

Guidelines for assessment of ovarian reserve

- **Outline**
- **Equipment**
- **Timing**
- **Indications for AFC assessment**
- **Ultrasound technique for AFC**
- **Interpretation**

The US examination should be done by a >7MHZ vaginal probe, abdominal ultrasound is not accurate.

A minimal training of 20-40 supervised patient examinations is advised.

All primordial follicles measuring 2mm-10mm, should be measured.

Some authors advocate only measuring the follicles 5-6mm, however this is more challenging and time consuming to differentiate them from the 7-9mm follicles.

Timing

- Preferably should be done in the Early follicular phase days 2-5 to avoid presence of cysts or Corpus luteum or dominant follicles.
- However, they could be measured at any time of the cycle avoiding the dominant follicles
- Could be measured while on hormone contraceptives but might give a lower AFC, so best to be repeated after 2-3 cycles of hormone free period.
- Previous pelvic surgery or presence of endometriomas may impair proper counting of AFC.
- In ART, we usually use the Total AFC, which is the total number of follicles found on both ovaries.

Indications for AFC

- Prediction of response in IVF cycles to individualize dosages of HMG; poor response is expected when 5-7, hyperresponse if > 20.
- Patients > 35 seeking fertility.
- Patients with expected or suspected low ovarian reserve; e.g. previous history of ovarian cystectomy, exposure to irradiation or chemotherapy.
- Predicting age of Menopause; AFC < 4 (controversial).
- Ultrasound diagnosis of PCO; according to most recent ESHRE guidelines (2018), shouldn't be diagnosed before 8 years from menarche and the total AFC should be 20 or more in each ovary with an ovarian volume >10ml.

Ultrasound Methods for assessment of AFC

- 2D Real time
- 2D Cine loop
- 3D Multiplanar
- Sono AVC 3D software

2D Real time US

Magnification, is essential, so as not to confuse with other pelvic structures, measure the follicle if large, use colour Doppler if needed.

Make a sweep in the ovary in two perpendicular planes counting all small follicles < 10 mm (Video 1, figure 2, figure 3).

2D Cine loop storage

- Can be replayed stored for later analysis.
- Operator dependent.
- Patient is not available later if acquisition wasn't good enough.

3D Multi planar Mode

- Acquisition should be done using a big angle >120 degrees, including the whole ovary
- Using the point to go through the ovarian tissue in the 3 planes (Figure 4).
- Has Better reproducibility.
- Using inversion mode enhances contrast better follicular view, will allow complete view of all follicles (turns darkest points to the brightest) (Figure 5).
- Add VCI (feature in some 3D machines).

3D SONO AVC

It is a semi-automated feature which requires special software not available on all 3D machines.

Through obtaining a 3D volume of the ovary the software will colour code the different fluid filled spaces(follicle) into different colours identifying each.

It counts all follicles, reduces time.

More recent software named SONOAVC antral is more accurate in counting the small follicles (Figure 6).

Does have fallacies, needs manual post processing.

The following table suggests how to interpret the follicle number in general gynecology & ART before induction of ovulation

<i>Nomenclature</i>	<i>FNPO</i>	<i>Interpretation in clinical practice</i>
Oligofollicular or low follicle count	1–3	Low ovarian reserve and increased risk of menopause in next 7 years*
Normofollicular or normal follicular count	4–24	Normal follicle count for women of reproductive age
Multifollicular or high follicle count	≥ 25	High risk of hyperandrogenism
<i>Nomenclature</i>	<i>Total AFC</i>	<i>Interpretation for ovarian stimulation</i>
Very low functional ovarian reserve or very small number of recruitable follicles	0–4	Very high risk of poor response to ovarian stimulation and reduced chance of pregnancy
Low functional ovarian reserve or small number of recruitable follicles	5–8	High risk of poor response to ovarian stimulation
Normal functional ovarian reserve or normal number of recruitable follicles	9–19	Expected normal response to ovarian stimulation
High functional ovarian reserve or large number of recruitable follicles	≥ 20	High risk of excessive ovarian response and OHSS

*35% vs 13%⁷. AFC, antral follicle count (number of follicles in both ovaries); FNPO, follicle number per ovary (number of follicles in ovary with more follicles); OHSS, ovarian hyperstimulation syndrome. Adapted from Martins *et al.*⁵.

References;

1-Consensus Opinion. Counting Ovarian follicles by Ultrasound. A Practical guide. Neto C, Ludwin A, Borell A, Benacerraf B, Ultrasound Obstet Gynecol 2018;51,10-20

2-International evidence-based guideline for the assessment and management of polycystic ovary syndrome 2018)ESHRE guidelines 2018

3-The Predictive value of the automated quantification of the number and size of small antral follicles in women undergoing ART. Batcha D, Campbell B, Jayaprakasan K Hum Reprod 2009 24(9):2124-32

Figures & Videos



Video 1 2D cine loop



Figure 2 Ovary with low ovarian reserve



Figure 3 Ovary with good ovarian reserve

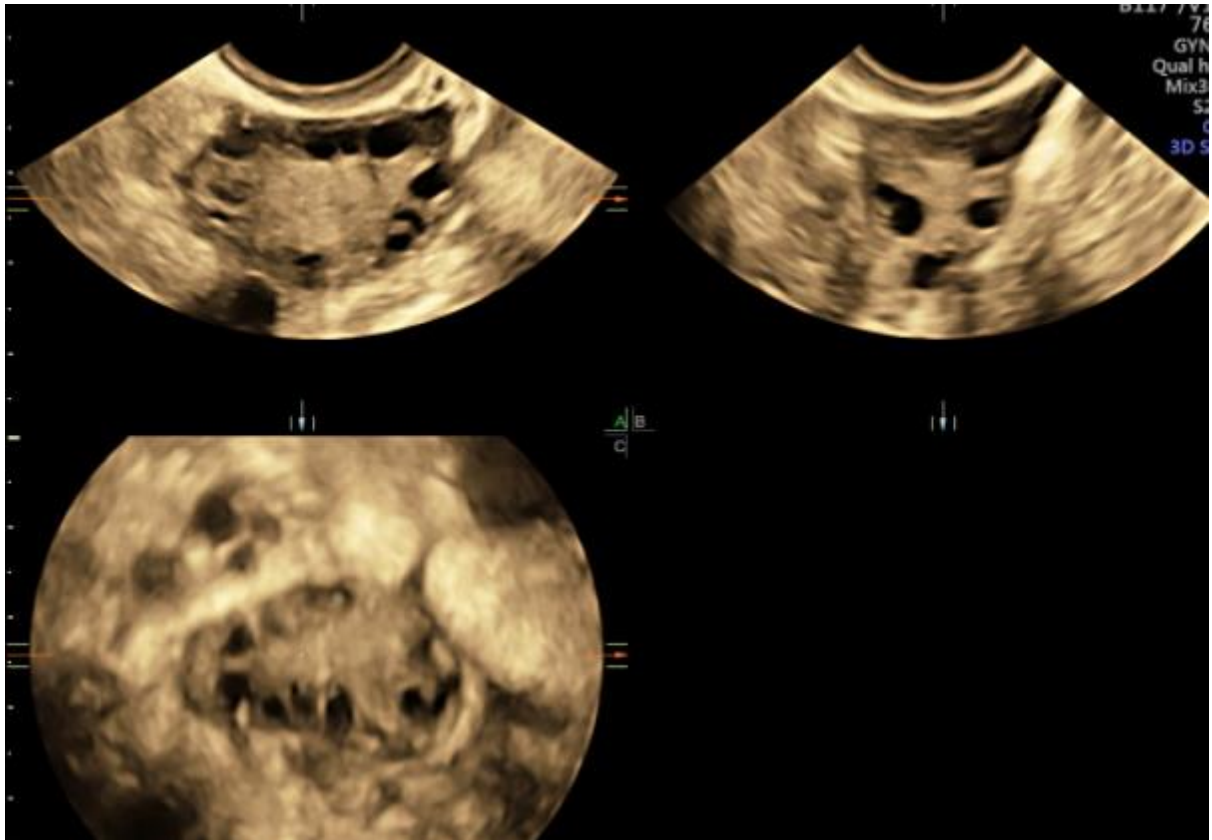


Figure 4 Multiplanar 3D volume of ovary

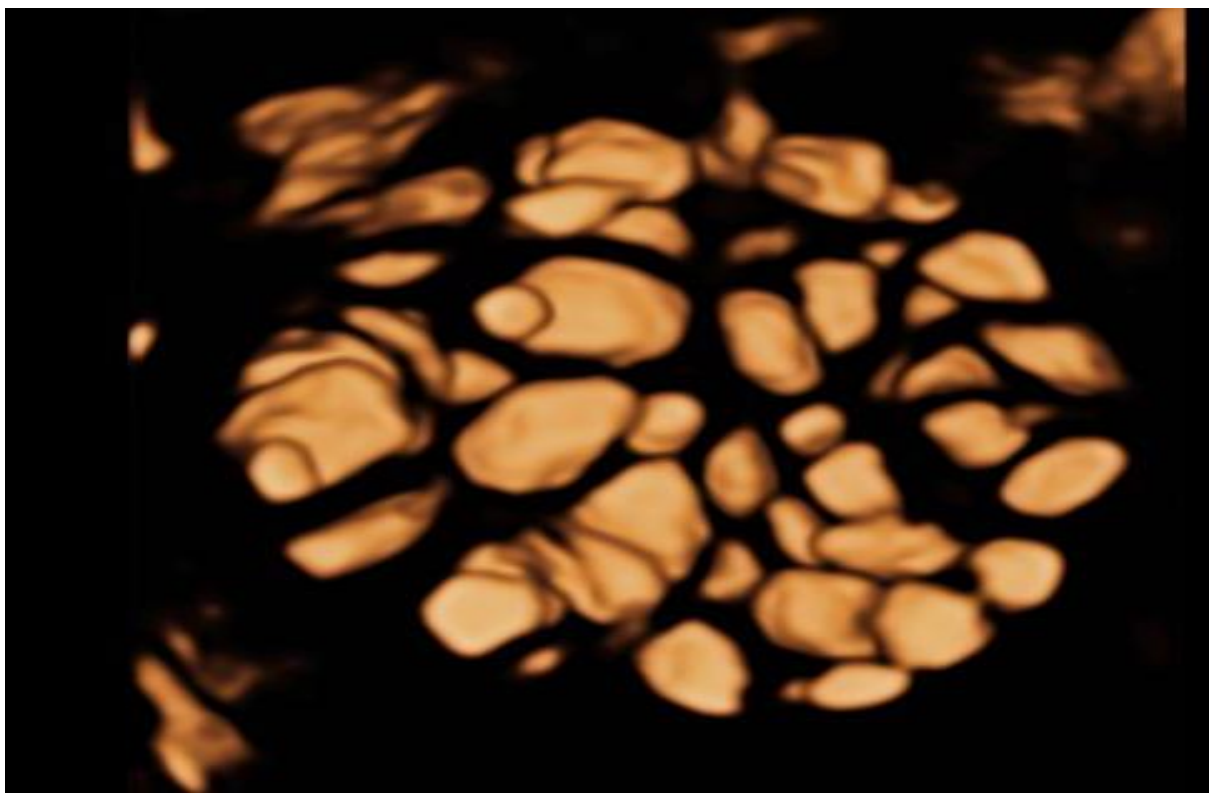


Figure 5 Inversion mode for counting of follicles

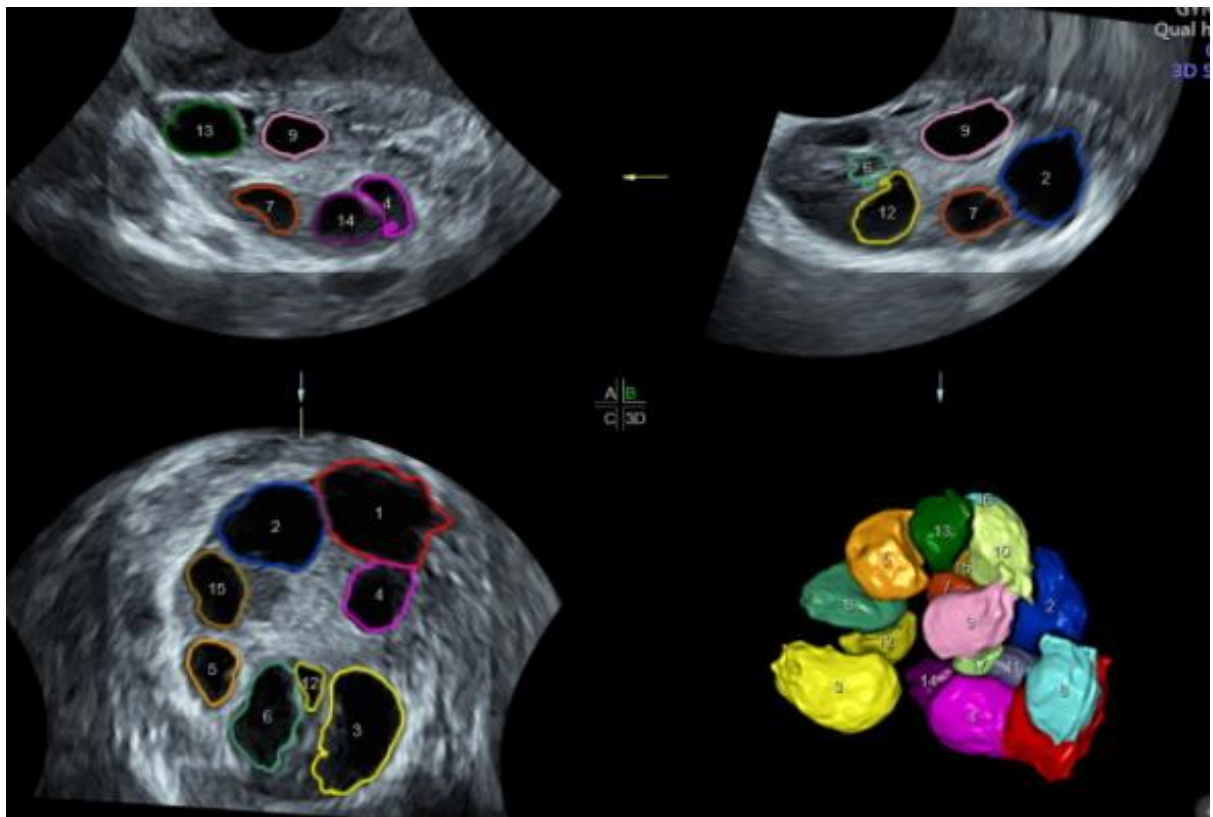


Figure 6 Sono AVC