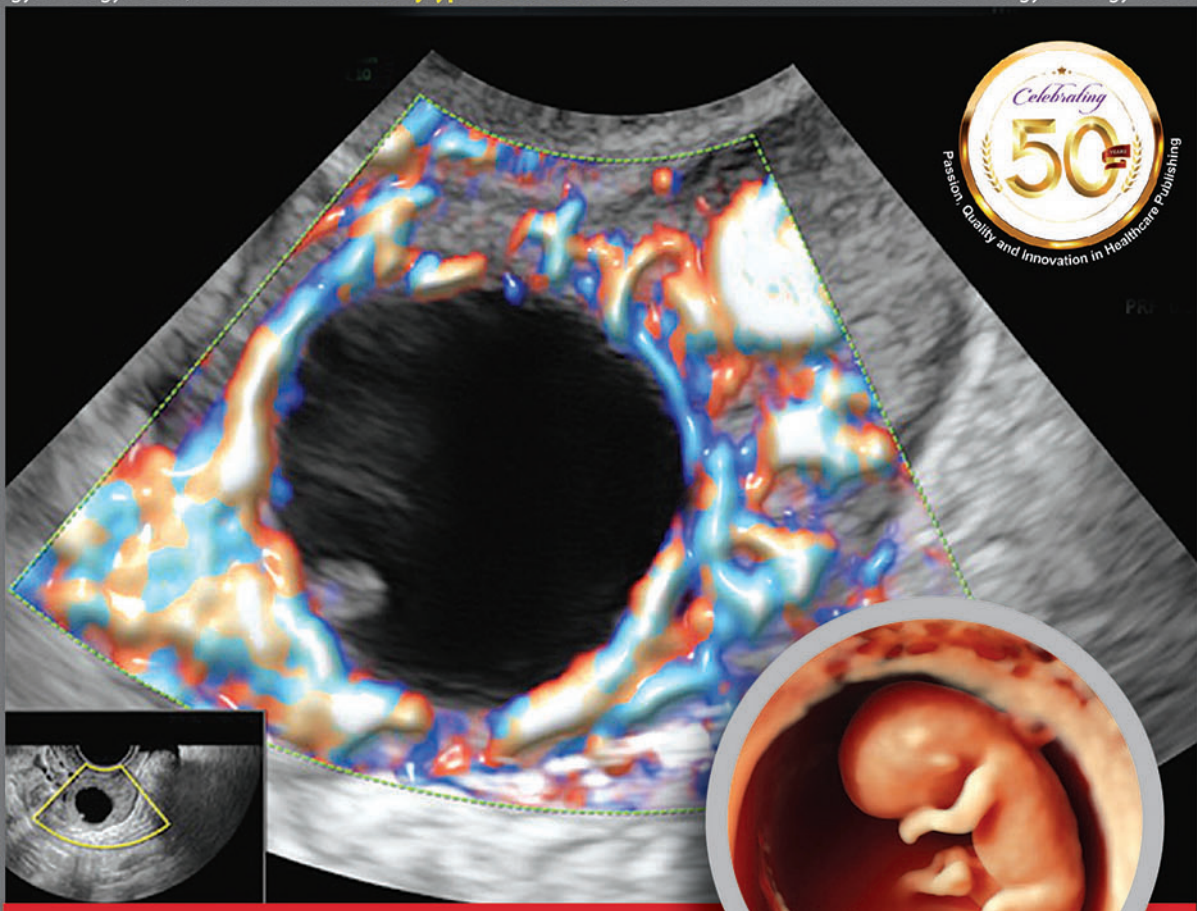

SECOND EDITION

Handbook of INFERTILITY & ULTRASOUND

for Practicing Gynecologists

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JAYPEE

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Section 1: INFERTILITY

CHAPTER 2

Hormonal Assessment of an Infertile Couple

Chaitanya Nagori

INTRODUCTION

It is extremely important to ask for precise investigations. Otherwise it may cause more confusion and patient has to spend unnecessarily for investigations. This chapter will tell us exactly which investigation should be requested for and when. It is unfortunate, that investigations are given more preference than clinical acumen. Clinical acumen is vanishing because of easily available investigations. If I remember days on undergraduate studies, there was a popular book of Clinical Surgery, that had mentioned the sequence as: Provisional diagnosis → Investigations → Final diagnosis. But the sequence followed today is Investigations → Provisional diagnosis → Final diagnosis. This should be strongly discouraged. Provisional diagnosis must be written when an investigation is asked for. Clinician should never diagnose a condition based on investigations alone.

We have seen patients taking tablet bromocriptine for months or years at a stretch for a borderline high prolactin levels. Patient should be treated not the reports. Remember that the clinician should be the ultimate person to make the diagnosis and decide the treatment. I would humbly request and strongly recommend pathologists not to comment on further investigations, diagnosis or management. Profiles and packages offered by laboratories are of no use. Clinician must evaluate the requirement of each investigation individually. Moreover as far as infertility is concerned, any hormonal assessment has clinical value, only if done at a particular time of the cycle and therefore packages and profiles are absolutely meaningless for infertility management. Moreover, it is also essential to understand the physiology of the hypothalamopituitary ovarian axis **(Fig. 1)**. Here we have emphasized the need for investigations for routine infertility practice and investigations especially required for in vitro fertilization (IVF) are separately discussed.

INVESTIGATIONS FOR THE INFERTILE WOMEN

Serum Follicle-stimulating Hormone

- Day 2–3 follicle-stimulating hormone (FSH) is done along with luteinizing hormone (LH) for diagnosis of polycystic ovarian syndrome (PCOS).

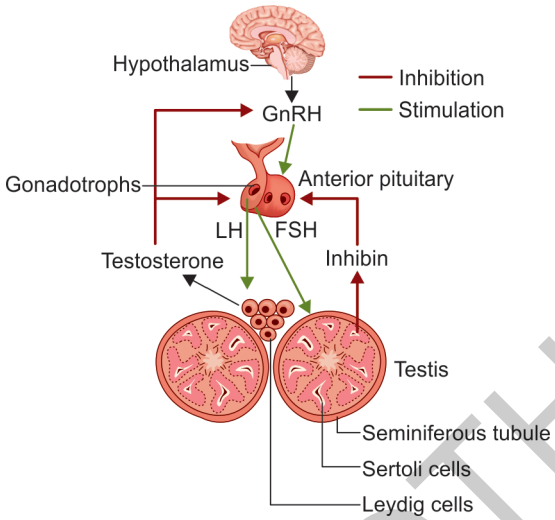

Fig. 1: Hypothalamo-pituitary testicular axis (FSH: follicle-stimulating hormone; GnRH: gonadotropin-releasing hormone; LH: luteinizing hormone)

This should not be done as it does not change the line of treatment. PCOS can be diagnosed by history, clinical examination, and ultrasound (US). US diagnosis of polycystic ovaries (PCO) has been discussed in the Chapter 16 of this book. We have never used FSH/LH ratio for diagnosis of PCOS. Because abnormal value of this ratio only indicates anovulation, which is otherwise also evident by history.

- Day 2–3 FSH is done before IVF. Higher FSH indicates lower chances of pregnancy.[1,2] Serum FSH levels up to 10–12 IU/L is considered normal. We do not get Day 2–3 serum FSH done as age + antral follicle count (AFC) gives better idea for assessing the ovarian reserve. However, systematic reviews from most studies have failed to define a single threshold or cut off value of serum FSH to describe poor ovarian function.[3]
- Occasionally for diagnosis of menopause, when progesterone withdrawal bleeding is absent, serum FSH can be used to confirm the diagnosis.
- Earlier serum FSH was assessed in several cycles to decide which cycle can be used for fertility treatment but raised serum FSH in anyone cycle can be an indicator of extremely low or no possibility of ongoing pregnancy.[4] Treatment should not be started in selected cycles also when serum FSH is normal.
- Basal FSH provides predictive value for pregnancy which can be judged by baseline scan. High FSH suggests poor ovarian reserve and that can be diagnosed by baseline scan. High FSH is a direct pituitary compensation for the older and less responsive ovary, where reduced oocyte numbers and reduced ovarian hormone production are present and lead to

attenuated negative feedback on hypothalamic/pituitary secretion of FSH. High basal FSH levels should be used for counseling women as regards their outcome rather than exclude them from IVF cycles. FSH above 15 IU/L in young women still show fair pregnancy rates, indicating that quality can compensate for quantity of oocytes.[5] Cycling women with high FSH should be offered treatment without further delay.[6] We, therefore, routinely do not recommend serum FSH assessment but rely more on baseline scan.

Serum Luteinizing Hormone

- Day 2–3 LH along with serum FSH is done to diagnose PCOS. But high LH indicates only anovulation which can be judged by history. So routine LH is not done.
- *Day 8–9 LH in clomiphene citrate (CC) cycles:* CC stimulates hypothalamus to secrete FSH and LH both. High LH is detrimental to ova and gives poor pregnancy rate with CC in spite of good ovulation rates. So, when LH is more than 10–12 IU/L, CC should not be given for the second cycle and patients should be switched over to gonadotropins.

Serum Estradiol Level

- *Follicular maturity*: Serum estradiol (E2) helps to decide the maturity and quality of the follicle. Especially when the follicle looks mature but the endometrium appears thin, it is E2 level that can decide whether it is the follicular immaturity or local endometrial cause for the same. Normal E2 level for a mature follicle is 150 pgm/mL/follicle. Serum level of E2 less than this indicates a bad quality or immature follicle. Normal serum E2 level with thin endometrium indicates a local cause. Though in today's practice if color Doppler is used for assessment of follicular and endometrial quality, E2 level is not required to assess physiological maturity of the follicle.
- *For poor responder*: For IVF cycles E2 is done on Day 2. If E2 is > 80 pgm/mL, it indicates poor IVF outcome as it indicates early follicular recruitment due to high FSH and poor ovarian reserve.[7,8] This is not required for intrauterine insemination (IUI) cycles and in majority of assisted reproductive technology (ART) cycles.
- *To assess ovarian suppression*: In IVF cycles with long agonist protocol, gonadotropin-releasing hormone agonist (GnRHa) is started from Day 21 of previous cycle. This downregulates pituitary and FSH, LH levels are therefore very low. In turn it also brings E2 to baseline levels. To assess downregulation therefore, E2 is done on Day 2 of the cycle and stimulation may be started if E2 <30 pgm/mL, or some may also allow <50 pgm/mL. In patients who are on downregulation with oral

contraceptive pills, E2 levels are checked after 12 days of oral contraceptive pills to start stimulation.

- *For suspected risk of hyperstimulation*: After superovulation in IUI cycles or when gonadotropins are used for ovulation induction, ovaries may develop multiple follicles. Ovarian hyperstimulation syndrome (OHSS) is feared in such patients. E2 level can be measured for these patients. In non-IVF cycles, E2 >1,600 pgm/mL and in IVF cycles E2 levels > 4,000 pgm/mL on the day of ovulation trigger can cause OHSS. But risk of OHSS can also be judged by three-dimensional (3D) US and has been discussed at length in the US section of the book. We, therefore, do not get E2 levels done to assess the risk of OHSS.

  We always prefer a chronic low dose protocol for superovulation with IUI in PCOS patients. In spite of that if we get four to five follicles in each ovary, we would use GnRHa for ovulation trigger to avoid OHSS. E2 level assessment is not required to decide the ovulation trigger if proper US assessment with Doppler is done.

  In IVF/intracytoplasmic sperm injection (ICSI) cycles, OHSS is common for PCOS patients. In these patients therefore antagonist protocol is preferred to long agonist protocol and agonist is used for ovulation trigger in these patients. This protocol is almost 100% OHSS proof. If we get multiple follicles unexpectedly in an agonist downregulated cycle, ovarian volume on US can give a clue to the risk of OHSS. This is if total ovarian volume (of both ovaries) is more than approximately 180 cc.[9] In these cases, hCG is withheld. Therefore to avoid OHSS:
  - Use chronic low dose protocol in PCOS patients
  - Use antagonist protocol instead of long agonist protocol for down-regulation and agonist as ovulation trigger
  - In doubtful cases, ovarian volume is calculated by 3D US and when ovarian volume is huge, hCG is withheld.

  We use US to assess the risk of OHSS, but E2 can be used by a gynecologist, if facility of 3D US is not available.

Serum Progesterone

Most of progesterone is secreted by corpus luteum in second half of the cycle. Otherwise it is an intermediate hormone for other steroid hormones.

Normal values:

- *Follicular phase*: 1 ng/mL
- *LH surge*: 1–2 ng/mL
- *Ovulation*: 3 ng/mL

Midluteal serum progesterone, i.e., a week before menses is approximately 10 ng/mL. A level of >3 ng/mL indicates ovulation. Therefore if only

ovulation is to be documented and no intervention is planned, repeated US scans are not required. In the same way endometrial biopsy is not required to confirm secretory changes in endometrium and serum progesterone estimation suffices for the same.

Ultrasound with color Doppler is a better modality to assess the secretory phase of the cycle. It can define all luteal phase problems—luteal phase defect (LPD)/luteinized unruptured follicle. This has been discussed in detail in Chapter 16 of this book. So, it is the inevitable conclusion that random serum progesterone has little value beyond documenting ovulation.

Serum Prolactin

Prolactin is the hormone secreted by anterior pituitary and is regulated by prolactin inhibitory factor, which is secreted from hypothalamus.

- Normal level of prolactin is 10–25 ng/mL.
- In microadenoma it is between 100 and 200 ng/mL
- In macroadenoma it is >200 ng/mL
- Immunoassay for prolactin does not reflect the bioassay always
- Many times patients have no symptoms in spite of high prolactin level because of presence of macromolecules which are big prolactin molecules that account for 10–12% of normal patient otherwise but showing hyperprolactinemia on laboratory investigation.

Galactorrhea with Normal Prolactin Levels

Patients may come with complaint of galactorrhea and may present with normal serum prolactin levels. This may be mucoid discharge and not actual galactorrhea. Any discharge therefore from the breast should be checked under microscope. If it contains fat globules, only then it is galactorrhea.

When ovulation induction is done, in many patients E2 leads to rise in prolactin levels in first half of the menstrual cycle. These patients are known as spikers. This is transient hyperprolactinemia. The clinical presentation is poor endometrium in spite of good follicles. This condition is difficult to diagnose, but bromocriptine can be given in a dose of 1.25 mg/BD in these patients in first half of the cycle. It is a therapeutic test. If endometrium improves, it is continued in the subsequent cycle, otherwise it is stopped. If patient is a spiker, she needs treatment; otherwise this condition also deteriorates oocyte quality and causes LPD as certain amount of prolactin is essential for development of good follicle and also for corpus luteal function.

Marginally high prolactin levels are also found in PCOS patients due to high E2 and high dehydroepiandrosterone sulfate (DHEAS). In these cases bromocriptine or cabergoline is not the treatment, only PCOS is to be treated.

Table 1: Sources of testosterone.

Hormone	*Source*
Testosterone	• 50% peripheral conversion • 25% ovary • 25% adrenal
Androstenedione	• 50% ovary • 50% adrenal
Dehydroepiandrosterone (DHEA)	• 90% adrenal • 10% ovary
Dehydroandrosterone (DHA)	• 100% adrenal

17-OH-Progesterone

This investigation is done in all patients with hirsutism. It is increased due to 21-hydroxykase deficiency. Because of 21-hydroxylase deficiency in patients of heterogeneous carrier, late onset of congenital adrenal hyperplasia is observed. 17-OH-progesterone (17-OH-P) is a weak androgen and manifests as hirsutism, acne, clitoral enlargement, and menstrual irregularity at puberty.

Normal level of 17-OH-P is <200 ng/dL. Whenever the level is between 200 and 800 ng/dL, it requires adrenocorticotropic hormone (ACTH) testing. Level of >800 ng/dL is diagnostic of 21-hydroxylase deficiency.[10] These patients are treated with dexamethasone 0.5 mg daily at bedtime.

Serum Testosterone

Normal value of serum testosterone is 20–80 ng/dL. Its normal production is 0.2–0.3 mg/day. Out of this 80% binds to sex hormone binding globulin (SHBG) and 19% to albumin. Only 1% is free testosterone **(Table 1)**. Testosterone may rise in PCOS and tumors. Tumor is suspected if there is sudden onset of symptoms due to increased testosterone. PCOS patients show gradual rise in testosterone levels.[11] Routine estimation of serum testosterone is not required as it does not change the line of treatment.

Serum Dehydroepiandrosterone Sulfate

Dehydroepiandrosterone sulfate is exclusively secreted from adrenal glands. The normal value is 350 ngm/dL. It increases with hyperprolactinemia. Therefore in patients with PCOS, prolactin and DHEAS are slightly on higher side which do not require any specific treatment except the treatment of PCOS. This rise is secondary to E2 because of anovulation.

Whenever DHEAS is very high, it is due to adrenal tumor. So US is a better guide to diagnose adrenal tumor. Serum testosterone and US suffices to rule out adrenal tumors.

If there is moderate rise in PCOS and it does not require any treatment. If 17-OH-P is normal there is no need to search for adrenal enzyme defect. DHEAS > 700 µgm/dL is accepted as a marker for adrenal dysfunction. This is rarely found and does not change the management. Therefore, routine testing of DHEAS is not required.

Inhibin A and B

Inhibin B is predominantly secreted by antral follicles. Low, Day 3 inhibin B level of <45 pgm/mL has poor response to superovulation and patient is less likely to conceive. Same thing can be judged by raised serum FSH, raised serum anti-Müllerian hormone (AMH) or low AFC and so routine use of inhibin B estimation is not justified.

Inhibin A is secreted from preovulatory follicles. Both inhibin A and B are secreted from granulosa cells and regulate FSH by negative feedback mechanism. Routine estimation of inhibin A does not add any information that may change the management of the patient.

Serum Anti-Müllerian Hormone

It is a member of transforming growth factor (TGF). It is produced from granulosa cells. The expression of AMH is localized in granulosa cells of primary preantral and small antral follicles and has important role in human folliculogenesis. AMH expression in follicle decreases when antral follicle size is >8 mm in size. In follicles undergoing atresia and in corpus lutea also the AMH expression is completely lost.[12]

Anti-Müllerian hormone levels in women are low until the age of 8 years, rise rapidly until puberty and decline steadily from the age of 25 years until menopause, when AMH production ceases **(Table 2)**.

It is now well established that serum AMH concentrations reflect the number of preantral and small antral follicles in the ovary, this would account for raised AMH levels found in both polycystic ovarian morphology (PCOM) and PCOS.[13]

Table 2: Anti-Müllerian hormone: Values and implications.

Ovarian fertility potential	*pmol/L*	*ng/mL*
Optimal fertility	28.6–48.5	4.0–6.8
Satisfactory fertility	15.7–28.6	2.2–4.0
Low fertility	2.2–15.7	0.3–2.2
Very low/undetectable	0.0–2.2	0.0–0.3
High level	>48.5	>6.8

Physiology

Anti-Müllerian hormone has an inhibiting role in the ovary, contributing to follicular arrest.[14] It lowers the sensitivity of follicles to FSH, that is required for normal folliculogenesis. In vitro studies have shown that the action of FSH in promoting follicular growth is counteracted by AMH.[15] It has a steady level throughout the cycle except for a slight dip just after LH peak.[16] Though some investigators have recorded cyclical fluctuations in AMH with rapid decrease in early luteal phase.[17]

Anti-Müllerian Hormone and Polycystic Ovary

The reported property of AMH to counteract the actions of FSH implies that the high production of AMH by polycystic ovary (PCO) may have an important role in the pathophysiology of the syndrome.[14] In anovulatory PCOS, the failure of follicle development is due to an intrinsic inhibition of FSH action and this inhibition is due to the high concentration of AMH.[18] Increased ovarian stromal blood flow in PCOS may be because of over expression of vascular endothelial growth factor (VEGF), which modulates the permeability of theca cells and increase insulin-like growth factor 1 (IGF-1).[19,20] This in turn enhances gonadotropin-stimulated steroid production in granulosa cells and theca cells resulting in increased ovarian androgen production and subsequently increased AMH production.[21] AMH levels are two to three times higher in PCOS than in healthy controls.[22] This has been attributed not only to increased number of antral follicles, but also to higher production of AMH per follicle in patients with PCOS as compared to size-matched counterparts from normal ovary.[23]

In addition a positive correlation between AMH and serum concentration of both LH and testosterone in PCOS has been reported.[24]

Each individual follicle in a PCO in women with PCOS produces significantly more AMH than its sized-matched counterpart from a normal ovary.[23] Moreover, it has also been shown that metformin administration in PCOS patients is associated with reduction in AMH concentration in follicle and serum, suggesting that the measurement of AMH can be used to evaluate the treatment efficacy with insulin sensitizers.[25]

It can predict ovarian response. It can predict menopause by low levels. If AMH is very high in PCOS, then it predicts OHSS.

Anti-Müllerian Hormone and In Vitro Fertilization

In IVF patients, serum AMH value can predict the response of ovary and so it is useful for counseling the patient. When calculated optimal AMH cutoff of <1.26 ng/mL was used to predict responses to controlled ovarian stimulation (COS), it was found to have a 97% sensitivity for predicting poor responses

Table 3: AMH group.

AMH group (pmol/L)	*GnRH analog*	
<1.0	375 Antagonist	(Modified natural cycle)
1.0 to <5	375 Agonist	300 Antagonist
5.0 to <15	225 Agonist	225 Agonist
≥15.0	150 Agonist	150 Antagonist

(<4 oocytes retrieved) and 98% accuracy in predicting a normal COS response.[26] Nelson et al. suggested AMH-based strategy for deciding the COS protocol **(Table 3)**.[27]

But we have found AFC equally effective and more precise for prediction of ovarian response. We routinely do not assess AMH levels either in IVF or non-IVF cycles. With extremely low serum AMH levels, moderate, but reasonable pregnancy and live birth rates are still observed in our practice. Extremely low AMH level does not seem to represent an appropriate marker for withholding fertility treatment. Younger women are likely to have better pregnancy rates than their older counterparts with equally low AMH.[28]

Constant AMH and inhibin B levels suggest that neither AMH nor inhibin B is an accurate marker of ovarian response after low dose gonadotropins ovulation induction in patients with PCOS.[29] Mashiach et al. have also shown a relationship between follicular fluid AMH concentrations and the quality of embryos in patients with PCOS.[30]

Routine use of AMH does not help in managing non-ART patients. We require one to two follicles for superovulation with IUI and AMH will not help us in changing the line of treatment. Poor responding ovary or low reserve ovary can be very well judged by US.

Serum AMH estimation is indicated in:[31]

- Predicting both over and under response in controlled ovarian hyperstimulation (COH)
- Determining the most appropriate treatment regimen
- Pretreatment counseling for couples to make an appropriate and informed choice
- Predicting long-term fertility
- Predicting the age of menopause
- Predicting ovarian aging prior to or following chemotherapy/surgery
- Screening for polycystic ovaries.

The inhibitory effect of AMH on folliculogenesis may in future be used for hormonal contraception.

Clinical applications of AMH apart from fertility assessment are as follows:

- To confirm presence of testicular tissue in children with low testosterone levels

- Differential diagnosis of intersex disorders
- In patients with bilateral nonpalpable gonads
- Females with granulosa cell tumors.

Insulin Resistance

Now it has been proved that in patients of PCOS there is high androgen because of increased insulin level and its sensitivity. It indicates the severity of PCOS. Clinically waist circumference of 35 inches or 90 cm is predictive of abnormal endocrinology and metabolic function.

There are various methods to diagnose insulin resistance. But 2 hours glucose and insulin response is the most reliable one.

2 hours glucose tolerance test (after 75 g of glucose):

- *Normal*: <140 mg/dL
- *Impaired*: 140–190 mg/dL
- *Noninsulin-dependent diabetes mellitus (DM)*: ≥200 mg/dL

2 hours insulin response (after 75 g of glucose):

- *Insulin resistance very likely*: 100–150 μU/mL
- *Insulin resistance*: 151–300 μU/mL
- *Severe insulin resistance*: >300 μU/mL

In clinical practice, patients with high insulin resistance are the ones who require ovarian drilling. They have tonically high LH levels and therefore drilling helps. Alternatively they may also be benefitted by GnRH antagonist.

Antagonist decreases LH levels, prevents premature luteinization and improves oocyte quality.

Patients with insulin resistance who do not want immediate pregnancy are the patients for Metformin therapy. 3D US is a novel way to diagnose insulin resistance, based on assessment of stromal volume.[32] But for all those who do not have volume US, 2 hours glucose and 2 hours insulin test is the best alternative. So for chronic anovulation only three investigations are required:

1. Serum prolactin
2. Serum thyroid-stimulation hormone (TSH)
3. Insulin resistance

Thyroid Function Tests

- Normal level is 0.5–2.5 mIU/mL
- If TSH is high, measure free T4
- Any woman after the age of 35 years should be assessed for thyroid function
- Presence of antithyroid antibodies indicates future hypothyroidism

- During pregnancy or in recurrent pregnancy loss, it is done every 2 months
- Requirement of thyroxine decreases with age
- For hyperthyroidism T4 is measured and if it is normal, T3 is measured.

Laboratory Investigations for Male Infertility

In patients of male infertility, there are three important hormonal investigations: serum TSH, serum LH, and serum testosterone used for diagnosis and treatment plan. There are various permutation combinations of these hormones.

- *High FSH, high LH, and low/normal testosterone*: This indicates primary testicular failure, due to spermatogenic and Leydig cell damage. Treatment option for these patients will be only donor insemination or adoption. These patients cannot even provide sufficient number of sperms for ICSI. Though microdissection testicular sperm extraction (micro-TESE) may help.
- *High FSH, normal LH, and normal testosterone*: This combination indicates primary spermatogenic failure. As LH is normal, there is no Leydig cell damage. This is due to inhibin deficiency. Treatment option to these patients is again donor insemination or adoption. Micro-TESE may be tried.

  In both these groups, FSH is high. Therefore, instead of assessing these three hormones, one can assess only serum FSH and if that is high evaluation of other two hormones is not required. But if serum FSH is normal, LH and testosterone levels need to be assessed.

  In patients with high FSH, with normal LH and testosterone, the possible diagnosis is varicocele. In grade 3 varicocele, because of testicular damage, FSH is borderline high. In these patients varicocele ligation + gonadotropins + antioxidants can improve spermatogenesis in many cases.
- *Normal FSH, high LH, and high testosterone*: Normally LH and testosterone are regulated by negative feedback mechanism. But in this case, LH and testosterone both are high, as testosterone is not perceived by receptors. This is known as partial androgen resistance. High androgen will be converted into E2 and so E2/testosterone ratio will be high. This high E2 will cause gynecomastia, that is a diagnostic criterion. It also causes oligoasthenoteratozoospermia, which does not respond to drugs. ART is advised in these patients or adoption if the patient is not affording, after proper counseling.
- *Normal FSH, normal LH, and normal testosterone*: This is a very common finding in our patients. It may be due to organic cause like obstruction

in ductal system, retrograde ejaculation, varicocele or germ cell failure. The treatment is according to the cause.

- *Obstruction*: Surgery or ICSI after percutaneous epididymal sperm aspiration/testicular sperm aspiration (PESA/TESA)
- *Retrograde ejaculation*: α-adrenergic blocking drugs + IUI or ART
- *Varicocele*: Surgery + gonadotropins + antioxidants
- *Germ cell failure*:
  - *Spermatogonia arrest:* Donor insemination
  - *Spermatid arrest:* FSH + ICSI

But most commonly patients having azoospermia with normal FSH, LH, and testosterone do not have any pathological cause. These patients have qualitative failure causing azoospermia or severe oligozoospermia.

As discussed in the chapter on medical management of male infertility, these patients can be treated with FSH or human menopausal gonadotropin (hMG) 75–150 international units (IU) thrice a week and hCG 5000 IU twice a week. It has given excellent results in many cases. In these cases endogenous bioactivity is poor in spite of normal immunological levels [radioimmunoassay (RIA) test]. This is why exogenous FSH, LH, and hCG are useful.

- *Low FSH, low LH, and low testosterone*: These are the patients having hypogonadotropic hypogonadism. These patients can be treated by hCG 5,000 IU every fifth day for 5–7 weeks till testosterone becomes normal as it is required for initiation of spermatogenesis. After testosterone becomes normal, FSH 75 IU is added thrice a week for maturation of sperms. This is given for 3–6 months. But results are excellent and it initiates spermatogenesis.

There may be panhypopituitarism which require replacement of thyroid, corticotrophin, and growth hormone (GH).

There may be Kallmann syndrome which is congenital. Prolactinoma is normally macro type which requires surgery.

Hyperprolactinemia

Most diagnostic symptom of hyperprolactinemia is loss of libido. There is no galactorrhea or gynecomastia. Cause of low testosterone is macroadenoma leading to hyperprolactinemia, and this macroadenoma must be removed surgically. If there is no macroadenoma, oligospermia is because of androgen resistance. Therapy of choice for these patients is long-term bromocriptine or cabergoline.

Thyroid Dysfunction

Autoimmune thyroiditis is the most common condition. Hypothyroidism can cause oligospermia and hyperprolactinemia because of high TSH.

Hyperthyroidism also causes oligospermia. Therefore, thyroid function assessment is required in patients of oligospermia.

Adrenal Dysfunction

Infertility may be the only manifestation of adrenal dysfunction. It leads to feminization and softening of testis. Raised DHEAS also leads to increased prolactin levels. These are also associated with signs and symptoms of adrenal insufficiency. Risk is high in patients with family history of congenital adrenal hyperplasia.

Endocrine Workup

- Serum FSH
- Serum LH
- Serum testosterone
- Serum prolactin
- Serum TSH and T4
- Serum DHEAS
- Serum E2
- Serum 17-OH-P
- Serum cortisol
- Sex hormone-binding globulin

Carry Home Message

- Investigation is requested for confirmation of provisional diagnosis.
- FSH >15 IU/L indicates poor quality and quantity of ova.
- In CC cycle, Day 8–10 FSH should be <10 IU/L.
- E2 >1600 pgm/mL in IUI cycle may lead to OHSS.
- S. Progesterone >3 ng/mL documents ovulation.
- S. Prolactin >100 IU indicates adenoma.
- Prolactin is high in PCOS patients.
- 17-OHP is recommended in all patients with hirsuitism.
- Low AMH indicates poor ovarian reserve.
- High FSH in male indicates testicular failure.
- Hypogonadotrophic hypogonadism has good fertility prognosis after treatment in both the partners.
- When FSH, LH and testosterone are normal in men, it is mostly qualitative failure.

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