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Case Report

Decoding Ovarian Health: Doppler Ultrasound as a Tool for Fertility Assessment

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Abstract

Ovarian reserve assessment is essential in evaluating fertility potential. Doppler ultrasound, a non-invasive imaging technique, provides real-time insights into ovarian vascularity, which plays a crucial role in follicular development and reproductive outcomes. This study examines Doppler ultrasound parameters, including Resistance Index (RI) and Pulsatility Index (PI), in a sample of 150 women undergoing fertility evaluation. The research explores the correlation between Doppler indices and traditional ovarian reserve markers such as Antral Follicle Count (AFC) and Anti-Müllerian Hormone (AMH) and assesses how Doppler findings impact IVF success rates. Our findings suggest that lower RI and PI values correlate with better ovarian reserve and higher pregnancy success rates, emphasizing Doppler ultrasound as a valuable tool in reproductive medicine.

Keywords: intestinal neuroendocrine tumor; surgical resection; immunohistochemistry

Introduction

Ovarian reserve refers to the number and quality of a woman's remaining oocytes and is a key determinant of fertility potential. Traditionally, ovarian reserve is assessed using hormonal markers (AMH, FSH, LH, Oestradiol) and Antral Follicle Count (AFC) via transvaginal ultrasound [1]. However, these methods

provide static information and do not assess the dynamic vascular environment of the ovaries. Doppler ultrasound, which measures ovarian blood flow, offers a promising alternative [2]. Ovarian perfusion plays a crucial role in follicular recruitment, maturation, and ovulation. Poor blood supply has been linked to diminished ovarian reserve (DOR and poor IVF outcomes [3,4]. This study evaluates the effectiveness of Doppler ultrasound in ovarian reserve assessment and its predictive value in fertility treatments [5].

1.Methodology

1.1 Study Design & Participants

- Sample Size: 150 women undergoing fertility evaluation.

- Age Range: 20-45 years.

- Inclusion Criteria: Women with regular menstrual cycles, no history of ovarian surgery, and no severe reproductive disorders.

- Exclusion Criteria: Women with known PCOS, endometriosis, or ovarian malignancies.

- Study Period: 12 months at a tertiary fertility clinic.

1.2 Data Collection

Participants underwent:

1. Transvaginal Doppler Ultrasound: Measurement of Resistance Index (RI) and Pulsatility Index (PI) in ovarian arteries.

2. Ovarian Reserve Testing: AFC count using ultrasound, AMH levels, and FSH levels on Day 3 of the menstrual cycle.

IVF Cycle Monitoring: Ovarian stimulation response and pregnancy outcomes.

2.Results

2.1   Doppler Indices and Ovarian Reserve

Women were categorized into two groups based on ovarian reserve

- Normal Ovarian Reserve (NOR): AFC ≥ 8, AMH > 1.5 ng/mL.

- Diminished Ovarian Reserve (DOR): AFC < 8, AMH < 1.5 ng/mL.

Ovarian Reserve	Participants (N=150	Mean RI	Mean PI	Mean AFC
Normal NOR	97 (65%)	O.52 +_0.06	1.1 +_0.2	12 +_ 2
Diminished DOR	53 (35%)	O.61 +_0.07	1.4 +_0.3	6 +_2

Findings:

-     Higher RI and PI values were associated with lower ovarian reserve.

-     Women with lower blood flow resistance (RI < 0.55) had significantly better ovarian function.

Doppler Parameters	Pregnancy rate	Miscarriage rate
Low RI and PI (good blood flow)	60% (45/75)	12% (9/75)
High RI and PI (Poor blood flow)	25% (19/75)	30% (23/75)

Key Insights:

-     Women with better ovarian blood flow (low RI & PI) had a 60% pregnancy success rate.

2.2   Relationship Between Doppler Indices and IVF Success

Among 150 participants, 75 underwent IVF cycles and were monitored for pregnancy outcomes.

-     Women with poor vascularization had higher miscarriage rates.

2.3   Age and Ovarian Doppler Findings

Age group	Mean AFC	Mean RI	Mean PI	Participants 150
20-30 years	14 +_ 3	O.50 +_0.05	1.0 +_0.2	55
31- 40 years	09 +_ 2	O.56 +_0.07	1.2 +_ 0.3	60
41-45 years	05 +_ 2	O.63 +_0.06	1.5 +_ 0.4	35

Findings:

-     Ovarian vascular resistance increased with age, correlating with a decline in ovarian reserve.

-     Women above 40 years had significantly higher RI and PI values, which impacted fertility outcomes.

2.4   Correlation Between Doppler Indices, AFC, and AMH

-     AFC & RI Correlation: r = -0.62 (Strong Negative Correlation)

-     AMH & PI Correlation: r = -0.58 (Moderate Negative Correlation)

Interpretation:

-     As ovarian blood flow improved (lower RI/PI), ovarian reserve markers (AFC/AMH) were higher.

-     Older women had higher RI/PI values, leading to lower AFC and AMH levels.

3.Discussion

Doppler ultrasound is a valuable tool in ovarian reserve assessment. This study demonstrates that higher vascular resistance (high RI/PI) is linked to diminished ovarian function and poor IVF outcomes. These findings are consistent with previous studies highlighting ovarian blood flow as a predictor of fertility potential.

Clinical Implications:

1.   Better Fertility Prediction: Doppler ultrasound offers real-time insights into ovarian function.

2.   IVF Cycle Optimization: Women with poor blood flow may require adjusted stimulation protocols.

3.   Early Detection of Ovarian Aging: Doppler indices can detect declining ovarian function before traditional markers.

Limitations:

-     Doppler measurements can be operator-dependent.

-     More research is needed to establish standard Doppler cutoff values for ovarian reserve.

4.Conclusion

This study confirms that Doppler ultrasound is a powerful tool for ovarian reserve assessment [6]. It provides dynamic, real-time information that traditional hormonal markers cannot7. Lower RI and PI values correlate with better ovarian function, higher AFC, and improved fertility outcomes. Incorporating Doppler ultrasound into fertility assessments may enhance predictive accuracy in reproductive medicine [8].

5.References

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