ANTRAL FOLLICLE COUNT

AFC

The number of antral follicles in ovaries serves as one of the parameters to estimate ovarian reserve.

⚠ Risk factor ♂ Male & Female

About Antral follicle count

The number of antral follicles (a stage of folliculogenesis) determinates the quantity of oocytes potentially available for ovulation. It is one of the characteristics used to specify so-called ovarian reserve which represents an important factor to predict the result of IVF cycle, among other things. AFC can be set by usage of transvaginal ultrasonography (a sonography that applies an ultrasound transducer in the vagina to visualize organs within the pelvic cavity). AFC is reflecting quite accurately the pool of recruitable follicles in ovaries affected by follicle-stimulating hormone (FSH) and correlates with ovarian response in IVF programmes. AFC also correlates with menopausal transition. To comprehend the importance of antral follicle count, it needs to be explained at least briefly the definition of antral follicle itself.

Antral follicle represents semi-final stage of folliculogenesis which is a process of follicle formation that correlates with oogenesis – the process of oocyte formation. Antral follicle is denominated by the cavity called the antrum inside the follicle. There can be found granulosa and theca cells in the follicle. Theca cells are forming “coat” of antral follicle. Granulosa cells differentiate into distinct structures: corona radiata surrounding the zona pellucida (protective layer of oocyte within the follicle) and cumulus oophorus, that connects granulosa cells and corona radiata cells (Pic. 1). Antral follicles usually measure between 2 and 10 mm in diameter. The creation of antral follicles is called recruitment, a process dependent on hormonal implication between follicles (hormone called inhibin) and exogenous sex hormones (such as follicle-stimulating hormone). Antral follicles are recruited in so-called cohorts, meaning that only few tertiary follicles (inter-stage in folliculogenesis) evolve into antral follicles. The number of antral follicles (the size of antral follicle cohort) is age dependent, decreasing with higher age.

As mentioned above, antral follicle count is one of the measured characteristics reflecting FOR which is an acronym for ovarian reserve (OR). Ovarian reserve is a female reproductive specification used to determine potential capacity of the ovary to provide oocytes that are capable of fertilization (growing oocytes) resulting in a healthy and successful pregnancy. Total ovarian reserve (TOR) stand for the count of all stages of follicles (growing and not growing follicles) that can be found in ovaries.

The follicles created in prenatal age represent the first stage of folliculogenesis and they are called as primordial follicles. The number of primordial follicles is quite variable among women and ranges approximately from hundreds of thousands to millions. The size of a woman’s initial follicle pool between birth and menarche is of great importance because it reflects the symbolic starting point of follicle depletion. On the start of the puberty (before menarche) most of primordial follicles undergo so called process of atresia (natural oocyte abishment) reducing significantly total ovarian reserve. The size of the initial TOR is strongly influenced by genetics. Also, elevated androgen levels during prenatal development have an adverse effect on the early establishment of the ovarian reserve. Nevertheless, primordial follicles always represent the main part of TOR. A woman’s cumulative hypothetical pregnancy chance is mathematically reflected in her complete follicle pool, her TOR. Since TOR declines with age, "ovarian age" is another frequently heard term to describe a woman’s remaining reproductive capacity.

Antral follicle count can point out some problems regarding TOR and may also help to conduct properly IVF (in vitro fertilization) treatment. A low AFC is a major factor in the diagnosis of poor ovarian reserve. Poor ovarian reserve: (also known as impaired ovarian reserve, premature ovarian aging or declining ovarian reserve) is a
condition of low fertility characterized by 1): low numbers of remaining oocytes in the ovaries or 2) possibly impaired pre-antral oocyte development or recruitment. AFC can be used to predict IVF outcome quite accurately, especially in older women (<45 years of age). A great advantage of AFC over any other test is its potential usefulness for its ability to concomitantly predict low and high responders to the treatment. AFC performs well as a test for ovarian response being superior or at least similar to complex expensive and time consuming endocrine tests and it is probably most applicable in general practise.

Symptoms

- none

Associated diseases

- PCOS (polycystic ovary syndrome)
- endometriosis
- Fragile x syndrome

Complications

- infertility

Risk factors

- genetic predispositions
- autoimmune disorders
- adrenal gland impairment
- age
- surgery (e.g. laserization of the surface of the ovary to treat endometriosis)
- radiation, chemotherapy

Prevention

- none known

How it can affect fertility

Antral follicle count has well established relation to fertility potential. With higher AFC, better fertility potential there is. Meaning that if 14 or more antral follicles are present on the ovaries, the fertility potential is supreme and no fertility issue should appear (if no other pathological condition is present). On the other hand, with AFC decreased to 7 or less antral follicles on the ovaries, there is quite high probability of infertility issues. With age higher than 35 years this conditions become much stricter and more severe infertility issues may appear.

Prognosis

There is often observed lower fertility in women with relatively lower AFC. Fecundity (spontaneous conception chance) and fertility treatment success depend on TOR, and especially FOR: The lower FOR, the poorer are overall chances of conception in the sense that low antral follicle count (≤4 antral follicles; poor ovarian reserve) means that less time of fertile period is left in women’s life. As TOR and FOR decline with advancing age, pregnancy chances, therefore, decline in parallel. Naturally, AFC correlates with age and the time of menopause (Pic. 2). This means that in case of low AFC at specific age, sooner the menopause will appear in comparison with women of same age and higher AFC. If low AFC is correlated with endocrine test (such as FSH testing and AMH testing; AMH = anti-müllerian hormone) it may predict lowered chances of successful IVF cycles. AFC itself will determinate the dosage of FSH stimulation during assisted reproduction cycles.
Pic. 1: Antral follicle features
Antral follicle is a follicle with existing antrum and differentiated structures such as corona radiata and cumulus oophorus.

Pic. 2: Relation of age, menopause and AFC
Examples of AFC measurement and estimated time left to menopause.

<table>
<thead>
<tr>
<th>Antral Follicle Count (Both Ovaries)</th>
<th>Age at Time of Count</th>
<th>Age of Loss of Natural Fertility</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>30</td>
<td>29-33</td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>33-38</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>38-41</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>33-38</td>
</tr>
<tr>
<td>10</td>
<td>35</td>
<td>38-41</td>
</tr>
<tr>
<td>15</td>
<td>30</td>
<td>38-41 (closer to 41)</td>
</tr>
</tbody>
</table>

Sources

"Ovarian reserve" — sourced from Wikipedia licensed under [CC BY-SA 3.0](https://en.wikipedia.org/wiki/Ovarian_reserve)

"Poor ovarian reserve" — sourced from Wikipedia licensed under [CC BY-SA 3.0](https://en.wikipedia.org/wiki/Poor_ovarian_reserve)

"Antral follicle" — sourced from Wikipedia licensed under [CC BY-SA 3.0](https://en.wikipedia.org/wiki/Antral_follicle)

"Ovarian volume and antral follicle count for the prediction of low and hyper responders with in vitro fertilization" — by Kwee et al. licensed under [CC BY 2.0](https://rbej.biomedcentral.com/articles/10.1186/1477-7827-5-9)

"Individualization of the FSH starting dose in IVF/ICSI cycles using the antral follicle count" — by La Marca et al. licensed under [CC BY 2.0](https://ovarianresearch.biomedcentral.com/articles/10.1186/1757-2215-6-11)

"Defining ovarian reserve to better understand ovarian aging" — by Gleicher et al. licensed under [CC BY 2.0](https://rbej.biomedcentral.com/articles/10.1186/1477-7827-9-23)

"Endometriosis, Ovarian Reserve and Live Birth Rate Following In Vitro Fertilization/Intracytoplasmic Sperm Injection" — by Neto et al. licensed under [CC BY 4.0](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-72032016000500218)

"Adhesions after Laparoscopic Ovarian Drilling in the Treatment of Women with Polycystic Ovary Syndrome: Should it be a Concern?" — by Api licensed under [CC BY-NC 4.0](http://mimsurgery.com/10729.fulltext)

"Antral follicle" — by Kadlec, created for Fertilitpedia.org licensed under [CC BY-SA 4.0](http://uploads/6c3/894/ba1/6c3894ba1079ce07dcf33c20c5b7497592dbe1fd.jpeg)