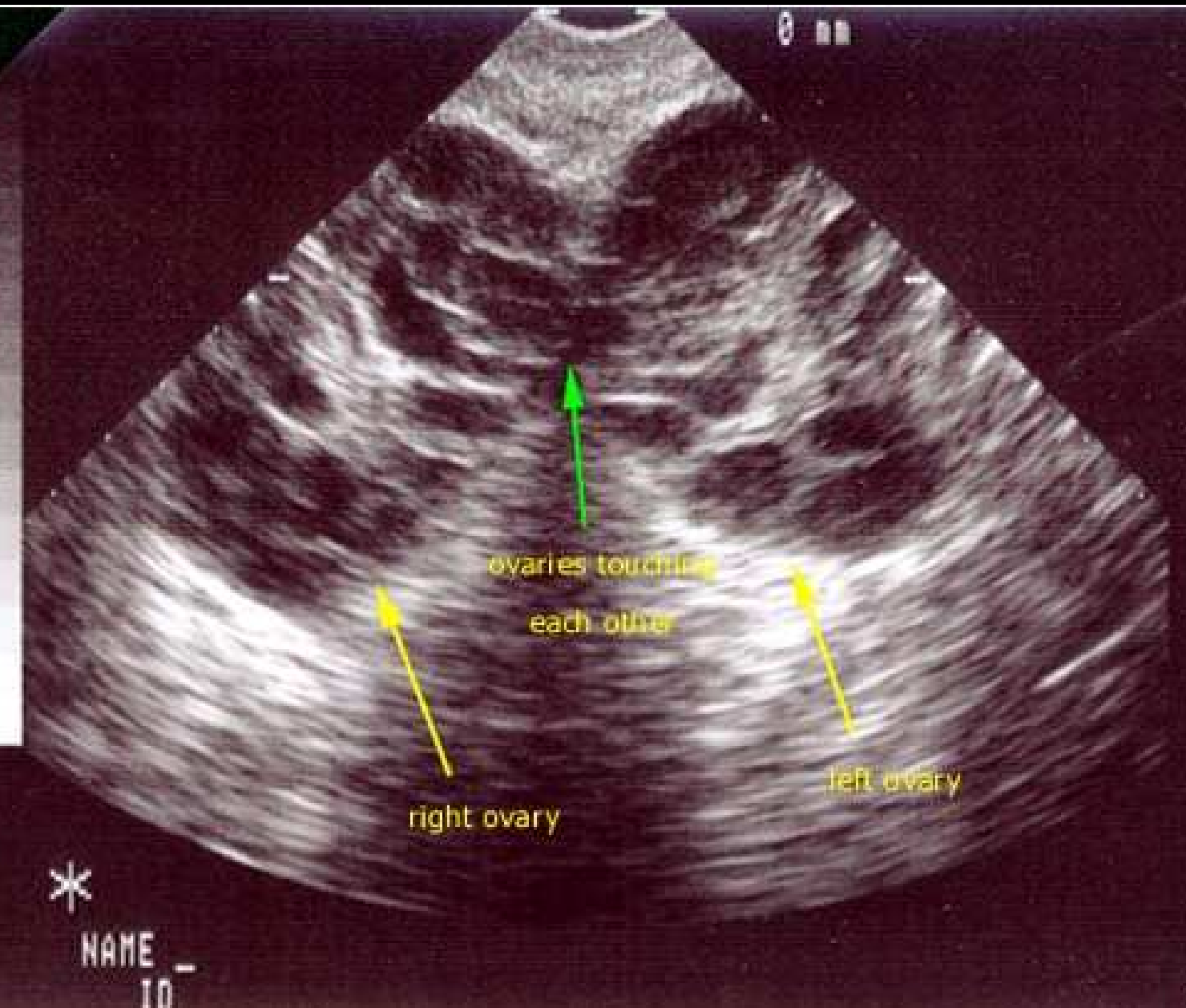


Ultrasound and PCO

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NRNG
47 db
5.0MFI
DEPTH
124 MM
POWER
30%
FPS
28
REJECT
1
EDGE
2
GREY
3
SMOOTH
F 2
ALPHA



*

NAME _
10

Eric Doiter, MD

TGC
PRESET

Introduction

- Transvaginal U/S is currently the gold standard for the diagnosis of Polycystic Ovaries
- Incidence of PCOS: 4 – 10%
- Results of studies using ultrasound suggests a prevalence in young women of at least 20% (21 – 33 %)
- 5-10% of the women with the ultrasound picture will have the classic symptoms

- Considerable heterogeneity of symptoms & signs amongst women with PCOS
- These may change over time in an individual

Typical Ultrasound Findings

- Larger ovaries
- Multiple small peripheral follicles
- Increased echogenicity of stroma
- More spherical than ovoid shape

Ultrasound Criteria

- Ovarian Volume
 - > 10cm³
- No of follicles 2 – 9mm
 - > 10
- Increased echogenecity of stroma
 - Present

– Atiomo et al 2000

3-D Ultrasound

- Dedicated volumetric probe
- Difference in ovarian size due to difference in stromal volume Kyei-Mensah et al
- **Not for general use!**

Doppler Ultrasound

- Power doppler allows detection of blood flow in stroma –
 - but does not quantify the flow
- Colour doppler
 - ↑ PI in PCO
 - ↓ RI – positive correlation with LH-levels
- **No significant differences in ovarian artery PI or RI when comparing PCO with normal ovaries**

MRI

- Limited data
- Rarely used in clinical practice
- Does not provide more information than TVS
- Expensive
- Possibly in virgin or severely obese patients

Patients with Clinical PCO

- Common features:
 - Greater mean BMI
 - Higher s-total testosterone
 - Irregular cycles
 - Insulin resistance

What are more common in their ultrasounds?

- Number of small follicles
- Ovarian volume
- Stromal width / echogenicity
 - ***BUT***
 - Classic U/S features are not consistently present

Diagnosis

- How reliable is an ultrasound diagnosis of PCOS?
 - Prospective Observational Study
 - 18 patients with clinical & biochemical features of PCOS
 - 9 normal control patients
 - Single ultra-sonographer
 - 27 scans

- Scans video-recorded
- Rearranged to give 54 scans
- 4 Observers
- Diagnosis:
 - Normal
 - Possible PCOS
 - Definitely PCOS

Results

- Intra-observer agreement

– 70%

- Inter-observer agreement

– 50%

Conclusions

- Current used U/S criteria have significant variability and must be considered subjective
- Measurements too insensitive?
- Ultra-sonography alone may not be a reliable method of diagnosing or excluding PCOS

- Human Reprod June 2002

Number of follicles

- PCOS Vs Control
 - Higher number of follicles 2 – 5mm MFNPO
 - Significant correlation with androgens
 - Similar 6 – 9mm
 - Significant correlation with BMI & Fasting insulin
- Proposal:
 - Add to definition ≥ 12 follicles in 2-9mm range mean of both ovaries
 - Sens – 75%, specificity – 99%

Ovarian Volume

- Mean ovarian volume is greater in patients with PCOS
- Use spherical formula: $\pi/6*(T+AP+Long)$
- Association of total ovarian volume, pre-antral follicle number and total follicular number with some of the biochemical indices of PCOS, but none between ovarian stromal volume and these indices

Ovarian Stroma

- Stroma / total area had a sensitivity of 100% for diagnosis of PCOS and the most significant correlation with androgen levels
 - Fertility & Sterility Aug 2001
- **Stromal index** – ratio of mean stromal echogenicity to mean echogenicity of entire ovary
- **SI** – significantly greater in PCOS
 - Increased volume of stroma and
 - Lower mean echogenicity of entire ovary
 - Human Reprod March 1999

Stromal Area

- Correlated with levels of ASD and
17-OH-Progesterone
 - but not with
- Testosterone or LH or Insulin

Stromal Blood Flow

- Significantly higher in PCO
- Measurement is predictive of follicular response to ovarian stimulation

Effect on Fertility

- PCOS on ultrasound
- No symptoms
- Looked @ TTP, RR of sub-fertility
 - PCOS on U/S took longer TTP
 - Less fertile if:
 - Obese
 - Hirsutism
 - Acne
 - Number of symptoms

Effect

- Obese (BMI >29) RR = 2.6
- Menstrual disturbances RR = 4.6
- Hirsutism RR = 2.5
- Acne RR = 2.7
- Number of symptoms:
 - 2 3 – fold
 - 3 7 – fold
 - 4 10 – fold
- No symptoms:
 - no longer TTP

Conclusions

- Appearance of polycystic ovaries on U/S has no significant impact on fertility or fecundity in women with no symptoms
- Appearances alone do not reflect pathological features
- Obesity, menstrual disturbances and/or hyper-androgenism are associated with subfertility in these patients

Fer & Ster October 2003

IVF

- PCO on U/S but no clinical symptomatology
 - More:
 - Follicles
 - Oocytes
 - Embryos
 - Same:
 - Fertilization
 - Cleavage
 - Miscarriage

- 69% higher chance of achieving pregnancy after 3 cycles
- 82% higher chance of achieving a live birth

Colour Doppler

- Quantification of doppler signal in ovarian stroma appeared to be greater in PCOS
- Lower:
 - Resistance index (\uparrow flow)
 - Pulsatility index
 - Vascularization Flow Index (VFI)
 - Flow Index (FI)
- Higher:
 - Vascularization Index (VI)
 - Significantly higher in patients with PCOS compared to normal ovaries

Correlations

- Negative:

- Pulsatility index and LH
- Pulsatility index and testosterone
- Pulsatility index and LH/FSH ratio

- Conclusions:

- Measurement of ovarian stromal blood flow by colour doppler may be of value in predicting outcome of treatment

Doppler Blood Flow

- May predict risk of ovarian hyper-stimulation during gonadotrophin therapy
- Requires specific expertise & machinery
- = not necessary as part of the diagnostic criteria for PCO

LOD

- Stromal Blood Flow measurement and the value of prediction of treatment outcome
- Prior & after LOD
- Colour doppler flow in stroma
- LH, FSH, Testosterone
- 6 – 10 weeks postop
 - LH and testosterone decreased $p < 0.001$
 - Peak systolic velocity decreased $p < 0.001$
 - Pulsatility index and resistance index increased $p < 0.001$

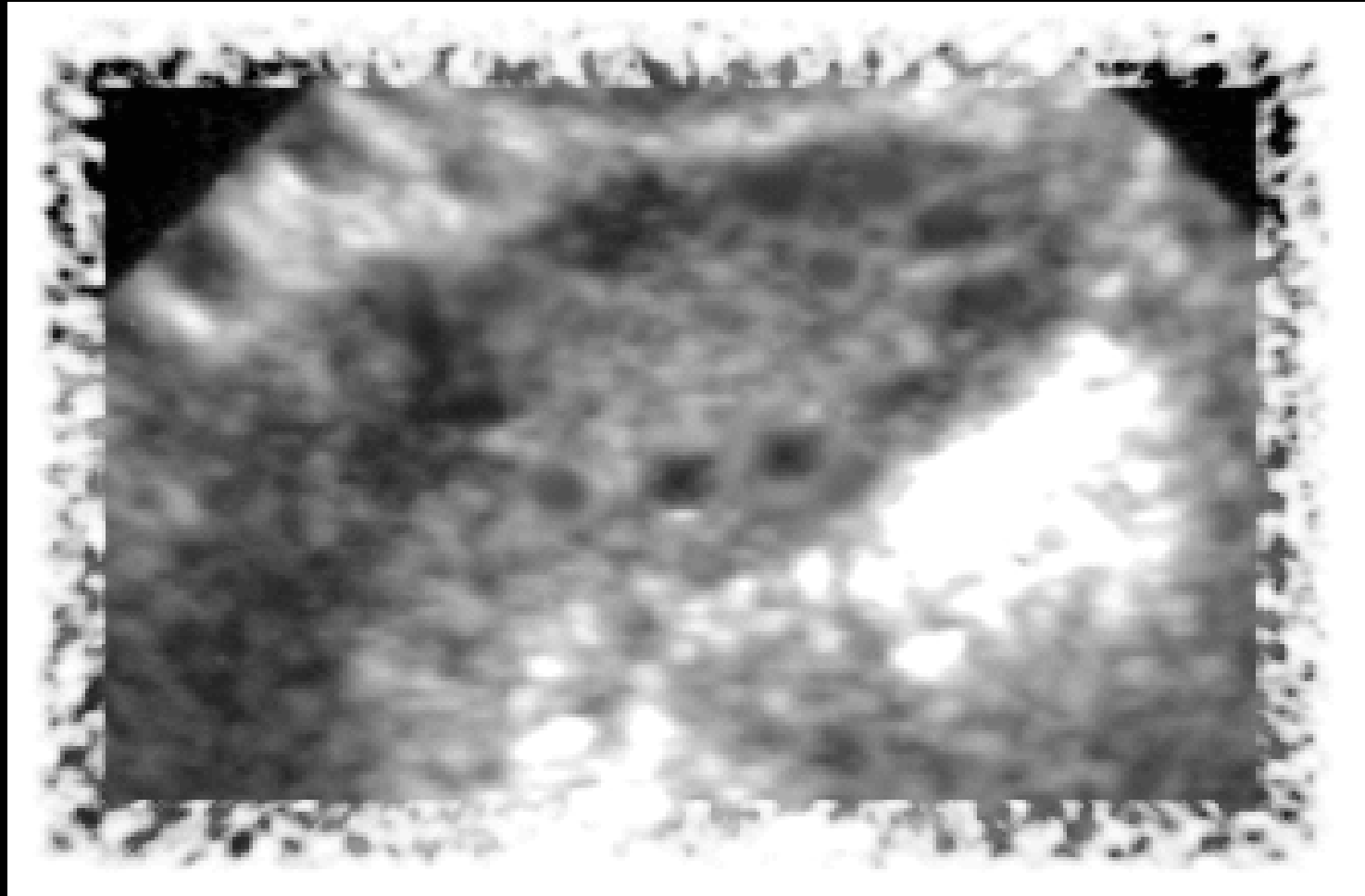
LOD

- Long-term endocrine & ultra-sonographic outcomes:
- Ovarian volume
- LH, FSH, testosterone , ASD, SHBG
- Intervals:
 - Short < 1 yr
 - Medium 1 – 3 yrs
 - Long-term 4 – 9 yrs

Results & Conclusions

- Beneficial endocrine and morphological effects appeared to be sustained for up to 9 years

- Human Reprod Nov 2002



**International Consensus
Definitions
Of
Ultrasound Assessment of
the Polycystic Ovary**

PCO

- Should have at least one of the following
 - ≥ 12 follicles 2 – 9mm
 - Ovarian volume $>10\text{cm}^3$
- One ovary or single occurrence sufficient
- Not applicable to women taking pill
- Must have clinical symptoms

Technical Recommendations

- State of art equipment and trained people
- Transvaginal scan preferred
- When to scan?
 - Early follicular or random
- Dominant follicle or Corpus luteum – repeat scan in next cycle
- Ovarian volume calculation:
 - $0.5 \times (\text{length} \times \text{width} \times \text{thickness})$
- Follicle number & size
 - Measured in 3 sections

Clinical Diagnosis

- “Syndrome”
- 2/3 criteria
 - Oligo – and/or an-ovulation
 - Hyperandrogenism
 - Clinical or biochemical
 - Polycystic ovaries
 - Exclusion of other aetiologies
- Assess U/S features alongside appropriate endocrine, biochemical and metabolic tests as indicated by the presentation

- Ultrasound appearance of PCOs have limited predictive value for the endocrine parameters
- Inclusion of endocrine and biochemical criteria as diagnostic prerequisites of the syndrome is, therefore, necessary to reflect its pathological features

Thank you for your attention !!