبار طول المدى، تم تثبيط إشارات الغدة التناسلية بالاعتماد على هرمون (GnRH-a)، ثم بدأ تشخيص المبيض بإستخدام هرمون إفطاع اللمب البشري أو الهرمون المنبه الجسيري في اليوم الثاني من الدورة الشهرية.

في المجموعة الثالثة، لاحظت في المرضى ارتفاع من الأقل من القيادات الزائدة، وفي يوم إعطاء حقنة الهرمون المشيمى البشري، فحصت المريضات بعد إعطاء الهرمون في المريضات ذات الأقل من القيادات الزائدة، ركبت قبل ما مع وضع وسادة صغيرة تحت الأرجل وذلك باستخدام جهاز الموجات فوق الصوتية المهلك مع مرفق توريد المحم، عندما تم الحصول على عرض طولي للمحم تمت دراسة تدفق الدم في الأوعية الدموية ما بين بطاطا الرحم.

وقد تم قياس المؤثرات الآتية:
- مؤثر الموقف: الفرق بين الحد الأقصى لتدفق الدم الإفطاعي والحد الأدنى لتدفق الدم الإفطاعي، مقيمة على متوسط تدفق الدم طوال الفترة (S/D) (النوع الإفطاعي/الليس طوال). (S/D)
- مشاكل في القدرة الإفطاعية والليست طوال (S/D).
- النسبة بين تدفق الدم الإفطاعي والليست طوال.

هذه الملاحظة الثلاثة تعتبر من المعايير معرفة عدم وجود مقص، وهي تزداد قيمة عندما تزيد المقاومة، والعكس بالعكس، ومع فترات تدفق الدم الإفطاعي أكثر ندرة تหลากหลาย القوة الإفطاعي.

قد تم فحص كل المعايير باستخدام نظام توريد المحم.

إن متوسط مسح بطاقة الرحم قبل إعطاء حقنة الهرمون المشيمى البشري موازا المصدر بعد إعطاءه، أما بالنسبة للحمل، فقد كان متوسط مسح بطاقة الرحم في المجموعة الأولى حمل أقل من الحالة الإفطاعي. هذه المريضات في المجموعات كلياً في جميع الجوانب المصاحبة. وقد كان متوسط مؤثر الجرام في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط مؤثر الجرام في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط مؤثر التذبج في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط مؤثر التذبج في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط نسبة (S/D) في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

(1/58) في حقيقتهم 24% وما يحمل، ويتميز لهم بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط مؤثر المقاومة في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

(1/58) في حقيقتهم 24% وما يحمل، ويتميز لهم بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط مؤثر التذبج في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائيه قيمة.

(1/58) في حقيقتهم 24% وما يحمل، ويتميز لهم بعد إعطاءهم وفقرة نو دالة إختهدائية قيمة.

وقد كان متوسط نسبة (S/D) في المجموعات قبل إعطاء حقنة الهرمون المشيمى البشري أعلى من بعد إعطاءهم وفقرة نو دالة إختهدائيه قيمة.

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(1/58) في حقيقتهم 24% وما يحمل، ويتميز لهم بعد إعطاءهم وفقرة نو دالة إختهدائيه قيمة.