Sudan University of Science and technology

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A Study of female Infertility using Ultrasonography

دراسة عقم النساء باستخدام التصوير بالموجات فوق الصوتية

A thesis Submitted in Partial Fulfillment for the Requirements of M.Sc. Degree in Medical Diagnostic Ultrasound.

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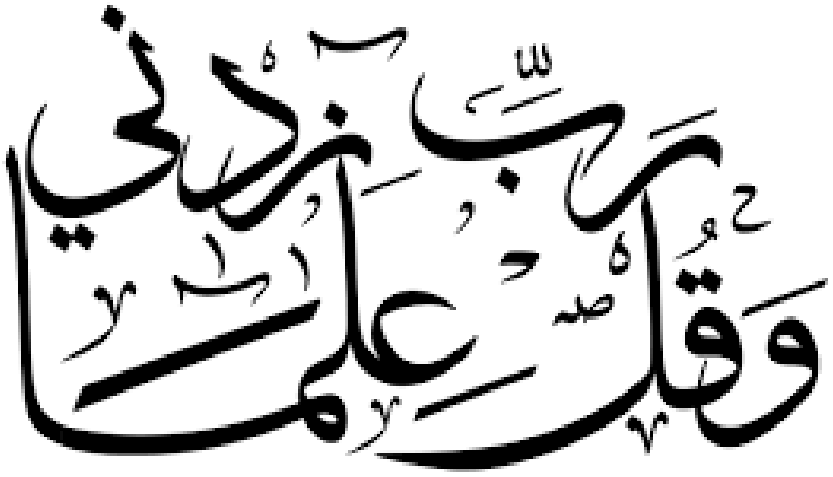

صدق الله العظيم

سورة طه ، الاية (144)

Dedication

To my mother , , father , husband , and to baba Taha soul ALLAH

Which I loved and they loved me much more than I did and always supporting me hoping that tomorrow will be better.

To my big family in portpeal and Aldouha

Acknowledgment

I wish to express my special thanks to **Dr. Husain Ahmed Hasan** for his kind assistance, patient helpful, useful advices and continuous encourage "research supervisor", the assistance and extreme co-operation I found in contact with Dr. Altigani Sideeg (infertility specialist)who facilitate data collection, Dr. Awadia who provide advice and consultations on data analysis, To all of them and to everybody who provide any kind of support or encouragement. Also I would like to thank all teachers and all my Colleagues.

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Abstract

This descriptive study which was done in 2017 in wad madani, Aljazeera state , center of Sudan in altegany fertility center to understanding of the medical causes of infertility which is important in order to reduce incidences of Infertility and for improving the clinical management of infertility for that This Study performed to Diagnosis and managements of infertility Using ultrasound. Objective of this study To study female infertility using ultrasonography. Method: Study was done for 97 infertile patient their age grope between(16 to 50 year) to study infertility causes and management by get medical history and lab result of Hormonal blood tests then apply sequence Ultrasound scan by using Ultrasound system Probes (Tran abdominal and Transvaginal). result: the study found that most female lab finding is normal 81.4% .female Ultrasound results for female as fallowing 35.1% polycystic ovary, 7.2% Congenital anomaly, 6.2% Mass and fibroid, 32% Normal Ultrasound finding, 4.1% pelvic inflammatory disease and 15.4% premature ovarian failure. This study show high hereditary risk factor (19.6 %). The result of male lab finding show 52.6% of infertility cases has abnormal male factor. After medication Ultrasound collective finding of monitoring ovarian follicles and endometrial thickness show causes of infertility57%is due to ovulatory disorder also show high response to the treatment (26.4%) in pco cases. (20.5%) pco cases have complication with ohss. 30.9% of all infertility cases use Ultrasound guide procedure to egg collection and artificial insinuation after response to medication. study recommend Don't depend on lab result only in diagnose of infertility cases because it not give accurate result if case is chronic or under medication and not differentiate between one big, some medium or many small follicles also recommend the doctor to further study about use of a mild hormone called dehydroepiandrosterone (DHEA) in women with POF to increase spontaneous pregnancy rates in premature ovarian failure.

مستخلص الدراسة

أجريت هذه الدراسة الوصفية 2017 -2018م باستخدام التصوير الموجات فوق الصوتية للمساهمة في تقليل حدوث العقم وتحسين العلاج وزيادة معدلات الشفاء. هدفت هذه الدراسة لدراسة العقم باستخدام التصوير بالموجات فوق الصوتية أجريت هذه الدراسة في مركز التجاني للخصوبه في ودمدني ولاية الجزيره- السودان ل 97 سيدة كلهن مصابات بالعقم وتتراوح أعمارهن من 16 لي 50 سنة وذالك بأخذ التاريخ المرضي وإجراء الفحوصات المعملية لكميات الهرمون في الدم وإجراء فحص الموجات فوق الصوتية باستخدام مسار الموجات فوق الصوتية ألبطني والمهبلي . وكانت النتائج كما يلي نتيجة المعمل كانت 81.4 %سلبي إما نتيجة التصوير بالموجات فوق الصوتية للسيدات كانت كما يلي 35.1% أكياس متعددة في المبايض(تكيس) و7.2% عيوب خلقيه في الرحم و6.2% أورام ليفيه و32% سيده اعطو نتيجة سلبيه من الأمراض و4.1% مرض الالتهاب الحوضي المزمن و15.4% فشل المبايض المبكر. وأيضا أوضحت الدراسة أن هده الحالات لديها عامل خطر وراثي قوي.أما نتيجة الفحوصات المعملية الخاصة بالرجل أوضحت أن 52.6% كانت ايجابيه .بعد المعالجة بالعقاقير الطبية كانت نتيجة التصوير بالموجات فوق الصوتية في متابعة حجم البويضات ونموها وحجم بطانة الرحم أن هناك استجابة قويه 26.4 % في مرض تكيس المبايض لكن كانت هنالك مضاعفات من العلاج وهي عبارة عن مرض زيادة تحفيز المبايض بنسبة20.5%. 30.9% من جميع الحالات استخدمنا فيها عملية التتبع بالموجات فوق الصوتية لجمع البويضات وحقن السائل المنوي داخل الرحم (الحقن الصناعي) بعد الاستجابة للعلاج .أوصت الدراسة بعدم الاعتماد علي نتيجة المعمل في تشخيص ومعالجة العقم لان المعمل قد يعطي نتيجة سلبيه إذا كانت الحالة مزمنة أو المريض تحت العلاج بالعقاقير الطبية وأيضا لا تفرق بين البويضات الكبيرة والصغيرة في الحجم.وأيضا أوصت الدراسة بدراسة دور العلاج بهرمون الديهايدربيندروستيرون في زيادة نسبة الاستجابة في فشل المبايض المبكر.وللمزيد من المعلومات أرجو الاطلاع علي هدا البحث بعنايه

Chapter One

Introduction

Chapter One

1.1 Introduction:

Infertility is defined as a failure to achieve pregnancy during 1 year of frequent, unprotected intercourse in the general population (which includes people with fertility problems), it is estimated that 84% of females would conceive within 1 year of regular unprotected sexual intercourse. This rises cumulatively to 93% after 3 years.

Evaluation of the infertile male starts with a detailed history and physical examination. This is followed by laboratory tests and imaging in order to identify a possible correctable cause. Laboratory tests routinely include follicle-stimulating hormone and testosterone levels, imaging often allows the selection of the best method for impregnating the female partner, such as image-guided sperm aspiration from the epididymis or seminiferous tubules, allowing in vitro fertilization or intra cytoplasmic sperm injection. The investigation of male infertility is assuming greater importance, with male factors implicated as a causal factor in up to half of infertile couples. Following routine history, examination and blood tests, imaging is frequently utilized in order to assess the scrotal contents for testicular volume and morphology. Additionally, this may give indirect evidence of the presence of possible reversible pathology in the form of obstructive azoospermia. The three main imaging modalities used for investigation of the male reproductive system are ultrasound, MRI and invasive techniques such as venography and vasography. MRI is useful in problem solving, and the invasive techniques are generally reserved for therapeutic intervention in previously defined abnormalities Ultrasound remains the mainstay as it is non-invasive, safe and widely available, and is able to define many of the abnormalities relevant to male infertility. .

(ref te Velde ER, Eijkemans R, Habbema HDF. Bongaarts J.2000)

About female infertility Assessment of Ovulation is very important Ovulatory defects are present in 40% of infertile women and in. Often a defect in ovulatory function manifests itself in menstrual disturbances and can be identified by history in the majority of women. A patient with menstrual abnormalities should be investigated for underlying causes such as polycystic ovarian syndrome, thyroid disease, hyper prolactinemia, and hypothalamic causes secondary to weight changes. In addition to a thorough menstrual history, other methods used to evaluate ovulation include basal body temperature (BBT) recordings, urinary luteinizing hormone (LH) ovulation predictor kits, mid luteal serum progesterone testing, and endometrial biopsy to assess for secretory endometrial development. Assessment of Uterus and Fallopian Tubes (ref)Alexander Quaas, Anuja Dokras.2017

Assessment of the uterine contour and the tubal patency is an integral part of the basic infertility evaluation.3 This may be achieved by hysterosalping-ography (HSG). An HSG consists of radiographic evaluation of the uterine cavity and fallopian tubes after injection of a radio-opaque medium through the cervical canal. Along with laparoscopic dye perturbation, it can best assess tubal patency: the concordance of HSG with laparoscopic dye perturbation is estimated as close to 90%. However, patent fallopian tubes on HSG do not confirm that ovum pickup will occur. For example, women with severe endometriosis may have adherent ovaries in the cul de sac with normal fallopian tubes Ultrasound evaluation in the follicular phase is used to identify uterine fibroids, polyps, and congenital cavitary anomalies such as a septate uterus. At the same time, information on ovarian volume and antral follicle counts can be obtained, making pelvic ultrasound part of the initial workup for infertility. (Ref)Alexander Quaas, Anuja Dokras.2017

A complete cavitary assessment, however, necessitates either sonohysterography for conditions such as uterine polyps, submucus leiomyoma, or Asherman’s syndrome (uterine synechiae).12

Sonohysterography, an office procedure, involves assessing the uterine cavity with ultrasound with concurrent instillation of sterile water. Some practitioners prefer diagnostic office hysteroscopy as it allows direct visualization of the uterine cavity.

Ultrasound became an important help for the diagnosis of infertility by demonstration of the pelvic organs, of growing ovarian follicles, of intrafollicular structure and of cyclic uterine endometrial changes. Ultrasonic particularities of ovaries and their landmarks such as the ovarian artery, are described. Average ovarian blood flow can be measured. In hormone stimulated cycles, the ultrasonic examination is repeated through ovulation where two or more follicles of that diameter are present, multiple pregnancy occurs. The risk of overstimulation can be assessed. The importance of ultrasound even higher than estradiol because it is impossible to differentiate between one big, some medium or many small follicles with hormone assays. Cyclic changes in the histology of the endometrium are described and make it possible to predict ovulation within 12 hr. Ultrasound is an important aid in predicting the time of ovulation more accurately than the basal body temperature faster and cheaper than hormone profiles.

Ultrasound plays a role in egg collection and replacement of the embryo. The detection of ovulation is very important in the treatment of infertility. This was only possible for a longtime by hormone profile. Nowadays ultrasound is an accepted method in the diagnostic procedures of this field. It permits the visualization of the position and size of the uterus, Fallopian tubes and ovaries, the exclusion of genital anomalies and the demonstration of physiological changes of these organs during the menstrual cycle. The main points of ultrasound in the diagnosis of infertility are as follows: Demonstration of the pelvic organs (uterus, Fallopian tube, and ovary) and vascular structures. Demonstration of growing ovarian follicles (Measurement of their numbers and sizes). Demonstration of intrafollicular structures (Cumulus oöphorus,

Corpus luteum). Demonstration of cyclic uterine endometrial changes. (ref)Alexander Quaas, Anuja Dokras.2017

1.2 Problem of the study

Diagnosis and managements of infertility is very important factor to prevent failure of pregnancy in Aljazeera state. Understanding of the medical causes of infertility which is important in order to reduce incidences of Infertility and for improving the clinical management of infertility

1.3 Objective of the study

1.3.1 General Objective

A Study of female Infertility using Ultrasonography

1.3.2Specific. Objective

To assess the general pathological problem that lead to infertility in female

To assess the male factor that lead to infertility

To follow up the ovulation process and endometrium thickness

To assess haw ultrasound useful in infertility management

To assess the general Complication witch result from infertility treatment

1.4 The area of the study

Aljazeera state, wadmadani town, altigani center of infertility and deferent other hospitals Sudan. December 2017

Significance of the study

This study will facilitate rich information about infertility factor .also will give information about ultrasound modality in solving infertility problems

Chapter Two

Literature review and previous study

Chapter Two

Literature review and previous study

2.1Literature review

2.1.1 Anatomy

2.1.1..1 The female reproductive organs

The female reproductive organs can be subdivided into the internal and external genitalia.

2.1.1.1.1 External genitalia

The external genitalia lie outside the true pelvis. These include the perineum, mons pubis, clitoris, urethral (urinary) meatus, labia majora and minora, vestibule, greater vestibular (Bartholin) glands, Skene glands, and periurethral area.

2.1.1.1.2 Internal genitalia

The internal genitalia are those organs that are within the true pelvis. These include the vagina, uterus, cervix, uterine tubes (oviducts or fallopian tubes), and ovaries.

2.1.1.1.2.1 Vagina

The vagina extends from the vulva externally to the uterine cervix internally (fig2-3). It is located within the pelvis, anterior to the rectum and posterior to the urinary bladder. The vagina lies at a 90º angle in relation to the uterus. The vagina is held in place by endopelvic fascia and ligaments (see the image below). The vagina is lined by rugae, which are situated in folds throughout. These allow easy distention, especially during child bearing. The structure of the vagina is a network of connective, membranous, and erectile tissues. The pelvic diaphragm, the sphincter urethrae and transverse peroneus muscles, and the perineal membrane support the vagina. The sphincter urethrae and the transverse peroneus are innervated by perineal branches of the pudendal nerve.

The pelvic diaphragm primarily refers to the elevator ani and the coccygeus and is innervated by branches of sacral nerves S2-S4

The vascular supply to the vagina is primarily from the vaginal artery, a branch of the anterior division of the internal iliac artery. Several of these arteries may be found on either side of the pelvis to richly supply the vagina. The nerve supply to the vagina is primarily from the autonomic nervous system. Sensory fibers to the lower vagina arise from the pudendal nerve, and pain fibers are from sacral nerve roots. Lymphatic drainage of the vagina is generally to the external iliac nodes (upper third of the vagina), the common and internal iliac nodes (middle third), and the superficial inguinal nodes (lower third).

(Ref Aurora M Miranda, et,al, 2017).

2.1.1.1.2.2 Uterus

The uterus is the inverted pear-shaped female reproductive organ (fig2-3) that lies in the midline of the body, within the pelvis between the bladder and the rectum. It is thick-walled and muscular, with a lining that, during reproductive years, changes in response to hormone stimulation throughout a woman's monthly cycle.

The uterus can be divided into 2 parts: the most inferior aspect is the cervix, and the bulk of the organ is called the body of the uterus (corpus uteri). Between these 2 is the isthmus, a short area of constriction.

The body of the uterus is globe-shaped and is typically situated in an anteverted position, at a 90º angle to the vagina. The upper aspect of the body is dome-shaped and is called the fundus; it is typically the most muscular part of the uterus. The body of the uterus is responsible for holding a pregnancy, and strong uterine wall contractions help to expel the fetus during labor and delivery.

The average weight of a non-pregnant, nulliparous uterus is approximately 40-50 g. A multiparous uterus may weigh slightly more than this, with an upper

limit of approximately 110 g. A menopausal uterus is small and atrophied and typically weighs much less.

The cavity of the uterus is flattened and triangular. The uterine tubes enter the uterine cavity bilaterally in the supero lateral portion of the cavity.

The uterus is connected to its surrounding structures by a series of ligaments and connective tissue. The pelvic peritoneum is attached to the body and the cervix as the broad ligament, reflecting onto the bladder. The broad ligament attaches the uterus to the lateral pelvic side walls. Within the broad base of the broad ligament, between its anterior and posterior laminae, connective tissue strands associated with the uterine and vaginal vessels help to support the uterus and vagina. Together, these strands are referred to as the cardinal ligament.

Rectouterine ligaments, lying within peritoneal folds, stretch posteriorly from the cervix to reach the sacrum. The round ligaments of the uterus are much denser structures and connect the uterus to the anterolateral abdominal wall at the deep inguinal ring. They lie within the anterior lamina of the broad ligament. Within the round ligament is the artery of Sampson, a small artery that must be ligated during hysterectomy.

The vasculature of the uterus is derived from the uterine arteries and veins. The uterine vessels arise from the anterior division of the internal iliac, and branches of the uterine artery anastomose with the ovarian artery along the uterine tube.

The nerve supply and lymphatic drainage of the uterus are complex. Lymphatic drainage is primarily to the lateral aortic, pelvic, and iliac nodes that surround the iliac vessels. The nerve supply is attained through the sympathetic nervous system (by way of the hypo gastric and ovarian plexuses) and the parasympathetic nervous system (by way of the pelvic splanchnic nerves from the second through fourth sacral nerves).

(Ref Aurora M Miranda, et,al, 2017).

2.1.1.1.2.3 Cervix

The cervix is the inferior portion of the uterus, separating the body of the uterus from the vagina (fig2-3). The cervix is cylindrical in shape, with an endocervical canal located in the midline, allowing passage of semen into the uterus. The external opening into the vagina is termed the external os, and the internal opening into the endometrial cavity is termed the internal os. The internal os is the portion of a female cervix that dilates to allow delivery of the fetus during labor. The average length of the cervix is 3-5 cm.

The vasculature is supplied by descending branches of the uterine artery, which run bilaterally at the 3 o'clock and 9 o'clock position of the cervix. The nerve supply to the cervix is via the parasympathetic nervous system by way of the second through fourth sacral segments. Many pain nerve fibers run alongside these parasympathetic. Lymphatic drainage of the cervix is complex. The obturator, common iliac, internal iliac, external iliac, and visceral parametrial nodes are the main drainage points.

(Ref Aurora M Miranda, et,al, 2017).

2.1.1.1.2.4 Uterine tubes

The uterine tubes (also referred to as fallopian tubes) are uterine appendages located bilaterally at the superior portion of the cavity (fig2-3). Their primary function is to transport sperm toward the egg, which is released by the ovary, and then to allow passage of the fertilized egg back to the uterus for implantation.

The uterine tubes exit the uterus through an area known as the cornea and form a connection between the endometrial and peritoneal cavities. Each tube is approximately 10 cm in length and 1 cm in diameter and is situated within a portion of the broad ligament called the mesosalpinx. The distal portion of the uterine tube ends in an orientation encircling the ovary.

The uterine tube has 3 parts. The first segment, closest to the uterus, is called the isthmus. The second segment is the ampulla, which becomes more dilated

in diameter and is the typical place of fertilization. The final segment, furthest from the uterus, is the infundibulum. The infundibulum gives rise to the fimbriae, fingerlike projections that are responsible for catching the egg that is released by the ovary.

The arterial supply to the uterine tubes is from branches of the uterine and ovarian arteries, small vessels that are located within the mesosalpinx. The nerve supply to the uterine tubes is via both sympathetic and parasympathetic fibers. Sensory fibers run from thoracic segments 11-12 and lumbar segment 1. Lymphatic drainage of the uterine tubes is through the iliac and aortic nodes. (Ref Aurora M Miranda, et,al, 2017).

2.1.1.1.2.5 Ovaries

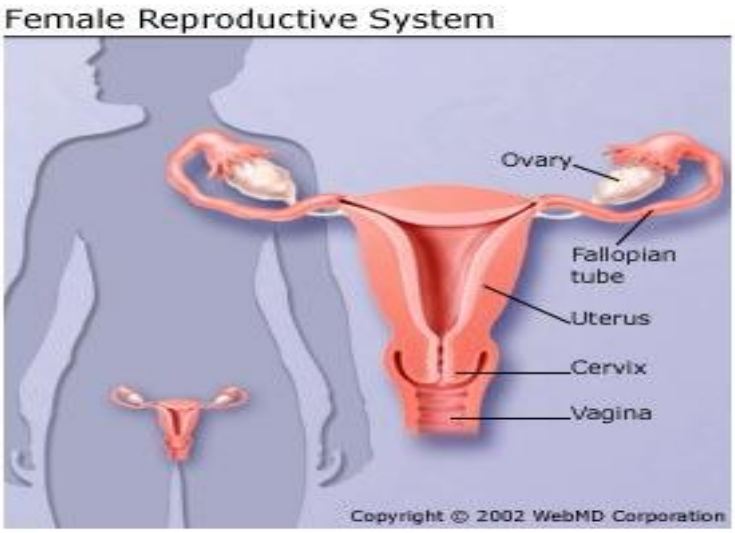
The ovaries are paired organs located on either side of the uterus within the mesovarium portion of the broad ligament below the uterine tubes (fig2-3). The ovaries are responsible for housing and releasing the ova, or eggs, necessary for reproduction. At birth, a female has approximately 1-2 million eggs, but only 300 of these eggs ever mature and are released for the purpose of fertilization.

The ovaries are small and oval-shaped, exhibit a grayish color, and have an uneven surface. The actual size of an ovary depends on a woman's age and hormonal status; the ovaries are approximately 3-5 cm in length during childbearing years and become much smaller and atrophic once menopause occurs. A cross-section of the ovary reveals many cystic structures that vary in size. These structures represent ovarian follicles at different stages of development and degeneration.

Several ligaments support the ovary. The ovarian ligament connects the uterus and ovary. The posterior portion of the broad ligament forms the mesovarium, which supports the ovary and houses the vascular supply. The suspensory ligament of the ovary (infundibular pelvic ligament), a peritoneal fold overlying the ovarian vessels, attaches the ovary to the pelvic sidewallBlood

supply to the ovary is via the ovarian artery; both right and left ovarian arteries originate directly from the descending aorta at the level of the L2 vertebra. The ovarian artery and vein enter and exit the ovary at the hilum. The left ovarian vein drains into the left renal vein, and the right ovarian vein empties directly into the inferior vena cava. Nerve supply to the ovaries run with the vasculature within the suspensory ligament of the ovary, entering the ovary at the hilum. Supply is through the ovarian, hypo gastric, and aortic plexuses. Lymphatic drainage of the ovary is primarily to the lateral aortic nodes; however, the iliac nodes may also be involved.

(Ref Aurora M Miranda, et,al, 2017)..



Fig(2-1) internal genetalia anterior veiw

2. 1. 1.2. Male Reproductive System

The male external structures are the penis and the scrotum (a pouch hich protects the testes). The penis consists of the glans (the head), and the shaft (the body). The glans is covered by a fold of skin called the foreskin (circumcision removes the foreskin). The scrotum surrounds and protects the two testes, internal structures also referred to as testicles fig.

The testes are the male gonads and contain hundreds of tiny seminiferous tubules where sperm cells are produced. The epididymis is a small oblong body witch rests on the surface of the testes where sperm mature and are

stored. The epididymis leads into the vas deferens (narrow tubes which carry sperm away from the testes). The vas deferens extends to join with the ducts of the two seminal vesicles (located on side of the prostate gland) to form the ejaculatory ducts which extend through the body of the prostate gland and empty into the urethra. The prostate gland surrounds the neck of the bladder (the structure that stores urine) and the urethra, (a thin tube which extends through the penis and carries semen and urine outside of the body, although not simultaneously). The Cowper's glands (also called the bulbourethral glands) are found on each side of the urethra, just below the prostate gland (fig2-4) .

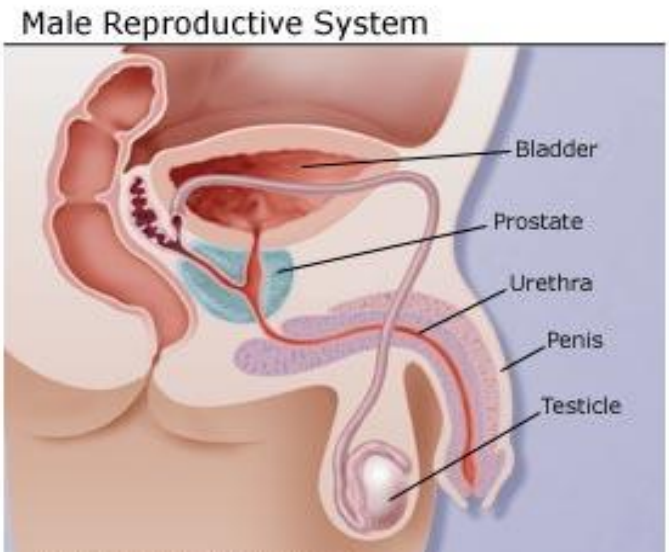


Fig (2-2) male reproductive system lateral view

2.1.2physiology

2.1.2.1Menstrual Cycle

Females of reproductive age experience cycles of hormonal activity that repeat at about one-month intervals. With every cycle, a woman's body prepares for a potential pregnancy, whether or not that is the woman's intention. The term menstruation refers to the periodic shedding of the uterine lining. (Menstru means "monthly.")

The average menstrual cycle takes about 28 days and occurs in phases: the follicular phase, the ovulatory phase (ovulation), and the luteal phase.

There are four major hormones (chemicals that stimulate or regulate the activity of cells or organs) involved in the menstrual cycle: follicle-stimulating hormone, luteinizing hormone, estrogen, and progesterone.

Continued.

2.2.1.1.Follicular Phase of the Menstrual Cycle The first day of menstruation (referred to as Day 1) occurs when levels of estrogen and progesterone are low (fig2-5). In response to these low levels, the hypothalamus secretes gonadotropin releasing hormone (GnRH) which triggers the anterior pituitary gland to release two hormones: follicle stimulating hormone (FSH), and luteinizing hormone (LH). FSH stimulate the growth of about 15 to 20 eggs within i the ovaries, each in its own "shell," called a follicle.

One dominant follicle takes over. As it continues to grow, the hormones these hormones (FSH and LH) also trigger an increase in the production of the female hormone estrogen.

As estrogen levels rise, like a switch, it turns off the production of follicle-stimulating hormone. This careful balance of hormones allows the body to limit the number of follicles that mature.

As the follicular phase progresses, one follicle in one ovary becomes dominant and continues to mature. This dominant follicle suppresses all of the other follicles in the group. As a result, they stop growing and die. The dominant follicle continues to produce estrogen.

2.1.2.1.2 .Ovulatory Phase of the Menstrual Cycle

The ovulatory phase, or ovulation, starts about 14 days after the follicular phase started (fig2-5).. The ovulatory phase is the midpoint of the menstrual cycle, with the next menstrual period starting about two weeks later. During this phase, the following events occur:

The rise in estrogen from the dominant follicle triggers a surge in the amount of luteinizing hormone that is produced by the brain.

This causes the dominant follicle to release its egg from the ovary (fig2-5).

As the egg is released (a process called ovulation), it is captured by finger-like projections on the end of the fallopian tubes (fimbriae). The fimbriae sweep the egg into the tube. Also during this phase, there is an increase in the amount and thickness of mucus produced by the cervix (lower part of the uterus). If a woman were to have intercourse during this time, the thick mucus captures the man's sperm, nourishes it, and helps it to move towards the egg for fertilization.

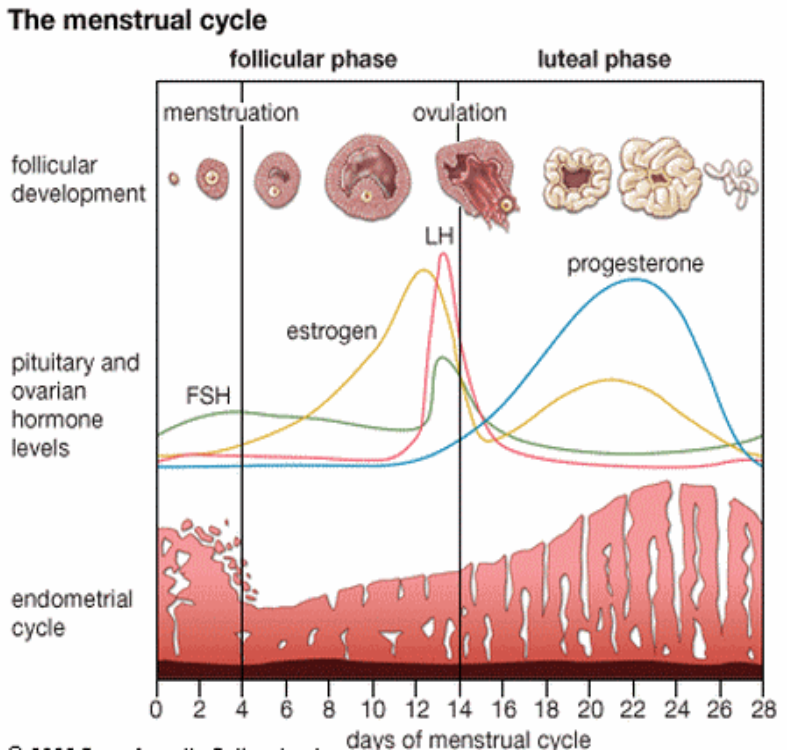
2.1.2.1.3Luteal Phase of the Menstrual Cycle

The luteal phase of the menstrual cycle begins right after ovulation and involves the following processes:

Once it releases its egg, the empty follicle develops into a new structure called the corpus luteum(fig2-5).

The corpus luteum secretes the hormone progesterone. The progesterone causes the endometrium to thicken (fig2-5), preparing it for implantation of a fertilized egg. If fertilization takes place during ovulation, hormonal levels remain high, essential for the maintenance of the pregnancy. If fertilization does not occur, the corpus luteum shrinks and levels of both estrogen and progesterone decrease (fig2-5). The withdrawal of estrogen and progesterone cause the blood vessels of the endometrial (uterine) lining to “break” resulting in vaginal bleeding (menstruation). The average menstrual cycle is 28-35 days, and menstrual flow usually continues for three to seven days, although there are variations among women.

Following menstruation, estrogen and progesterone levels are low, triggering the hypothalamus to once again release GnRH, starting the entire cycle again to understand this see fig(2-5). If fertilization does take place, menstruation will not reoccur for the duration of the pregnancy .



Fig(2-3) menstrual cycle endomettrium and hormonal trace

2.1.2.1.4How Many Eggs Does a Woman Have?

The vast majority of the eggs within the ovaries steadily die, until they are depleted at menopause. At birth, there are approximately 1 million to 2 million eggs; by the time of puberty, only about 300,000 remain. Of these, only about 500 will be ovulated during a woman's reproductive lifetime. Any remaining eggs gradually die out at menopause.

2.1.2.1.5. Menopause

Menopause, the end of menstruation, occurs between the ages of 45 and 55 (with the average age of 51.3). An entirely normal developmental and physiological process, it can be accompanied by symptoms including hot flashes, fatigue, moodiness, insomnia, decreased libido and sexual response, changes in memory, weight gain, and vaginal dryness. Until cessation of ovarian function is confirmed through a blood test, and/or one year of no menses, women may continue to ovulate and therefore require contraception to prevent unintended pregnancy.

2.1.2.2. Process of Spermatogenesis

Spermatogenesis begins in the seminiferous tubules of the testes. Sperm pass into the epididymis where they mature and become motile so they are able to move through the vas deferens and into the seminal vesicles where they mix with seminal fluids, rich in fructose and other nutrients. The prostate gland and the Cowper's glands secrete fluids which also help to nourish and transport the sperm. This mixture of fluids and sperm is called semen, the fluid which is expelled from a man's penis during ejaculation. Sexual arousal can cause fluid from the Cowper's glands to be released prior to ejaculation. This fluid is called pre-ejaculatory fluid and does not contain sperm unless it is leftover from a previous ejaculation. Contrary to popular belief, there is little evidence to support that pre-ejaculatory fluid contains enough sperm to cause pregnancy.

Although men continue to produce sperm throughout their lives, testosterone production decreases at about 45-65 years of age.

2.1.2.3. Fertilization:

During sexual intercourse between a male and a female, semen is released into the vagina and transported through the uterus into the fallopian tube. Although many factors contribute to whether or not a single act of intercourse will result in pregnancy, most important is whether or not a sperm cell will "meet" an ovum in the fallopian tube (fertilization). Fertilization can only occur if intercourse takes place before the time of ovulation that usually occurs "mid-cycle", or about 14 days before the woman's next menstrual period. At the time of ovulation, the ovum is released from the ovary and transported in the fallopian tube where it remains for about 24-48 hours. Pregnancy is most likely to occur if fresh semen is present when ovulation occurs.

. Sperm cells remain viable within the female reproductive tract for about 72 hours. Only a single sperm cell is needed to fertilize the ovum, even though the average ejaculation contains approximately 300 million sperm.

During fertilization, the sperm enters the cell membrane of the ovum so the nuclei of the sperm and egg cells combine to form a zygote. The zygote will remain in the fallopian tube for approximately three days before it travels to the uterus where it will remain for approximately four to five days before implantation into the uterine lining.

2.1.3Ultrasnographic anatomy

2.1.3.1 Uterus

. The uterus should be readily seen in the midline of the pelvis and normally exhibits an echo density that is clearly distinguishable from surrounding pelvic viscera (Fig 2-7). The endometrial echo has a variable density, depending on water content and cellular density, that fluctuates with the hormonal status of the patient. The changes noted in endometrial ultrasonographic appearance(fig2-6) have been characterized. The endometrium has a trilaminar preovulatory appearance, then thickness becomes more homogeneous after ovulation. Progressive echogenicity of the functional zone (compactum and spongiosum) occurs with completion of the preovulatory phase and during the secretory phase (Fig. 2-6). The thickness of the endometrium correlates with the histologic response to hormonal stimulation. The uterus should be readily seen in the midline of the pelvis and normally exhibits an echo density that is clearly distinguishable from surrounding pelvic viscera (Fig 2-7). The endometrial echo has a variable density, depending on water content and cellular density, that determine with the hormonal status of the patient. The changes noted in endometrial ultrasonographic appearance (fig2-6). The endometrial cycle consist of two phase's proliferative and secretory phase. Proliferative phase occurs after menstruation and characterized by thin endometrium appearance. In the mid cycle the endometrium has a trilaminar preovulatory appearance, then thickness becomes more homogeneous after ovulation. Progressive echogenicity of the functional zone occurs during the secretory phase (Fig. 2-6). The thickness of

the endometrium correlates with the histologic response to hormonal stimulation.Top of Form

Bottom of Form

The relative position of the uterus to the cervix and to the axis of the vagina should be noted. The normal position should be ante version (body forming 90 degree angle with the cervix) or ante flexion (body forming acute angle with the cervix). Retro displacement of the uterus usually produces a less clearly defined image on transabdominal scanners but does not interfere with uterine delineation significantly using the transvaginal approach. The shape or symmetry of the uterus also should be assessed during this scanning position. (Ronald V. et,al,2008)

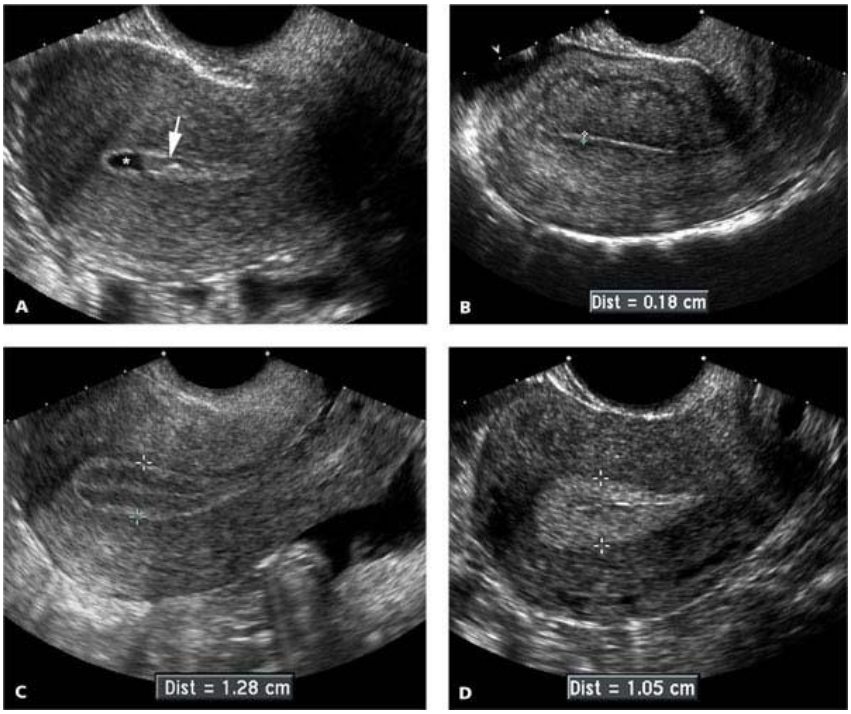


Fig (2-4)Transvaginal scan show the endometrial ultrasonographic appearance.(A) menstrual bleeding (B) proliferative phase .(C) trilaminar preovulatory appearance(D) secretory phase.,

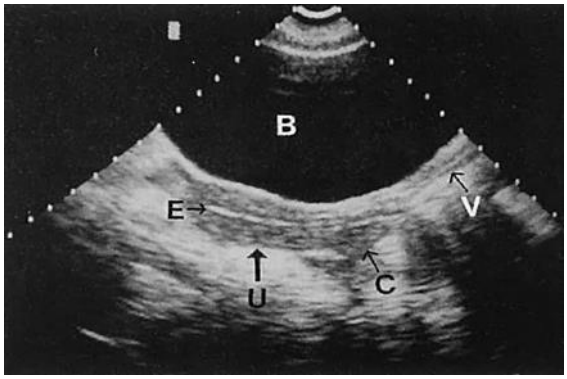


Fig2-5. Longitudinal transabdominal scan of a normal uterus (U) in proliferative phase of the menstrual cycle. E, endometrium; B, bladder; C, cervix; V, vagina.

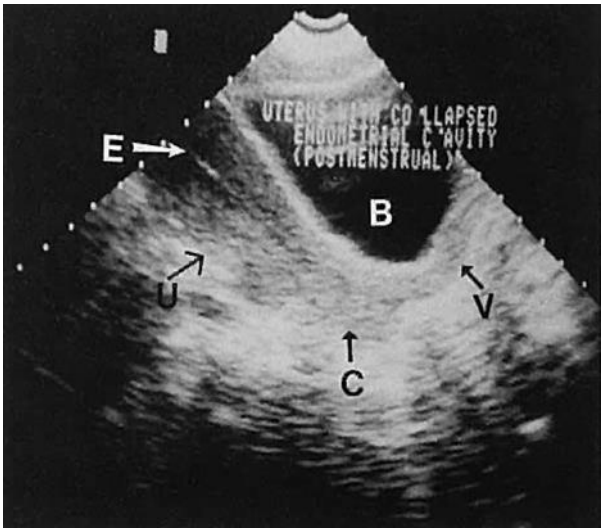


Fig (2-6). Transabdominal longitudinal scan of a postmenopausal uterus (U) with less prominent endometrial echoes. E, endometrium; B, bladder; C, cervix; V, vagina

2.1.3.2. CERVIX

The uterine cervix is visible and may be measured with a great degree of accuracy (fig2-8), especially with the transvaginal technique.

(Ronald V. et,al,2008)

2.1.3.3 .Urinary bladder

The urinary bladder usually is clearly seen and represents another landmark for anatomic orientation in transvaginal and transabdominal scanning (fig2-7 and fig2-8). The bladder should be partially distended before attempting transabdominal scanning. Caution must be used to differentiate a full urinary bladder from a unilocular, anechoic-type ovarian cyst that may lie anterior to the uterus. If any question regarding this possibility exists, a post void scan is advisable for definitive evaluation.

Excessive filling of the urinary bladder displaces the uterus so posteriorly .Conversely, in the interpretation of transabdominal images with inadequate bladder filling, significant posterior uterine wall or fundal disease may be missed. The appropriate amount of urine in the bladder for optimal visualization varies from patient to patient.

(Ronald V. et,al,2008)

2.1.3.4 .Vagina

The vagina appears as a collapsed tubular structure lying inferior to the urinary bladder and distal to the uterine cervix by trans abdominal (fig2-7) scanning. Transvaginal ultrasonography does not delineate the vagina as well as the transabdominal or perineal (introital) approach.

(Ronald V. et,al,2008)

2.1.3.5 Adnexa

The main structures that are recognizable with ultrasonography include the ovary, fallopian tube, and vascular anatomy.

(Ronald V. et,al,2008)

2.1.3.5.1 OVARY

Posterior to broad ligament. Anterior to iliac vessels and ureter. Inferior to uterine tube. Held in place by ovarian ligaments and infundibulopelvic

(suspensory) ligaments. Blood supply: Adnexal branch of uterine artery and an ovarian branch, which runs through the infundibulopelvic ligament. Almond shaped paired structures on either side of uterus. Size of ovaries is related to patient's age and phase of follicular development. 3-4cm long, 2cm wide and 1cm AP dimension. Volume of the ovaries versus age
= 6cm cubed (range = 9.8-10.9cm cubed).
= 3.5cm cubed in postmenopausal patients.

On ultrasound usually, the ovaries lie in a lateral position to the uterus and are identifiable by scanning in transverse or longitudinal planes lateral to the uterine corpus. Identification Landmarks: Anterior to internal iliac artery, ovarian artery entering superior pole and Echo pattern with follicles. With transvaginal ultrasonography is helpful in identifying the appropriate location of the ovary, but manipulation of the scanning transducer to bring out the full extent of the ovarian echo frequently is necessary. During transvaginal scanning, the manipulation should be performed slowly, and patient cooperation is helpful. In the absence of pelvic adhesive disease, the ovary moves in response to transducer manipulation.

With high-resolution ultrasonography, the ability to monitor follicular development exists (fig2-9). Low-level echo pattern interrupted by anechoic areas that represent developing follicles, functional cysts or corpora luteal. Follicles are clearly visible in most ovaries in women of reproductive age and appear as echo-sparse, well-circumscribed areas within the ovarian stroma, varying between 5 and 20 mm in diameter (Fig.2- 10). Ultrasonographic follicular monitoring has become an integral aspect of ovulation induction protocols by allowing correlation of serum estradiol levels with follicular diameter during gonadotropin stimulation. A follicular diameter of 18 to 22 mm is characteristic of a periovulatory follicle.

(Ronald V. et,al,2008)

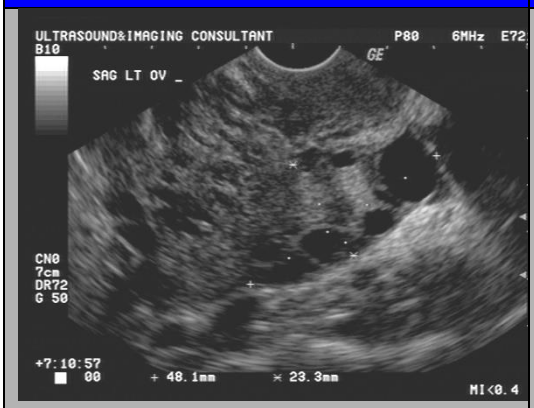
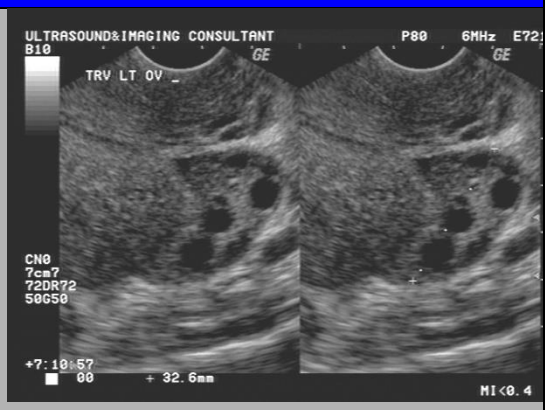
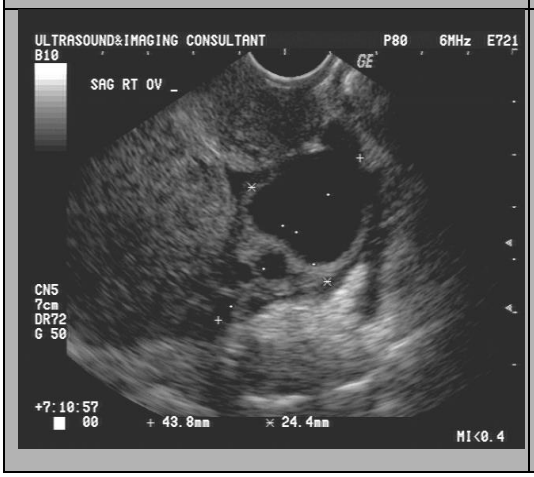
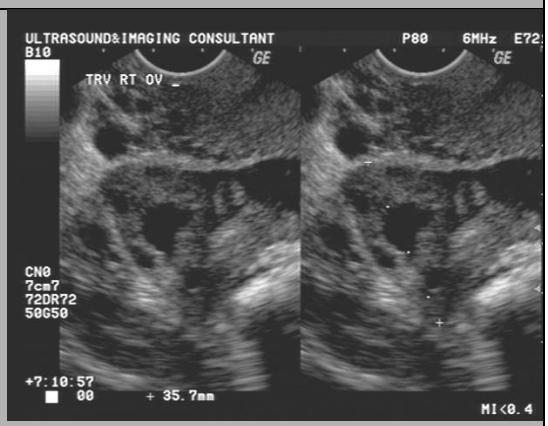
Sagittal views of left and right ovary	Transverse views of left and right ovaries
	
	

Fig2-7 Transvaginal view show follicle development inside the ovary.

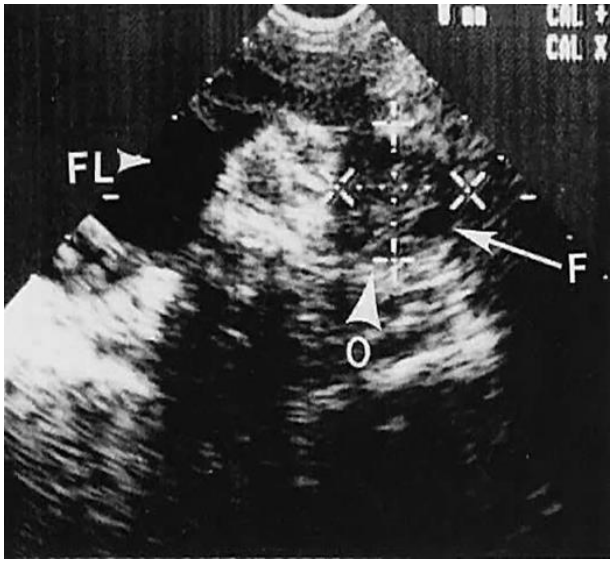


Fig2-8 an ovary (O) with preovulatory follicles (F), transvaginal scan. A small amount of free fluid (FL) also is seen. 2.3.5.2 FALLOPIAN TUBE

The fallopian tube is difficult to visualize in the normal state. Frequently, in cases of abnormal tubal morphologic conditions such as after the development of a hydrosalpinx or neoplasm, the tube may be more clearly defined. Transvaginal ultrasonography results in a higher frequency of tubal visualization. A hydrosalpinx typically is a convoluted, anechoic tubular structure (Fig2-11). Frequently, the tube and ovary form a complex, echo-dense adnexal mass in cases of adhesive inflammatory disease of the pelvis or a neoplastic process.

(Ronald V. et,al,2008)

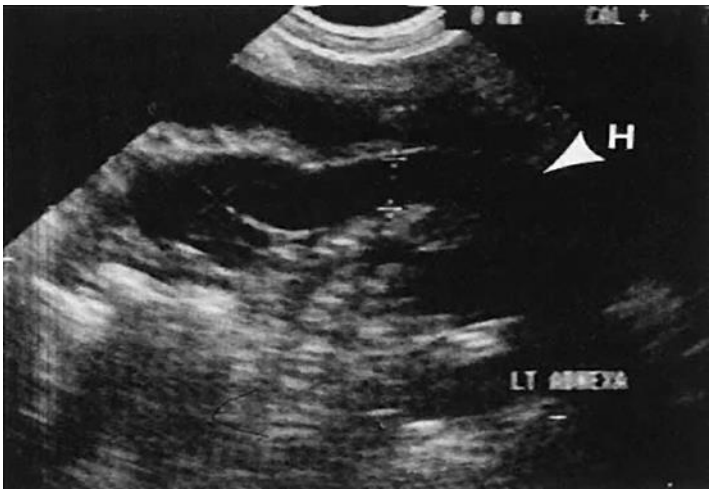


Fig2-9 Unilateral hydrosalpinx (H), transvaginal scan.

2.1.3.6 Other Pelvic Findings

2.1.3.6.1. LIGAMENTS OF THE UTERUS

The supporting uterine ligaments rarely are not clearly visualized with ultrasonography (infundibulopelvic, broad ligaments and uterosacral ligaments) are not seen. The round ligament, which is a tubular structure composed of smooth muscle, may be seen.

(Ronald V. et,al,2008)

2.1.3.6.2. BOWEL CHARACTERISTICS

The presence of gas and feces in the bowel produces a variably dense echo return. Peristalsis is seen easily. Frequently, gas-filled bowel has proximal echoes with poor distal echoes from gas attenuation of the ultrasound energy. Occasionally, a distended loop of bowel may be confused with a complex cystic or solid adnexal mass.

(Ronald V. et,al,2008)

2.1.3.6.3. PELVIC VASCULAR ANATOMY

The internal iliac vessels, as previously noted, are landmarks for ovarian location (Fig2- 12). Pelvic vessels that are amenable to insonation for Doppler study include the ovarian and uterine arteries, as well as vascular structures within the stroma of pelvic masses.

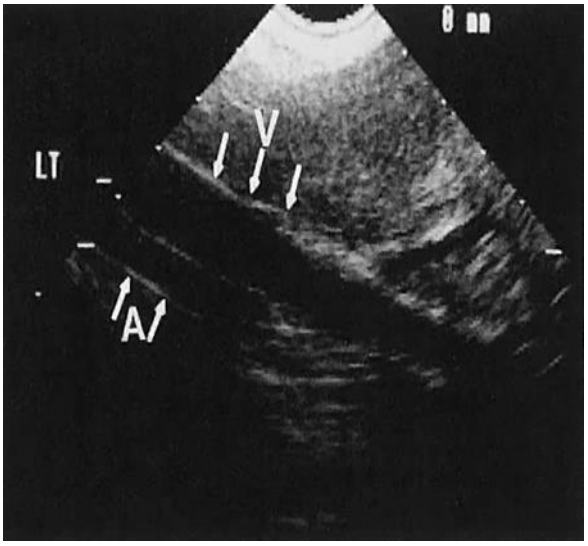


Fig2-10 transvaginal scan, internal iliac artery (A) and vein (V).

CUL-DE-SAC FLUID ACCUMULATION The presence of fluid in the cul-de-sac is a frequent finding. Small amounts of peritoneal fluid accumulate in the inferior-most portion of the cul-de-sac as a result of the menstrual cycle. (Ronald V. et,al,2008)

2.1.4. Main pathology leading to infertility

2.1.4.1. Polycystic ovary syndrome

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder among women between the ages of 18 and 44. It affects approximately 2% to 20% of this age group depending on how it is defined It is one of the leading causes of infertility. Many of the symptoms of PCOS are caused by high levels of androgens circulating in your body, causing 'hyperandrogenism'. Androgens are also called ‘male’ hormones, and the main one is testosterone. All women produce small amounts of androgens in tissues including the ovaries and the adrenal glands. High levels of androgens can prevent ovulation and affect the menstrual cycle. (**March WA, et al, 2010**).

2.1.4.1.1. Pathogenesis

Polycystic ovaries develop when the ovaries are stimulated to produce excessive amounts of androgenic hormones, in particular testosterone, by either one or a combination of the following;

The release of excessive luteinizing hormone (LH) by the anterior pituitary gland]

Through high levels of insulin in the blood (hyperinsulinaemia) in women whose ovaries are sensitive to this stimulus.

The syndrome acquired its most widely used name due to the common sign on ultrasound examination of multiple (poly) ovarian cysts. These "cysts" are actually immature follicles not cysts. The follicles have developed from primordial follicles, but the development has stopped ("arrested") at an early antral stage due to the disturbed ovarian function. The follicles may be

oriented along the ovarian periphery, appearing as a 'string of pearls' on ultrasound examination Women with PCOS experience an increased frequency of hypothalamic GnRH pulses, which in turn results in an increase in The ratio of LH (Luteinizing hormone) to FSH (Follicle-stimulating hormone).the ratio is elevated in women with PCOS to 2:1 or 3:1 as tested on Day 3 of the menstrual cycle.

A majority of women with PCOS have insulin resistance and/or are obese. Their elevated insulin levels contribute to or cause the abnormalities seen in the hypothalamic-pituitary-ovarian axis that lead to PCOS. Hyperinsulinemia increases GnRH pulse frequency, LH over FSH dominance, increased ovarian androgen production decreased follicular maturation, and decreased SHBG binding. (Ref Teede H, et, aL 2010).

2.1.4.1.2. Signs & symptoms of PCOS

Symptoms of PCOS may include:

PCOS symptoms present in many different ways, and some women will have only some, or mild symptoms, whereas others will have severe symptoms.

2.1.4.1.2.1.Periods

Although some women with PCOS have regular periods, high levels of androgens and also the hormone insulin can disrupt the monthly cycle of ovulation (when eggs are released) and menstruation.

If you have PCOS, your periods may be “irregular” or stop altogether. The average menstrual cycle is 28 days with one ovulation, but anywhere between 21 and 35 days is considered “normal”. An “irregular” period cycle is defined as either:

Eight or less menstrual cycles per year

Menstrual cycles longer than 35 days

As menstrual cycles lengthen, ovulation may stop entirely or only occur occasionally. Some women with PCOS also experience heavier or lighter bleeding during their menstrual cycle. (**Fauser B, Tarlatzis B et al, 2012**)

2.1.4.1.2.2. Excess hair (hirsutism)

Hirsutism is an excess of hair on the face and body due to high levels of androgens stimulating the hair follicles. This excess hair is thicker and darker. The hair typically grows in areas where it is more usual for men to grow hair such as the sideburn region, chin, upper lip, around nipples, lower abdomen, chest and thighs.

Up to 60 per cent of women with PCOS have hirsutism. Women with PCOS from ethnic groups prone to darker body hair (e.g. Sri Lankan, Indian and Mediterranean populations) often find they are more severely affected by hirsutism. (**Fauser B, et al, 2012**)

2.1.4.1.2.3. Hair loss (alopecia)

For some women with PCOS, the high level of androgens causes hair loss or thinning of the scalp hair in a ‘male-like' pattern (receding frontal hair line and thinning on the top of the scalp).

2.1.4.1.2.4. Acne

If you have PCOS, the higher level of androgens can increase the size of the oil production glands on the skin, which can lead to increased acne. Acne is common in adolescence, but young women with PCOS tend to also have more severe acne. (**Fauser B, et al, 2012**)

2.1.4.1.2.5. Reduced fertility

High levels of androgens and high insulin levels can affect the menstrual cycle and prevent ovulation (the release of a mature egg from the ovary). Ovulation can stop completely or it can occur irregularly. This can make it more difficult for women with PCOS to conceive naturally, and some women can also have

a greater risk of miscarriage. However, this does not mean that all women with PCOS are infertile.

Many women with PCOS have children without the need for medical infertility treatment. Others may require medical assistance.

As being overweight can increase fertility problems, it is important to exercise regularly to maintain a healthy weight and/or prevent weight gain. For those that are overweight, even five per cent weight loss will improve fertility. (**Fauser B, et al, 2012**)

2.1.4.1.3. Psychological effects

Depression and anxiety are common symptoms of PCOS. Approximately 29 per cent of women with PCOS have depression compared to around seven per cent of women in the general population and even more women with PCOS will have anxiety – 57 per cent compared to 18 per cent of women in the general population.

There may be some link to hormones and PCOS but more research is needed in this area before we can understand why and how the hormones impact on mental wellbeing in PCOS.

Coping with hirsutism, severe acne, weight changes and fertility problems may affect your body image, self-esteem, sexuality and femininity. This may add to depression and anxiety levels. Problems with fertility can impact on your mood, particularly if fertility has been a concern for a long time.

On top of all of this, a delayed diagnosis of PCOS and problems with weight management can make you feel discouraged and helpless. This creates a negative cycle making it harder to take charge of your health

(**Deeks A, et al 2010**)

2.1.4.1.4. Causes of PCOS

While the cause of PCOS is unknown there do appear to be connections with family history, insulin resistance and lifestyle or environment.

2.1.4.1.4.1. Family history

Immediate female relatives (i.e. daughters or sisters) of women with PCOS have up to a 50 per cent chance of having PCOS. Type 2 diabetes is also common in families of those with PCOS. There is no clear genetic contributor to PCOS currently identified and the link is likely to be complex and involve multiple genes. *(Teede H, et,al,2010).*

2.1.4.1.4.2. Insulin resistance & lifestyle

One of the roles of insulin is to keep the levels of glucose in the blood from rising after eating. If you are insulin resistant, your body doesn't use the available insulin effectively to help keep the glucose levels stable.

Because the insulin is not working effectively, the body produces more insulin. These high levels can increase the production of androgens such as testosterone, in the ovaries. This contributes to excessive hair growth and acne, and can contribute to symptoms such as irregular periods, difficulty in ovulating, excess hair growth and acne.

Insulin resistance is present in up to 80 per cent of women with PCOS and this can contribute to an increased risk of developing type 2 diabetes and cardiovascular disease.

Insulin resistance is caused in part by lifestyle factors including being overweight because of a diet or physical inactivity. While women without PCOS who are overweight can have this form of insulin resistance, women with PCOS are more likely to have a particular form of insulin resistance caused by genetic factors separate from the insulin resistance associated with being overweight.

This means women with PCOS can have:

Insulin resistance as a result of genetic factors

Insulin resistance as a result of being overweight (related to diet and inactivity)

A combination of both of these factors

Weight

Being above a healthy weight worsens insulin resistance and the symptoms of PCOS. Some women with PCOS report that when they are a healthy weight, they don't have symptoms such as menstrual irregularity or excessive hair growth. These symptoms only appear once they gain weight. A healthy lifestyle of nutritious food and physical activity can assist in treating PCOS and in preventing it.

Health problems linked to PCOS

Women with PCOS appear to be at increased risk of developing the following health problems during their lives:

Insulin resistance (if they don't already have it)

Type 2 diabetes

Cholesterol and blood fat abnormalities

Cardiovascular disease (heart disease, heart attacks and stroke)

Endometrial carcinoma (cancer)

Sleep apnoea

Women with PCOS, particularly when they are overweight or insulin resistant, can be at an increased risk of developing sleep–disordered breathing or sleep apnoea. Sleep apnoea occurs when the upper airway is obstructed during sleep. Excessive fatty tissue in the neck can partially block the airway leading to sleep loss, fatigue, tiredness and reduced quality of life.

If you suspect you may have PCOS it is important you see a doctor. You may be referred to a specialist such as an endocrinologist (hormone specialist) or gynaecologist for more detailed assessments. An early diagnosis can help manage the symptoms of PCOS and reduce the potential long–term health risks posed by PCOS. *(Teede H, et,al,2010).*

2.1.4.1.5. PCOS diagnoses

There are a number of signs and symptoms women with PCOS can have. However, not every woman with PCOS will have every symptom, and each woman will be quite individual in her experience.

2.1.4.1.5. 1.Criteria for a diagnosis of PCOS

A diagnosis of polycystic ovary syndrome can be made when at least two out of three of the following criteria are met:

The ovaries are "polycystic" because:

12 or more follicles are visible on one ovary or

the size of one or both ovaries is increased:

high levels of 'male' hormones (androgens) in the blood (hyperandrogenism)

symptoms suggesting an excess of androgens such as:

excess hair growth

acne

There is menstrual dysfunction such as:

Lack of periods or menses (menstrual flow)

Menstrual irregularity

Lack of ovulation (where an egg is released) Androgen Excess PCOS Society

In 2006, the Androgen Excess PCOS Society suggested a tightening of the diagnostic criteria to all of the following:

Excess androgen activity

Oligoovulation/anovulation and/or polycystic ovaries

Exclusion of other entities that would cause excess androgen activity.

(Ref Teede H,et , al,2010).

With these criteria, a woman can be diagnosed with PCOS even if she has regular periods or normal androgen levels. This means women with PCOS can experience very different types of symptoms.

To make a correct diagnosis of PCOS a number of other conditions that could cause similar symptoms of menstrual dysfunction need to be ruled out.

When to see your doctor

If you think you may have PCOS, you need to see your doctor.

Below are some of the tests your doctor may recommend to test for PCOS and to exclude other conditions. Not all tests are necessary for every woman. **(Goodman NF, et al 201**5).

2.4.1.5. 2.Medical history & examination

As part of the diagnosis, your doctor will review your medical history and assess your physical symptoms, weight and BMI (body mass index). Blood tests

Hormonal blood tests

Blood tests are used to assess the levels of androgens in your body. Blood tests for androgens (such as testosterone) and free androgen index (FAI) are the best tests for diagnosing whether you have hyperandrogenism (high androgen levels).

Other blood tests that can be useful in identifying high androgen levels include:

- sex hormone binding–globulin (SHBG)
- dehydroepiandrosterone sulphate (DHEAS)
- androstenedione

Blood tests may also be done to assess the levels of other reproductive hormones in your body as these may affect your menstruation. These may include testing your levels of:

- oestradiol (oestrogen)
- follicle stimulating hormone (FSH)
- luteinizing hormone (LH)

Blood tests to exclude other conditions that have similar symptoms to PCOS may measure the levels of:

- thyroid stimulating hormone (TSH)
- prolactin

- hormones related to adrenal function (glands found above the kidney), e.g. 17-hydroxyprogesterone

Other blood tests

Assessing your risk of developing cardiovascular disease and diabetes is important when testing for PCOS because there are links between PCOS and insulin resistance and being overweight. Blood tests to assess these risks will measure: Cholesterol, Blood pressure and Glucose metabolism/ tolerance

Testing adolescents for PCOS

In adolescents, menstrual cycles can be irregular for reasons unrelated to PCOS. It is best to wait for two years of irregular periods before assessing whether the cause is PCOS, unless there are other bothersome symptoms such as excess hair growth, acne or weight excess.

(Goodman NF, et al 2015)

2.1.4.1.5. 3.Ultrasound

An ultrasound of the uterus, ovaries and the pelvis can be carried out to identify whether there are thick endometrium due to hormonal reaction any cysts on your ovaries and whether an ovary is enlarged .ultrasound show thick stroma with multiple prefills cysts (fig2-13)

A transvaginal ultrasound is a painless test with no radiation. It uses a pen–shaped probe with an ultrasound sensor on the tip, which is inserted into the vagina. This produces a much clearer picture than an abdominal ultrasound.

Transvaginal ultrasounds are only performed on wom(en who have been sexually active, otherwise an abdominal scan is done where the ovaries are viewed from. The outside through the stomach wall. **(Goodman ,et, al, 201**5)

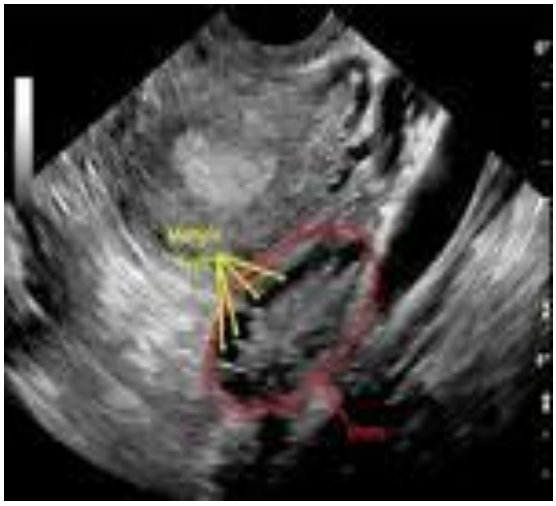


Fig2-11Transvaginal ultrasound scan of polycystic ovary ultrasound show thick stroma with multiple prefills cysts

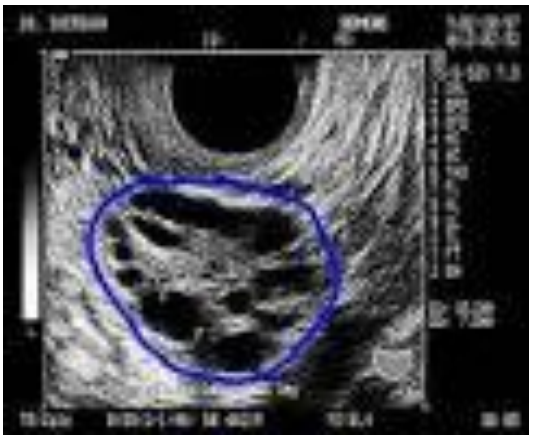


Fig2-12 Polycystic Ovary as seen on Sonography

2.1.4.1.6. Fertility - management & treatment

High levels of androgens (‘male’ hormones such as testosterone) and high insulin levels can affect the menstrual cycle and prevent ovulation (the release of an egg from the ovary). When an egg is not released on a regular basis, this is called anovulation. Ovulation can stop completely or it can occur irregularly. This can make it more difficult for women with PCOS to conceive naturally, and some women may also have a greater risk of miscarriage. However, this does not mean all women with PCOS are infertile.

Some women with PCOS may experience reduced fertility or “sub fertility” where it may take longer to conceive or they may need further medical

assistance to achieve a pregnancy. There are a number of things you can do to increase the likelihood of becoming pregnant and treatments are available if you need medical assistance. Sixty per cent of women with PCOS become pregnant without medical help.

As there are many reasons a woman may have difficulty becoming pregnant, see your doctor to determine whether PCOS is affecting your fertility.

2.1.4.1.6.1. Weight management

Small reductions in weight can assist with fertility, so if you are above a healthy weight, weight management and physical activity is the first treatment option. Even a five to ten per cent loss of weight has been shown to greatly improve the chances of becoming pregnant Current international recommendations are to either achieve a healthy weight or modest weight loss before pregnancy. This will reduce the risk of complications during pregnancy.

To help you lose weight:

including a well-balanced and nutritious diet of whole grains, fruits, vegetables, low fat dairy and lean meats and fish and what to limit

Physical activity

Consult your doctor and consider referral to a dietitian and/or exercise physiologist

2.1.4.1.6.2. Monitoring ovulation

There are days in a woman's menstrual cycle when pregnancy is possible. This is generally around the middle of the cycle. If ovulation has occurred a 'fertile window' creates an opportunity to conceive.

To improve the chance of becoming pregnant, ovulation needs to be monitored and sexual intercourse timed to coincide around ovulation.To help improve the chance of becoming pregnant watch for the following signs that ovulation is occurring or about to occur:

Mucus changes around the time of ovulation a woman may notice her vagina's mucus is slick and slippery.

Abdomial pain some women experience pain during ovulation. This pain may be general or on one side of the abdomen.

Premenstrual symptoms Symptoms such as:

Breast tenderness, abdominal bloating and moodiness

Estimate your ovulation time

As PCOS can affect the regularity of periods it can be tricky to estimate your ovulation time. For more information on possible different methods that may be helpful. An ovulation calculator and an ovulation predictor kit may help you work out when you may be ovulating.

Ovulation induction

If lifestyle and weight loss have not helped improve your fertility after three to six months, then your doctor may recommend medication to encourage ovulation.

Called ovulation induction, the treatment is designed to stimulate the ovary to increase egg production. Ovulation induction uses tablets or injections over a period of time. Ultrasounds and blood tests are performed to determinpe the best time to trigger ovulation using a hormone called HCG. Once ovulation has been triggered, semen is introduced either by sexual intercourse or inter-

uterine insemination when collected semen is placed directly into the uterus through the cervix.

Ovulation induction is not recommended for women with PCOS who have a BMI greater than 35.

Clomiphene citrate

Clomiphene (Clomid) is a tablet that is the most common medication for ovulation induction. It is often recommended as the first option for improving fertility in women with PCOS who are infertile and do not ovulate.

Not all women with PCOS are responsive to clomiphene citrate, and some may have to use combinations of clomiphene with other drugs (such as metformin) to gain the most benefit.

Metformin

Metformin can be used for treating infertility in women with PCOS who don't ovulate and who have no other reasons for infertility. Metformin helps to improve the function of circulating insulin, can reduce androgen levels and can improve ovulation rate

Metformin can be combined with other medications (such as clomiphene citrate) if women aren't responding to those medications or if they are obese

There are currently no guidelines for the use of metformin during pregnancy, and the usual recommendation is to stop metformin once pregnancy is achieved, unless your doctor advises otherwise.

Gonadotrophins

Gonadotrophins are hormones involved in regulating ovulation such as:

Follicle-stimulating hormone (FSH)

Luteinizing hormone (LH)

Human chorionic gonadotrophin (hCG)

These hormones can be used as treatments to stimulate growth and release of eggs

The medication is injected and the ovary carefully monitored by ultrasound to avoid over stimulation

These can also be used for treating infertility where women have not responded to clomiphene citrate

2.1.4.1.6.3Surgery for improving fertility

Ovarian drilling is a surgical procedure that can increase ovulation. This is performed using a laparoscope. It is a minimally invasive procedure where an incision is made in the abdomen under a general anaesthetic. Small holes are drilled in the surface of the ovary to remove tissue that produces excessive amounts of androgens (male hormones such as testosterone). Following ovarian drilling, ovulation is often restored for up to 6-12 months.

As surgery is a more intensive treatment than taking medication or lifestyle treatment, ovarian drilling is not commonly used and is primarily used after other lifestyle or medical treatment has proved ineffective.

Possible side effects

Side effects associated with ovarian drilling include a small risk of scar formation around the ovaries and damage to the bladder, bowel or blood vessels.

2.1.4.1.6.4. Assisted reproductive technology

For women who have not been able to conceive naturally or by using medications or lifestyle treatment to improve their fertility, another option is assisted reproductive technology. This includes treatments such as IVF (in vitro fertilization). Referral to a fertility specialist is necessary for these treatments. Assisted reproductive technology is best tried after other less intensive treatments have proved unsuccessful, as it is often costly and demanding. This technology is also more successful in women who have instituted lifestyle change effectively first, even if these changes have not improved fertility by themselves.

2.1.4.2. Premature ovarian failure

Premature ovarian failure is defined as a primary ovarian defect characterized by absent menarche (primary amenorrhea) or premature depletion of ovarian follicles/arrested folliculogenisis before the age of 40 years (secondary amenorrhea).

A commonly cited triad for the diagnosis is amenorrhea, hypergonadotropism, and hypoestrogenism. If it has a genetic cause, it may be called gonadal dysgenesis.

2.1.4.2.1 Epidemiology

POF affects approximately; 1% of the female population.

: One in 10,000 women by age 20; one in 1,000 women by age 30; one in 100 women by age 40. The familial form of POF is rare, representing 4 to 31% of all cases of POF.

2.1.4.2.2. Signs and symptoms

On average, the ovaries supply a woman with eggs until age 51, the average age of natural menopause.

POF is not the same as a natural menopause, in that the dysfunction of the ovaries, loss of eggs, or removal of the ovaries at a young age is not a normal physiological occurrence.

Infertility is the result of this condition, and is the most discussed problem resulting from it. Hormonally, POF is defined by abnormally low levels of estrogen and high levels of FSH, which demonstrate that the ovaries are no longer responding to circulating FSH by producing estrogen and developing fertile eggs. The ovaries will likely appear shriveled.

The age of onset can be as early as the teenage years, If a girl never begins menstruation, it is called primary ovarian failure. The age of 40 was chosen as the cut-off point for a diagnosis of POF. This age was chosen somewhat arbitrarily, as all women's ovaries decline in function over time. However an

age needed to be chosen to distinguish usual menopause from the abnormal state of premature menopause Premature Ovarian failure has components to it that distinguish it from normal menopause.

By the age of 40, approximately one percent of women have POF Women suffering from POF usually experience menopausal symptoms that are more severe than the symptoms found in older menopausal women.

(Ref Beck-Peccoz P, et,al2006).

Emotional health

The most common words women use to describe how they felt in the 2 hours after being given the diagnosis of primary ovarian insufficiency are "devastated, "shocked," and "confused." These are words that describe emotional trauma. The diagnosis is more than infertility and affects a woman's physical and emotional well-being. Patients face the acute shock of the diagnosis, associated stigma of infertility, grief from the death of dreams, anxiety and depression from the disruption of life plans, confusion around the cause, symptoms of estrogen deficiency, worry over the associated potential medical sequelae such as reduced bone density and cardiovascular risk, and the uncertain future that all of these factors create. There is a need for an evidence-based integrative medicine program to assist women with primary ovarian insufficiency. Presently such a program does not exist in the community, but a community of practice has formed to address this deficiency. Women with primary ovarian insufficiency perceive lower social support than control women, so building a trusted community of practice for them would be expected to improve their wellbeing. It is important to connect women with primary ovarian insufficiency to an appropriate collaborative care team because the condition has been clearly associated with suicide related to the stigma of infertility. Suicide rates are known to be increased in women who experience infertility.

2.1.4.2.3. Causes

The cause of POF is usually idiopathic. Some cases of POF are attributed to autoimmune disorders, others to genetic disorders such as Turner syndrome and Fragile X syndrome. An Indian study showed a strong correlation between incidence of POF and certain variants in the inhibin alpha gene. In many cases, the cause cannot be determined.

(ref Prakash, G. J,et ,al,2010)

Chemotherapy and radiation treatments for cancer can sometimes cause ovarian failure. In natural menopause, the ovaries usually continue to produce low levels of hormones, but in chemotherapy or radiation-induced POF, the ovaries will often cease all functioning and hormone levels will be similar to those of a woman whose ovaries have been removed. Women who have had a hysterectomy tend to go through menopause several years earlier than average, likely due to decreased blood flow to the ovaries. Family history and ovarian or other pelvic surgery earlier in life are also implicated as risk factors for POF. All women who experience POF before the age of 30 years should perform a blood test for chromosomal assessment. Older women should discuss the option of chromosomal studies, as identification of abnormality may influence other family members, sisters or daughters, who carry the same defect in term of planning pregnancies. Carriers of the genetic defect may be advised for early pregnancy or oocyte collection and preservation.

There are two basic kinds of premature ovarian failure. Case 1) where there are few to no remaining follicles and case 2) where there are an abundant number of follicles. In the first situation the causes include genetic disorders, autoimmune damage, chemotherapy, radiation to the pelvic region, surgery, endometriosis and infection. In most cases the cause is unknown. In the second case one frequent cause is autoimmune ovarian disease which damages maturing follicles, but leaves the primordial follicles intact. . Genetic disorders Autoimmune diseases

Tuberculosis of the genital tract

Smoking

Radiation and/or chemotherapy

Ovarian failure following hysterectomy

Prolonged GnRH (Gonadatrophin Releasing Hormone) therapy

Enzyme defects

Resistant ovary

Induction of multiple ovulation in infertility

(Ref Check JH 1991).

2.1.4.2.4. Diagnosis

2.1.4.2.4.1. Blood test:

Serum follicle-stimulating hormone (FSH) measurement alone can be used to diagnose the disease. Two FSH measurements with one-month interval have been a common practice. The anterior pituitary secretes FSH and LH at high levels due to the dysfunction of the ovaries and consequent low estrogen levels. Typical FSH in POF patients is over 40 mlU/ml (post-menopausal range). Both primary and secondary forms of ovarian failure are biochemically characterized by low levels of gonadal hormones (estrogens and inhibins) and high gonadotropins (LH and FSH) (hyper gonadotropic amenorrhea). The elevation of FSH is usually more marked than that of LH and an FSH value >30 U/L is indicative of ovarian failure.

2.1.4.2.4.2. Ultrasound

Ultrasound frequently reveals small ovaries or hypo plastic ovaries (0.20–0.30 ml on ultrasound) without evidence of growing follicles fig2-15.

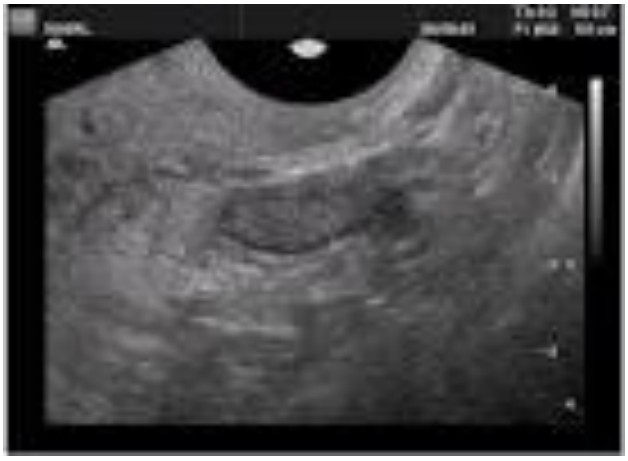


Fig2-13 transvaginal scan show small ovary with no follicles

2.1.4.2.5 Treatment

2.1.4.2.5.1 Fertility

Between 5 and 10 percent of women with POF may spontaneously become pregnant. Currently no fertility treatment has officially been found to effectively increase fertility in women with POF, and the use of donor eggs with in-vitro fertilization (IVF) and adoption are popular as a means of achieving parenthood for women with POF. Some women with POF choose to live child-free. Currently New York fertility researchers are investigating the use of a mild hormone called dehydroepiandrosterone (DHEA) in women with POF to increase spontaneous pregnancy rates. Published results from studies conducted on DHEA have indicated that DHEA may increase spontaneously conceived pregnancies, decrease spontaneous miscarriage rates and improve IVF success rates in women with POF.

Additionally, over the last five years a Greek research team has successfully implemented the use of dehydroepiandrosterone (DHEA) for the fertility treatment of women suffering with POF. The majority of the patients were referred for donor eggs or surrogacy, however after a few months of DHEA administration, some succeeded in getting pregnant through IVF, IUI, IUTPI or natural conception. Many babies have been born after treatment with

DHEA. "(ref) Clinical Trial: Study of Dehydroepiandrosterone (DHEA) Treatment

(Mamas L, Mamas E 2009).

Ovarian tissue cryopreservation can be performed on prepubertal girls at risk for premature ovarian failure, and this procedure is as feasible and safe as comparable operative procedures in children.

2.1.4.2.5.2. Hormonal replacement

Most people develop symptoms of estrogen deficiency, including vasomotor flushes and vaginal dryness, both of which respond to hormone replacement therapy. There are several contraindications of estrogen supplement, including smokers over 35 years of age, uncontrolled hypertension, uncontrolled diabetes mellitus, or history of thromboembolic events.

Women younger than 40 year with primary ovarian insufficiency benefit from physiologic replacement of hormones. Most authorities recommend that this hormone replacement continue until age 50 years, the normal age of menopause. The leading hormone replacement regimen recommended involves the administration of estradiol daily by either skin patch or vaginal ring. This approach reduces the risk of pulmonary embolism and deep venous thrombosis by avoiding the first pass effect on the liver that is induced by oral estrogen therapy. To avoid the development of endometrial cancer young women taking estradiol replacement need also to take a progestin in a regular cyclic fashion. The most evidence supports the use of medroxyprogesterone acetate per day for days one through 12 of each calendar month. This will induce regular and predictable menstrual cycles. It is important that women taking this regimen keep a menstrual calendar. If the next expected menses is late it is important to get a pregnancy test. It this is positive, the woman should stop taking the hormone replacement. Approximately 5 to 10% of women with confirmed primary ovarian insufficiency conceive a pregnancy after the diagnosis without medical intervention.

(Ref Coulam CB, et,al, 2017)

2.1.4.3. Fibroids

Fibroids are abnormal growths that develop in or on a woman's uterus. Sometimes these tumors become quite large and cause severe abdominal pain and heavy periods. In other cases, they cause no signs or symptoms at all. The growths are typically benign, or noncancerous. The cause of fibroids is unknown.Fibroids are also known by the following names: leiomyomas,myomas,uterine myoma sand Fibromas **.**

(Wallach EE, Vlahos NF 2004)

2.1.4.3.1 Classification of fibroid according to the site

Intramural fibroids

Intramural fibroids are the most common type of fibroid. These types appear within the muscular wall of the uterus. Intramural fibroids may grow larger and can stretch your womb.

Subserosal fibroids

Subserosal fibroids form on the outside of your uterus, which is called the serosa. They may grow large enough to make your womb appear bigger on one side. .(FIG 2-16)

Pedunculated fibroids

Subserosal tumors can develop a stem, a slender base that supports the tumor. When they do, they're known as pedunculated fibroids.

Sub mucosal fibroids

These types of tumors develop in the middle muscle layer, or myometrium, of your uterus. Sub mucosal tumors aren't as common as the other types. (Wallach EE, Vlahos NF 2004)

2.1.4.3.2. Causes

While it is not clearly known what causes fibroids, it is believed that each tumor develops from an aberrant muscle cell in the uterus but several factors may influence their formation;

Hormones

Estrogen and progesterone are the hormones produced by the ovaries. They cause the uterine lining to regenerate during each menstrual cycle and may stimulate the growth of fibroids.

Family history

Fibroids may run in the family. If your mother, sister, or grandmother has a history of this condition, you may develop it as well.

(Wallach EE, Vlahos NF 2004)

2.1.4.3.3. Risk for fibroid tumors.

Women are at greater risk for developing fibroids if they have one or more of the following risk factors: ,a family history of fibroids, age of older than30 because of their long exposure to high levels of estrogen African-American and high body weight

Research has also shown that some factors may protect a woman from developing fibroids. Some studies, of small numbers of women, have indicated that women who have had two live born children have one-half the risk of developing uterine fibroids compared to women who have had no children. Scientists are not sure whether having children actually protected women from fibroids or whether fibroids were a factor in infertility in women who had no children

(Wallach EE, Vlahos NF 2004)

2.1.4.3.4. Symptoms of fibroids

Your symptoms will depend on the number of tumors you have as well as their location and size. For instance, submucosal fibroids may cause heavy menstrual bleeding and trouble conceiving.

If your tumor is very small or you're going through menopause, you may not have any symptoms. Fibroids may shrink during and after menopause. This is because women undergoing menopause are experiencing a drop in their levels of estrogen and progesterone, hormones that stimulate fibroid growth.

Symptoms of fibroids may include:

Heavy bleeding between or during your periods that includes blood clots

Pain in the pelvis or lower back,increased menstrual cramping,increased urination

Pain during intercourse,menstruation that lasts longer than usual,pressure or fullness in your lower abdomen and swelling or enlargement of the abdomen **(Wallach EE, Vlahos NF 2004)**

.

2.1.4.3.5. Diagnoses

Fibroids are most often found during a routine pelvic examination. This, along with an abdominal examination, may indicate a firm, irregular pelvic mass to the physician. In addition to a complete medical history and physical and pelvic and/or abdominal examination, diagnostic procedures for uterine fibroids may include:

Ultrasound

An ultrasound to produce images of your uterus on a screen.(FIG 2-17) .(FIG 2-18) .(FIG 2-19) This will allow your doctor to see its internal structures and any fibroids present. A transvaginal ultrasound uses high-frequency sound waves, in which the ultrasound prop is inserted into the vagina, may provide clearer pictures since its closer to the uterus during this procedure.

Pelvic MRI

This in-depth imaging test produces pictures of your uterus, ovaries, and other pelvic organs. Hysterosalpingography. X-ray examination of the uterus and fallopian tubes that uses dye and is often performed to rule out tubal obstruction.

Hysteroscopy.

Visual examination of the canal of the cervix and the interior of the uterus using a viewing instrument (hysteroscope) inserted through the vagina.

2.1.4.3.6. Treatment for fibroids

In women whose fibroids are large or are causing significant symptoms, treatment may be necessary.

Medication

Medications to regulate your hormone levels may be prescribed to shrink fibroids.

Gonadotropin-releasing hormone agonists (GnRH agonists) such as leuprolide (Lupron). This approach lowers levels of estrogen and triggers a "medical menopause." Sometimes GnRH agonists are used to shrink the fibroid, making surgical treatment easier.

Anti-hormonal agents. Certain drugs oppose estrogen (such as progestin and Danazol), and appear effective in treating fibroids. Anti-progestins, which block the action of progesterone, are also sometimes used.

Surgical therapy

Hysterectomy. Hysterectomies involve the surgical removal of the entire uterus

Conservative surgical therapy. Conservative surgical therapy uses a procedure called a myomectomy. With this approach, physicians will remove the fibroids, but leave the uterus intact to enable a future pregnancy.

Minimally invasive procedures

A newer and completely noninvasive surgical procedure is forced ultrasound surgery (FUS). You lie down inside a special MRI machine that allows doctors to visualize the inside of your uterus. High-energy, high-frequency sound waves are directed at the fibroids to ablate, or destroy, them.

Similarly, myolysis shrinks fibroids using an electric current or laser, while cryomyolysis freezes the fibroids. Endometrial ablation involves inserting a special instrument into your uterus to destroy the uterine lining using heat, electric current, or hot water.

Another surgical option is uterine artery embolization. Uterine artery embolization. Also called uterine fibroid embolization, uterine artery embolization (UAE) is a newer minimally-invasive (without a large abdominal incision) technique. The arteries supplying blood to the fibroids are identified, then embolized (blocked off). The embolization cuts off the blood supply to the fibroids, thus shrinking them. Health care providers continue to evaluate the long-term implications of this procedure on fertility and regrowth of the fibroid tissue.

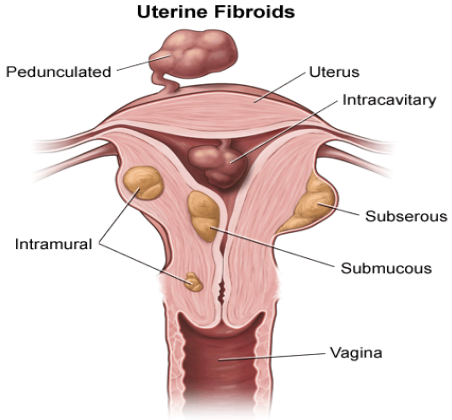


Fig2-14 classefication of fibroid acording to the site

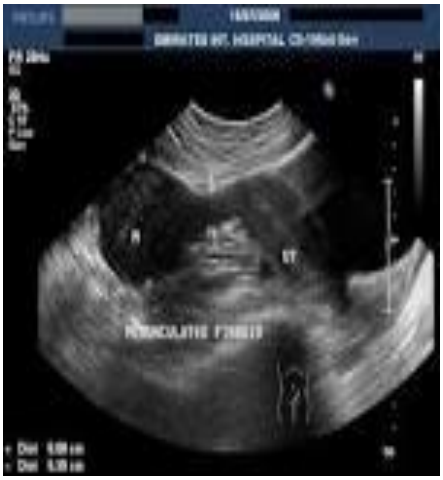


Fig2-15 Transvaginal scan show fundal pedenculated fibroid

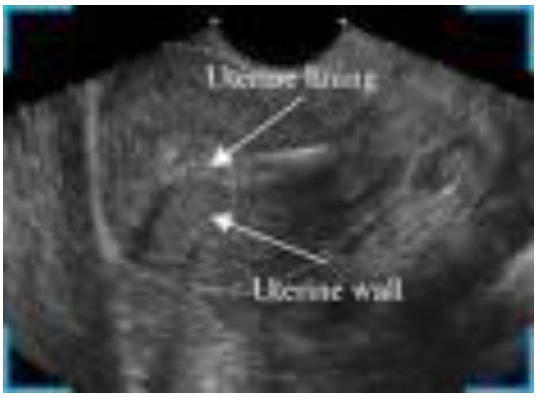


Fig2-16 Transvaginal scan show submucousal fibroid

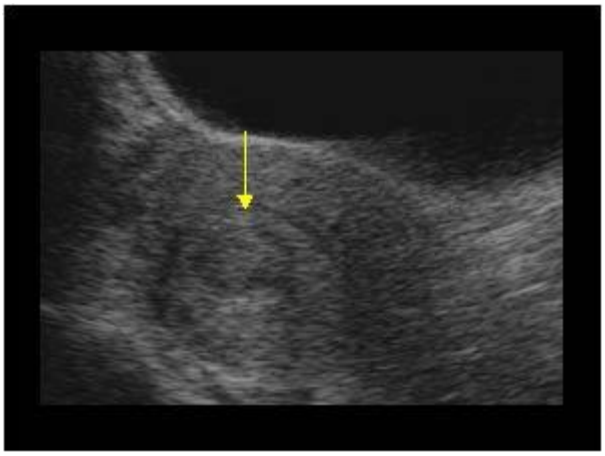


Fig2-17 Transvaginal scan show intramural fibroid

Congenital anomaly

Variations of female reproductive anatomy often stem from dysfunction during development in utero. They can also be caused by genetic changes or teratogenic effects.

Clitoromegaly, imperforate hymen, labial fusion, and vaginal agenesis are the most common variants of the external genitalia. Performing a thorough physical examination of newborns to detect these changes is important. Internally, the most common variants include vaginal septa, arcuate uterus, bicornuate uterus, didelphic uterus, unicornuate uterus, and septate uterus. Uterine anomalies are most frequently diagnosed by performing hysterosalpingography, a radiologic study in which dye is injected into the uterine cavity to visualize any abnormalities. Uterine anomalies are often detected during evaluation for infertility. These conditions are commonly diagnosed at the time of cesarean section

UTERINE ANOMALIES The most frequent uterine anomalies (Fig2-20) are those resulting from varying degrees of failure of fusion of the müllerian ducts. Many of these malformations are detected by radiologic or sonographic studies. The incidence of müllerian anomalies in patients with infertility has been reported to be as high as 6.3%. 20 Pregnancy occurs in many women despite these anomalies. The complication rates with pregnancy are considerably increased; complications include abortion, prematurity, postpartum hemorrhage, retained placenta, and breech presentation.21 Not surprisingly, the rate of cesarean delivery is markedly higher.

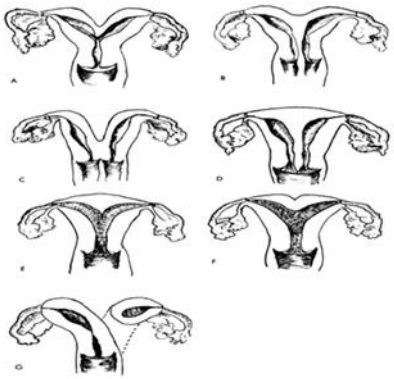


Fig2-18 Uterine anomalies. A. Uterus duplex unicollis. B. Uterus duplex with double vagina. C. Uterus didelphys. D. Uterus septus with single vagina. E. Uterus subseptus. F. Uterus arcuatus. G. Uterus unicornis with rudimentary contralateral hemiuterus

Uterus duplex, or the bicornuate uterus (fig2-23), is the most frequent uterine anomaly. The unicollis type in which there is a single cervix with a septum that does not reach the cervix and Uterus duplex bicollis, in which two cervices are present.

Uterus didelphys(fig2-21 and fig2-22), with completely separate uterine cavities, is also frequent. In most patients the vagina is septate, causing a double vagina. Uterus septus is an essentially normal uterus with a septum reaching to the cervix. Uterus subseptus involves a partial septum that does not reach the cervix. Uterus arcuatus is a normal uterus without a septum. The fundus, however, is notched or flattened. There is usually no interference with normal pregnancy. Uterus unicornis is a uterus with a single horn. A normal vagina and a single normal tube are usually present. The other half of the uterus is usually absent or rudimentary. In most patients the kidney is missing on the side of the missing uterus. Successful pregnancy can occur. Separate hemiuteri with separate vaginas is a rare condition that is usually associated with duplications of urethra and bladder or of the colon and anus.

(Ref Sotirios H. Saravelos; et,al, 2008).

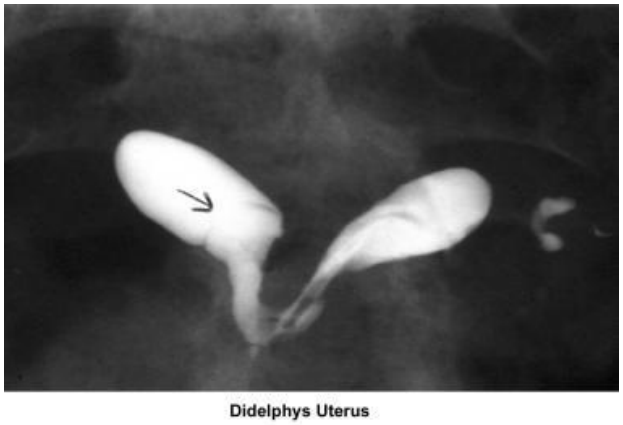


Fig2-19 hestrosalbingografy show didelphys uterus

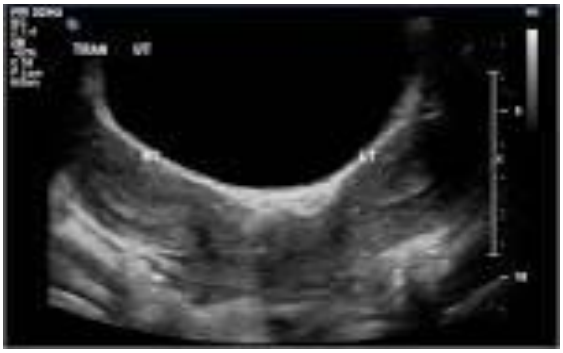


Fig2-20 transabdomenal scanshow didelphys uterus

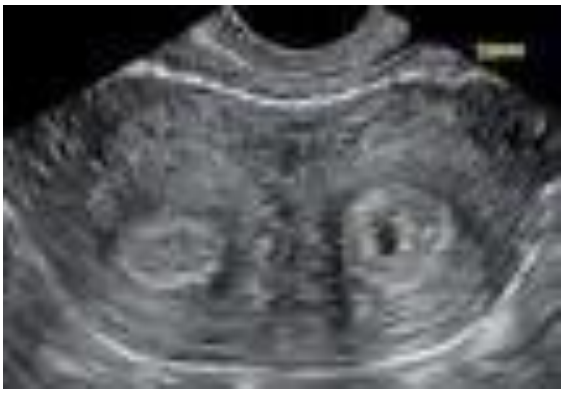


fig2-21 Transvaginal scan show bicornuate uetrus

2.1.4.5Pelvic inflammatory disease

Pelvic inflammatory disease fig (2-24) is an infection of a woman's reproductive organs. It is a complication often caused by some STDs, like chlamydia and gonorrhea. Other infections that are not sexually transmitted can also cause PID. You are more likely to get PID if you

Have an STD and do not get treated;

Have more than one sex partner;

Have a sex partner who has sex partners other than you;

Have had PID before;

Are sexually active and are age 25 or younger;

Douche;

Use an intrauterine device (IUD) for birth control. However, the small increased risk is mostly limited to the first three weeks after the IUD is placed inside the uterus by a doctor.

(Klausner JD, et al, 2007)

2.1.4.5.1 Sing and symptoms

There are no tests for PID. A diagnosis is usually based on a combination of your medical history, physical exam, and other test results. You may not realize you have PID because your symptoms may be mild, or you may not experience any symptoms. However, if you do have symptoms, you may notice

Pain in your lower abdomen;

Fever;

An unusual discharge with a bad odor from your vagina;

Pain and/or bleeding when you have sex;

Burning sensation when you urinate; or

Bleeding between periods.

(Klausner JD, et al, 2007)

2.1.4.5.2Complication of Pelvic inflammatory disease

If diagnosed and treated early, the complications of PID can be prevented. Some of the complications of PID are

Formation of scar tissue both outside and inside the fallopian tubes that can lead to tubal blockage;

Ectopic pregnancy (pregnancy outside the womb);

Infertility (inability to get pregnant); Chronic Inflammation of the uterine tubes can occlude them resulting in infertility

Long-term pelvic/abdominal pain.

(Klausner JD, et al, 2007)

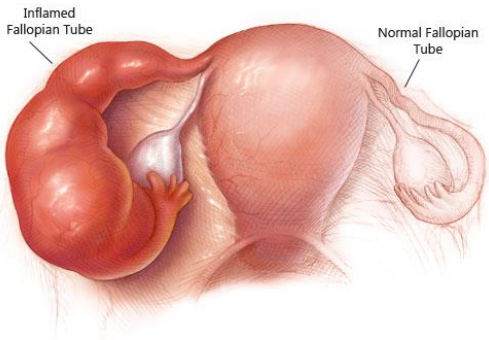


Fig 2-22 Pelvic Inflammatory Disease (PID). Enlarged Fallopian Tubes

2.1.4.5.3. Diagnosis

Since the symptoms for PID are often mild and there is no test for PID, a diagnosis for PID is typically based on the clinical findings. Your health care provider may also need to identify the type of organism causing the PID and order a test for chlamydia and/or gonorrhea. Ultrasound might also be used to see if the fallopian tubes show evidence of an infection. fig (2-25) fig (2-26) fig (2-27) . .

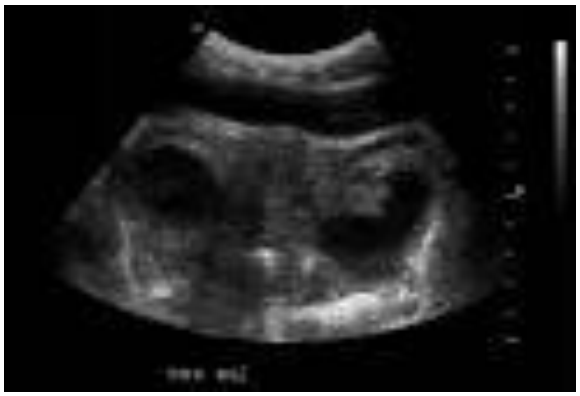


Fig2-23 Transvaginal scan show pid,enlarged uterin tube

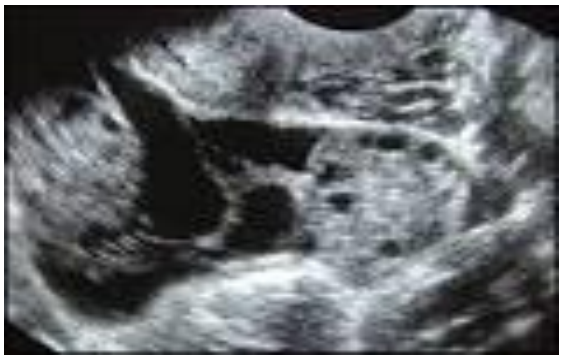


Fig2-24 Transvaginal scan show pid,adenexal abscese

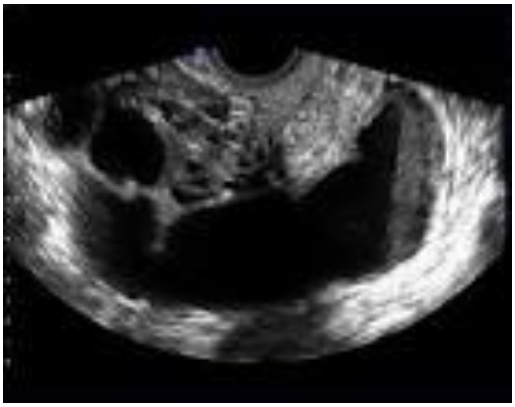


Fig2-25 Transvaginal scan show pid,cul de sac fluid

2.1.4.5.4. Treatment

PID is treated with antibiotics; however, the antibiotics will not reverse any damage already occurred, making it important for women to seek care immediately if she is experiencing any symptoms. A woman's sexual partner(s) should also be treated if a sexually transmitted disease is the cause of infection.

Becoming Pregnant after Pelvic Inflammatory Disease

For women that have had PID and have had damage to their reproductive organs, they will likely have to consult with a fertility specialist to maintain a healthy pregnancy. "The risk of an ectopic pregnancy is increase 6-7 times as a result of pelvic infection To address this risk and the inability to conceive due to scarring in their fallopian tubes, in vitro fertilization (IVF) is often the advised therapy to help achieve pregnancy because with IVF the tubes are bypassed completely.

(Klausner JD, et al, 2007)

2.1.4.6.Male infertility

Infertility is a widespread problem. For about one in five infertile couples the problem lies solely in the male partner. It is estimated that one in 20 men has some kind of fertility problem with low numbers of sperm in his ejaculate. However, only about one in every 100 men has no sperm in his ejaculate.

Reproduction (or making a baby) is a simple and natural experience for most couples. However, for some couples it is very difficult to conceive.

A man's fertility generally relies on the quantity and quality of his sperm. If the number of sperm a man ejaculates is low or if the sperm are of a poor quality, it will be difficult, and sometimes impossible, for him to cause a pregnancy.

Male infertility is diagnosed when, after testing both partners, reproductive problems have been found in the male.

2.1.4.6.1Symptoms of male infertility

In most cases, there are no obvious signs of infertility. Intercourse, erections and ejaculation will usually happen without difficulty. The quantity and appearance of the ejaculated semen generally appears normal to the naked eye. Medical tests are needed to find out if a man is infertile. 2.4.6.2Causes male infertility Male infertility is usually caused by problems that affect either sperm production or sperm transport. Through medical testing, the doctor may be able to find the cause of the problem.

About two-thirds of infertile men have a problem with making sperm in the testes. Either low numbers of sperm are made and/or the sperm that are made do not work properly.

Sperm transport problems are found in about one in every five infertile men, including men who have had a vasectomy but now wish to have more children. Blockages (often referred to as obstructions) in the tubes leading sperm away from the testes to the penis can cause a complete lack of sperm in the ejaculated semen.

Other less common causes of infertility include: sexual problems that affect whether semen is able to enter the woman's vagina for fertilisation to take place (one in 100 infertile couples); low levels of hormones made in the pituitary gland that act on the testes (one in 100 infertile men); and sperm antibodies (found in one in 16 infertile men). In most men sperm antibodies

will not affect the chance of a pregnancy but in some men sperm antibodies reduce fertility

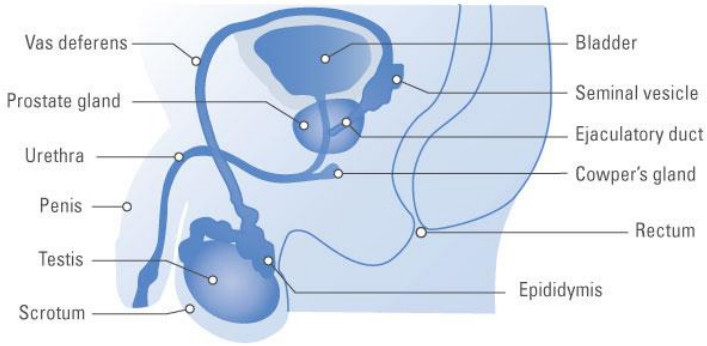


Fig2-26 A side view showing the main parts of the male reproductive system

The pituitary gland and the hypothalamus, located at the base of the brain control the production of male hormones and sperm. Luteinizing hormone (LH) and follicle stimulating hormone (FSH) are the two important messenger hormones made by the pituitary gland that act on the testes (fig 2-29).

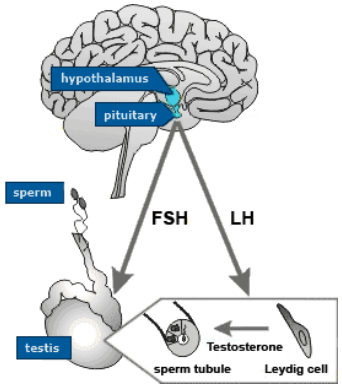


Fig2-27 Two messenger hormones act on the testes

2.1.4.6.3. Diagnosis

If a couple has been trying for a pregnancy without success, they should go to their local doctor, family planning clinic or women's health clinic, and have some initial tests. Both partners should be tested, even if one has a child from another relationship. Diagnosis can involve a medical history from the man and a physical examination along with a semen analysis to check the number, shape and movement of sperm in the ejaculate.

Blood tests may also be done to check the levels of hormones that control sperm production. Genetic investigations and testicular biopsies are sometimes done.

(American Society for Reproductive Medicine. 2016)

2.1.4.6.4. Treatment

One in eight infertile men has a treatable condition, and after treatment, couples can become pregnant naturally. Also intrauterine insemination if there problem in semen mortality.

In some cases, the doctor will recommend that the couple seek assisted reproductive technologies (ART), such as IVF (in vitro fertilisation). ART do not cure or treat the cause of infertility but they can help couples achieve a pregnancy, even if the man's sperm count is very low.

Intracytoplasmic sperm injection

(ICSI) is a form of IVF where a single sperm is placed directly into each egg by piercing the outer covering of the egg (fig2-30). ICSI is particularly helpful for men with poor sperm production. Sperm are collected from the semen or removed carefully from the testis or epididymis.

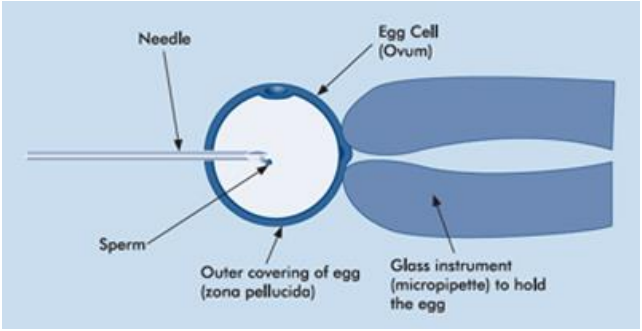


Fig2-28 Intracytoplasmic sperm injection (ICSI)

ICSI can achieve pregnancies even when only a few sperm are produced.

As for IVF, after fertilisation the resulting embryos are then placed into the woman's uterus.

2.1.5 How is ultrasound (sonography) used for treating infertility?

Ultrasound or sonography has helped revolutionize our approach to the infertile patient. Ultrasound machines are a very useful and help the doctor "image" or see structures in the female pelvis. Ultrasound uses high frequency sound waves much like SONAR machines used in ships for detecting submarines underwater.

The high frequency sound waves are bounced off the pelvic organs; and the reflected sound waves are received by the probe (transducer) and a computer is used to reconstruct the waves into black and white images on the monitor. Ultrasound machines today are all real-time machines, which give dynamic images.

In the old days, ultrasound for infertility was done through the abdomen. This required you to fill up your bladder (till it was ready to burst!) so that the sound waves could be transmitted into the pelvis

However, the standard ultrasound technique today for infertility is vaginal ultrasound (endovaginal scanning) in which a long, slim, slender probe is inserted into the vagina and used for imaging the pelvic organs

Not only is this much more comfortable for you; it also gives much sharper and clearer pictures, since the probe is much closer to the pelvic structures.

2.1.5.1. Follicular scanning to monitor ovulation

Ovulation scans allow the doctor to determine accurately when the egg matures; and when you ovulate. This is often the basic procedure for most infertility treatment since the treatment revolves around the wife's ovulation

Daily scans are done to visualize the growing follicle, which looks like a black bubble on the screen. Most women can see the follicle clearly for themselves - and know by the scans when the egg has ruptured.

Other useful information which can be determined by these scans is the thickness of the uterine lining - the endometrium. The ripening follicle produces increasing quantities of estrogen, which cause the endometrium to

thicken. The doctor can get a good idea of how much estrogen you are producing (and thus the quality of the egg) based on the thickness and brightness of the endometrium on the ultrasound scan.

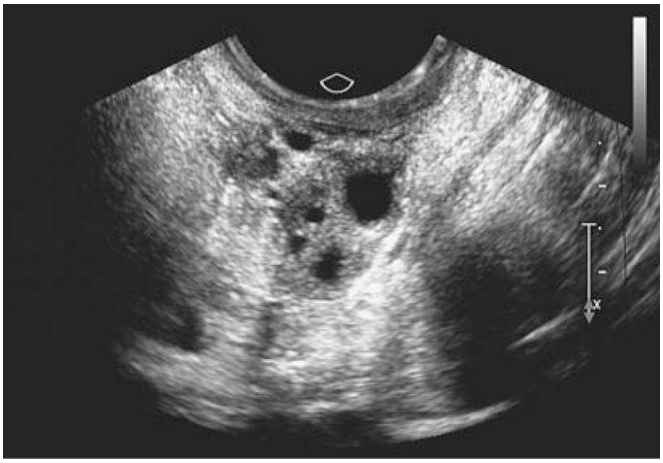


Fig 2-29. Ultrasound scan showing mature follicles

2.1.5.2 Ovarian cyst is found on ultrasound scans

One of the commonest findings on an ultrasound scan is an ovarian cyst. A cyst is a collection of fluid surrounded by a thin wall (a fluid-filled sac) that develops in the ovary. Typically, ovarian cysts are functional (not disease-related) and disappear on their own. During ovulation, a follicle may grow, but fail to rupture and release an egg. Instead of being reabsorbed, the fluid within the follicle persists and forms a follicular cyst.

Other Conditions

The other type of functional cyst is a corpus luteum cyst, which develops when the corpus luteum fills with blood. Functional ovarian cysts usually resolve on their own, and are not to be confused with other pathological conditions involving cystic ovaries, specifically polycystic ovarian disease and endometrium mass, or ovarian tumours.

Since an ultrasound picture is just a black and white shadow, the doctor has to be skilful in interpreting what the image means. Simple cysts are thin walled, and appear as a large black bubble. Cysts which contain blood (for example,

chocolate cysts found in patients with endometriosis) will have echoes within them, which appear white, and these are described as complex masses on ultrasound.

The incidence of follicular cysts is increased in infertile patients taking fertility drugs (such as clomiphene and HMG) for ovulation induction. Functional ovarian cysts usually disappear within 60 days without treatment. However, if the cyst is larger than 6 cm, or persists for longer than 6 weeks, then further testing may be needed.

2.5.3The recent advances have occurred in ultrasound

Ultrasound technology has made dramatic advances in recent years, and now tests have been described which allow the doctor to use ultrasound to assess tubal patency. Basically, these involve passing a fluid into your tubes through the uterus; and the gynaecologist can see the passage of the bubbles into the tubes and out into the abdomen. Since this test (sonosalpingography) can be done in the doctor's clinic itself, and does not involve X-ray radiation, it has advantages - especially for documenting that the tubes are normal.

However, the gold standard for tubal testing remains HSG (hysterosalpingography, an X-ray of the uterus and tubes) and laparoscopy today, because it provides us with a "hard copy" image which can be critically examined

Doppler: The newer ultrasound machines have Doppler attachments which allow the doctor to judge the flow of blood in the blood vessels.

Colour Doppler allows the doctor to "see" the blood flow in the pelvic blood vessels, mapped in colour on the monitor. While still a research tool, it may provide important information for assessing the infertile patient in the coming years

3Dimensional ultrasound. Using sophisticated microprocessors, the newest ultrasound machines allow the doctor to reconstruct the image, so that he gets a three dimensional view.

While this provides excellent pictures, the true value of this technique for infertility still has to be evaluated. It can be useful in assessing women with uterine anomalies, because it helps the doctor to differentiate between a septet uterus and a bicornuate uterus.

2.1.5.4 Ultrasound guided procedures

Ultrasound now also offers infertile patients newer treatment options not available before. Modern surgical techniques have progressively become available and less invasive - all to the patient's benefit! From laparotomy to laparoscopy, and now to ultrasound guided procedures, we are witnessing a change in the gynaecologist's armamentarium from the knife to the endoscope to the guided needle!

The benefits to the patient of "minimally invasive surgery" are many and include: reduced costs; reduced hospitalisation; reduced risk of complications; and better preservation of fertility, with increased chance of conception for the future.

Different USES Ultrasound-guided procedures can be used to treat a variety of problems seen in the infertile woman:

Egg pickup for IVF - The use of vaginal ultrasound for egg pickup has made egg retrieval a short, simple and inexpensive procedure, which can be performed in a day-care unit, under sedation and local anesthesia. The ovaries are normally present in the pouch of Douglas, and are very accessible transvaginally. Moreover, the presence of adhesions does not interfere with egg collection

Ovarian cyst aspiration. An ovarian cyst is a very common condition in which fluid collects in the ovary. However, cysts which are more than 5 cm in size need to be treated, as they can cause problems (twisting and rupture).

Normally, surgery had to be done to remove these cysts - and often this damaged the surrounding normal ovary as well. With ultrasound-guidance, we can stick a needle from the vagina into the cyst, and empty the contents

(usually clear fluid) by sucking it out. This empties the cyst, which often does not recur.

Treatment of ectopic pregnancy. With technological advances (ultrasound and beta-HCG blood tests) the diagnosis of tubal pregnancy can be made very early, usually before rupture.

It can be treated by injecting a toxic chemical, methotrexate, into the sac, which causes the tissue to die and then get reabsorbed, without any surgery whatsoever. In more advanced tubal pregnancies, potassium chloride can be injected direct into the heart of the baby in the ectopic gestational sac, thus killing it and preventing it from growing.

Ultrasound-guided tubal embryo and gamete transfer for IVF and GIFT techniques. Techniques have been devised to pass a special tube - the Jansen-Anderson catheter set - into the fallopian tubes through the vagina under ultrasound guidance, so as to place the embryos and /or the gametes in the fallopian tube. Since the tube offers a better environment for the gametes and embryos than the uterine cavity, it is believed that this will improve pregnancy rates.

Tubal recanalization for cornual blocks (proximal tubal obstruction). Often cornual blocks are due to the presence of mucus plugs and amorphous debris in the tubal lumen. Ultrasound guided tubal catheterization can effectively treat the blocked tubes in some of these patients.

The scope of ultrasound guided procedures has increased dramatically in the last few years; and with further improvements in technology, we can expect this list to become even longer, and doctors become more versatile with using this technology.

2.1.6. Complications of fertility treatment

For many clients treatment runs smoothly with no complications occurring. We inform you of these complications from the outset as part of your consent to treatment.

Complications (Risks) include:

Ovarian Hyper stimulation

Ovarian torsion

Potential for cancellation of your treatment cycle

2.1.6.1. Ovarian Hyper stimulation Syndrome OHSS:

Is the most serious risk in IVF A mild form occurs in up to 20% of women undergoing IVF, and the severe form in about 1–2% of women. If it is not treated, severe OHSS can cause blood clots, stroke and even death.

Ovarian hyper stimulation Syndrome (OHSS) is a complication occasionally seen in women who take certain fertility medicines that stimulate egg production. With this condition the ovaries over-respond to the stimulation injections and can suddenly become very swollen or enlarged. The abdomen can also become swollen due to fluid accumulation and in rare cases fluid can build up in the chest area. OHSS occurs only after the eggs are released from the ovary (ovulation) or following an injection of a hormone called human chorionic gonadotropin (hCG) to help trigger ovulation. If pregnancy occurs, there may be an even greater risk of this syndrome occurring in the following few weeks.

In most cases the condition is mild, but some women get a severe and dangerous form of OHSS which can be fatal. Additional risk factors for OHSS include:

Age younger than 35

Very high estrogen level while undergoing fertility treatment

Polycystic Ovarian Syndrome (Ref) mayo clinic staff 2017

2.6.2. Ovarian torsion

In about 1 in 500 cycles an ovary becomes twisted around its blood supply which can cause severe and sudden pain and sometimes the loss of the ovary. It is more common in women
who respond well to the IVF medications and who become pregnant. It is usually resolved by surgery to untwist the ovary.
(Avecillas, J. F., , et al. 2004).

2.1.6.3Potential for cancellation of your treatment cycle

Treatment cycles may be cancelled where there is an under or over response during stimulation which is not optimum for pregnancy to occur. In cases of over response or of a risk of ovarian hyper stimulation occurring, cancellation is advised by Galway Fertility Clinic. In such cases clients are asked to abstain from intercourse or to use protection during intercourse until the next menstrual cycle occurs, to avoid a multiple pregnancy.

2.1.6.4. Ectopic Pregnancy

This pregnancy occurs outside the uterus usually in the fallopian tubes. The incidence of ectopic pregnancy with fertility treatment is 2.5% approximately but may be marginally higher in those with a history of tubal disease or blockage. An early pregnancy scan is recommended after a pregnancy is confirmed to diagnose and manage this potentially serious condition.

2.1.6.5. Other problems that can arise during an IVF cycle.

Slow down regulation: sometimes downregulation takes longer than expected – usually this just means delaying the start of the FSH injections by another 4-7 days. If a cyst develops it can usually be resolved by giving an injection of hCG. An alternative is to stop the cycle and to start again in 1-2 months' time. Stopping treatment for under-stimulation: If fewer follicles develop than expected the best option may be to stop treatment and start again using more medications. This happens in about 10% of cycles. If you have a poor response

during a publicly funded cycle, we will make the decision on whether or not to stop and whether you can be offered another publicly funded cycle.

Ovulation before egg collection: This occurs in about in about 1 in 200 cycles.

No or low fertilization: Unexpected low or no fertilization can arise because of a sperm factor, an egg factor, or can just be unexplained. It seldom recurs and the pregnancy rate in subsequent ICSI cycles is normal.

Infection of culture dishes: very occasionally culture media may become contaminated with bacteria from the semen or from the vagina during egg collection which leads to the embryos dying. There are various strategies to minimize the risk in subsequent cycles.

Delayed or abnormal embryo development: Almost everyone has at least some embryos that stop developing normally by the time of embryo transfer. Occasionally all embryos stop developing before day 2 or 3 so that there are no embryos to transfer. When this happens it can be very difficult to advise what to do next – for some people the problem will recur in another cycle, while for others it is a 'one-off' phenomenon that probably arose by chance.

2.2Previous study

2.2.1Multicenter study by the World Health Organization found that in 20% of infertility cases the cause was predominantly male, and in 27% abnormalities were found in both partners; therefore, a male factor is present in approximately 50% of infertility cases.

2.2.2 Study by A.A. Osman 2010. The study was supported by, University of Gezira, Sudan Wad Medani City, Gezira State, Central of Sudan. The aim of this Study to identify the aetiology of Sudanese female infertility The sample size was 200 infertile couples Clinical examination and investigations which include; blood haemogram, urine analysis, hormonal assay,

hystosalpingogram and ultra sound for all infertile females results; 79.5% suffered from primary infertility and 20.5% had secondary infertility. Infertility due to husbands only was 20.5%, that due to wives alone was 37.5% and infertility due to both couple was 31% while those with unknown aetiology was 11%. The main aetiological factor for females, with primary infertility was due to unovulatory cycle (69.5%). The main cause for secondary infertility was tubal problems which found in 15%.

2.2.3 Study by Farhi J, Ben-Haroush A 2011.abut Distribution of causes of infertility in patients attending primary fertility clinics in Israel. METHODS: the 2515 couples identified from two clinics of major women's hospitals run by the country's largest health insurance fund. All patients were treated by one physician. RESULTS: ,. Primary infertility accounted for 65% of cases. Causes of infertility were male factor (45%), oligo-ovulation disorders (37%), and tubal damage (18%). Infertility factors were identified in the woman alone in 30.6% of cases and the man alone in 29.2%. Two combined infertility factors were found in 18% of patients. CONCLUSIONS: As male factor accounts for almost half of all cases of infertility in couples

2.2.4 Study by Roupa Zoe, 2009 The purpose of the study was to investigate the causes of infertility in women of reproductive age. Method: The study population consisted of 110 infertile women who sought medical help in a private Assisted Reproduction Center for a period of 2 months. Concerning the causes of infertility, 27.4% of the problems were due to fallopian tubes dysfunction, followed infertility of «unknown» cause in 24.5% of the cases, 20% were due to disorders of menstruation, 9.1% due to problems of the uterus.

2.2.5 Study by Farzana Arain, ET, al2008The purpose this study was conducted to see the frequency and outcome of treatment in PCOs related infertility in infertile couples coming to Mohammad Medical College,

BACSTAN **Methods:** This prospective observational study was conducted at Muhammad Medical College Hospital for three years from 2005 to 2008. Total 1289 infertile couples were included in this study. **Result:** The frequency of PCOs in female related infertility was 38.5%. Other causes of female infertility were in the frequency of 44% pelvic inflammatory disease, 12.3% endometriosis, 2.9% hyperprolactenemia, and 1.35% hypothyroidism. Patients with PCOS were given different treatment modalities. One hundred fifty patients with PCO were given ovulation induction with clomiphene citrate and out of them 109 (72%) conceived. Sixty three women were given combination of clomiphene citrate and Metformin. Out of them 50 (79%) conceived. Five patients were given gonadotropins, Out of them 2 (40%) patients conceived. Five patients had laparoscopic drilling out of them 3 (60%) conceived. **Conclusion:** Polycystic Ovarian Syndrome turned out to be the second most common cause of female related infertility. But as the international literature shows it had very good out come after medical treatment

2.2. 6 Study by **Mamatha M, et, al,** Vignan Pharmacy College, , India 25/07/2016 The purpose This study TO identified Relation between Obesity and PCOS (Polycystic Ovarian Syndrome).THE **Result:** The syndrome is characterized by anovulation, hyperandrogenism and polycystic ovaries. Obesity (defined as a BMI ≥30 kg/m2) occurs in approximately 30% to 60% of women with PCOS.

2.2.7 Study by Bizjak T, et , al, 2016 University Clinical Centre Maribor Division of Gynecology and Perinatology Ljubljanska 5, 2000 Maribor, Slovenia Tel: +3862 321 2178 .The aim of this study is to reveal the prevalence of fibroids in a patient population from the municipality of Maribor, Slovenia, and to identify associated risk factors. Methods: The study was based on a random sample of 2000 women within the age group of 25 to 56 living in the municipality of Maribor, Slovenia. Eligible patients had to fill out a questionnaire and would undergo a transvaginal ultrasound Results The prevalence of fibroids was statistically significantly lower (6.7%) in the younger group (25-35 years) than in the group aged 36-45

years (prevalence of 33.3%, $\chi 2$=34.4, p=0.0001) and that of 46-56 years (prevalence of 60%, $\chi 2$=53.7, p=0.0001). Women with fibroids had a 1.2 kg/m2 (95% CI: 0.4-1.9) higher BMI (t=-3.0, p=0.003).

2.2.8 Study by Marozzi A, et, al, 01 Mar 2000 Type: Multicenter Study Objective of this study was to evaluate the prevalence of familial cases of POF and EM and to assess the clinical and genetic characteristics of these patients. Method: One hundred and sixty women with idiopathic secondary amenorrhoea before the age of 45 and serum follicle-stimulating hormone (FSH) levels greater than or equal to 40 IU/l were included in the study. The 160 patients included in the study showed idiopathic POF (n=130) or EM (n=30). Incidence of familial cases of 28.5% in the POF group (n=37) and of 50% in the EM group (n=15). Results indicate a high rate of familial transmission of the condition. Pedigree's analysis suggests an autosomal or .an X-linked dominant sex-limited pattern of inheritance for POF and EM

Chapter Three

Material and Method

Chapter Three

Material and Method

3.1Material

3.1.1Patient

This study was done in Wad Medani City (Gezira State, Sudan), in2017 in altigane fertility center in Wad Medani City. Sample were selected by random selection, and the total number was 97 infertile couples

.**included criteria** ;Age for female between 16 year to 50 year and

Failure to achieve pregnancy during 1 year of frequent, unprotected intercourse

3.1.2Ultrasound system

3.1.2.1 Probes3.5-5 MHz transabdominal, 7-10MHz
transvaginal
3.1.2.2 Ultrasound gel Medical gloves to prevent infection transmission
3.1.2.3 Male condom prevent infection transmission
3.1.2.4 Computer for data analysis

3.2Method

3.2.1Method of data collection

As the first consent was secured. A questionnaire was designed for interviewing the couples it includes variable: age, type of fertility, infertility period, clinical feature, risk factor, hysterosalpingography result, lab result of both wife and husband, seminal analysis and ultrasound result before and after medication

3.2.2Ultrasound technique

pt scanned with ultrasound system using probe (3.5MHz Tranabdominal and 7-10 MHz transvaginal).the gel has been used to obtain good contact without

air gab. The patients were scanned in supine position. In the transabdominal u/s the urinary bladder should be adequately distended .for transvaginal urinary bladder should be empty.

3.2.3Image interpretation

Firstly we scanned uterus, ovaries, fallopian tube and cul de sac to diagnose infertility cusses. Then the data was collected according to the master sheet attached in the appendix A.

After that the doctor start to management the infertility in day (3) of menstrual cycle. Patient injected with gonadotropins hormone to stimulate the ovaries to develop multiple follicles. Daily scans are done to visualize the growing follicle, then the number of ovum has been counted also the diameter of the follicles and the thickness of the uterine lining (the endometrium)was measured by ultrasound caliber, and know by the scans when the egg has ruptured .we record the result in the master sheet attached in the appendix A

If there are positive response Egg pickup for IVF or artificial insemination was done by Ultrasound guided procedures.

Finally ultrasound scans are done to visualize infertility treatment complication.

3.2.4 Method of data analysis

The data was analyzed by using statistical packaged for social science (SPSS) and excel under windows.

Chapter Four

Results

Chapter Four

Results

Table (4.1) frequency distribution of age group

Age	Frequency	Percent	Valid Percent	Cumulative Percent
15-20 Years	16	16.5	16.5	16.5
21-25 Years	13	13.4	13.4	29.9
26-30 Years	29	29.9	29.9	59.8
31-35 Years	14	14.4	14.4	74.2
36-40 Years	11	11.3	11.3	85.6
41-45 Years	13	13.4	13.4	99.0
46-50 Years	1	1.0	1.0	100.0
Total	97	100.0	100.0	

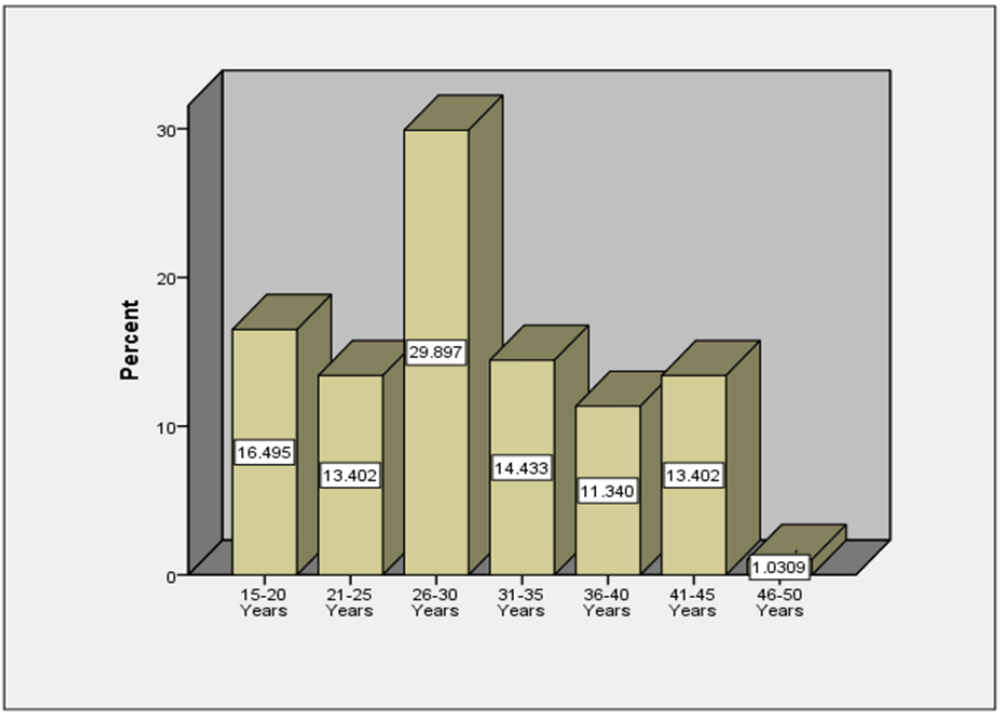


Figure (4.1) frequency distribution of age group

Table (4.2) frequency distribution of type of infertility

Type	Frequency	Percent	Valid Percent	Cumulative Percent
Primary	86	88.7	88.7	88.7
Secondary	11	11.3	11.3	100.0
Total	97	100.0	100.0	

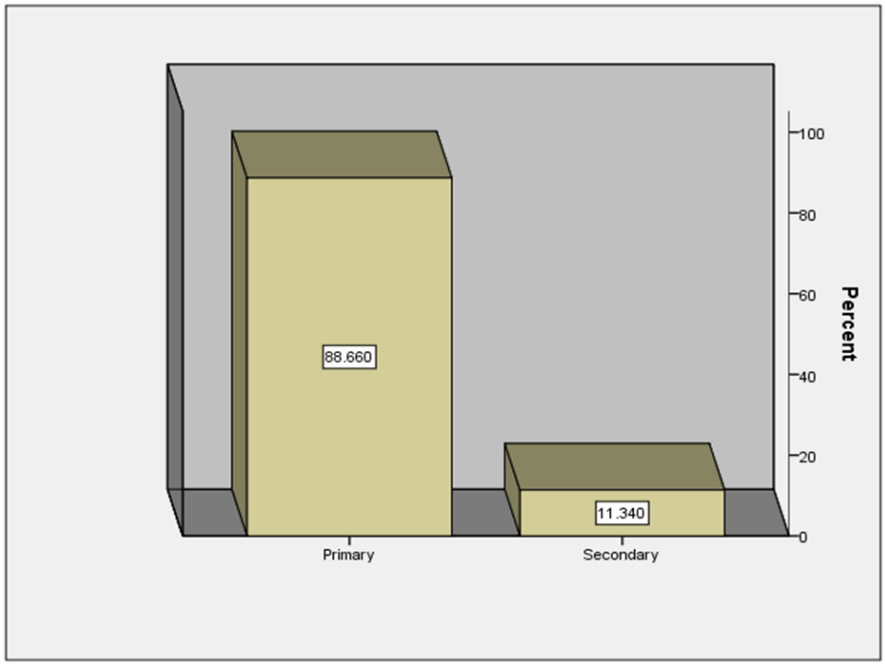


Figure (4.2) frequency distribution of type of infertility

Table (4.3) frequency distribution of duration of infertility

Duration	Frequency	Percent	Valid Percent	Cumulative Percent
1	8	8.2	8.2	8.2
2	22	22.7	22.7	30.9
3	13	13.4	13.4	44.3
4	6	6.2	6.2	50.5
5	15	15.5	15.5	66.0
6	8	8.2	8.2	74.2
7	4	4.1	4.1	78.4
8	4	4.1	4.1	82.5
9	2	2.1	2.1	84.5
10	2	2.1	2.1	86.6
11	4	4.1	4.1	90.7
12	1	1.0	1.0	91.8
13	2	2.1	2.1	93.8
15	3	3.1	3.1	96.9
16	1	1.0	1.0	97.9
18	2	2.1	2.1	100.0
Total	97	100.0	100.0	

Table (4.4) frequency distribution of clinical feature

Clinical features	Frequency	Percent	Valid Percent	Cumulative Percent
Asymptomatic	32	33.0	33.0	33.0
Symptomatic	65	67.0	67.0	100.0
Total	97	100.0	100.0	

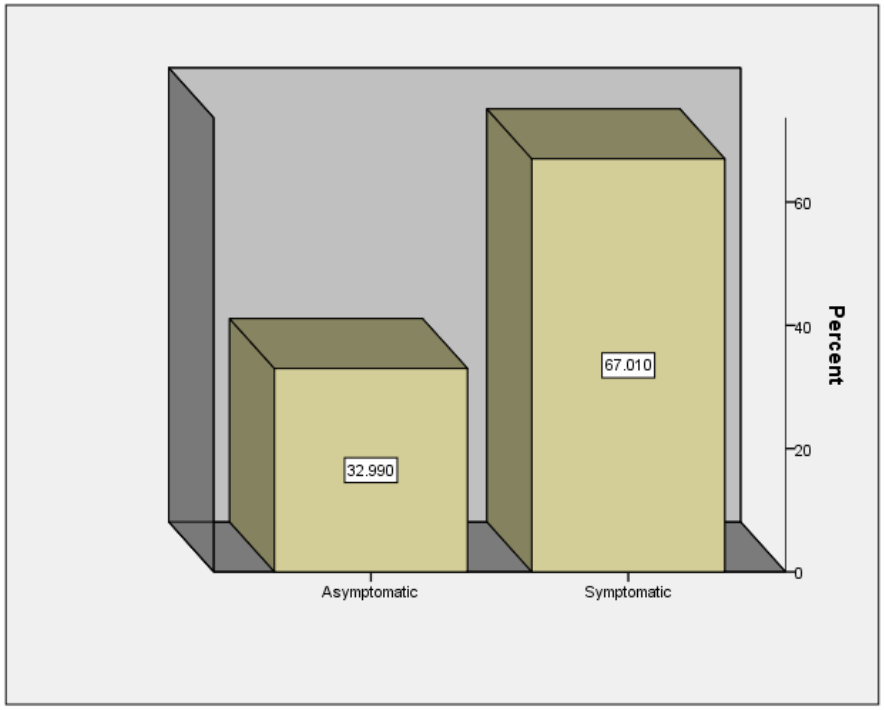


Figure (4.3) frequency distribution of clinical feature

Table (4.5) frequency distribution of signs and symptoms

Symptom	Frequency	Percent	Valid Percent	Cumulative Percent
Null	36	37.1	37.1	37.1
Menstrual disorder	54	55.7	55.7	92.8
Pelvic pain	6	6.2	6.2	99.0
Vaginal bleeding	1	1.0	1.0	100.0
Total	97	100.0	100.0	

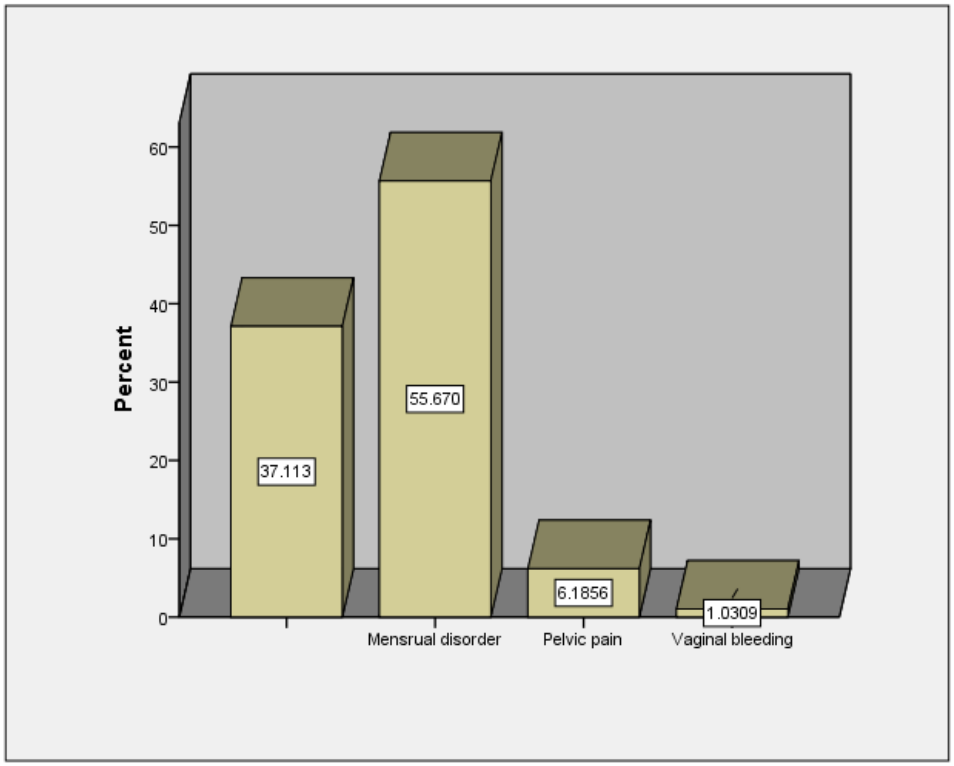


Figure (4.4) frequency distribution of signs and symptoms

Table (4.6) frequency distribution of risk factors

Risk factors	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	59	60.8	60.8	60.8
Positive	38	39.2	39.2	100.0
Total	97	100.0	100.0	

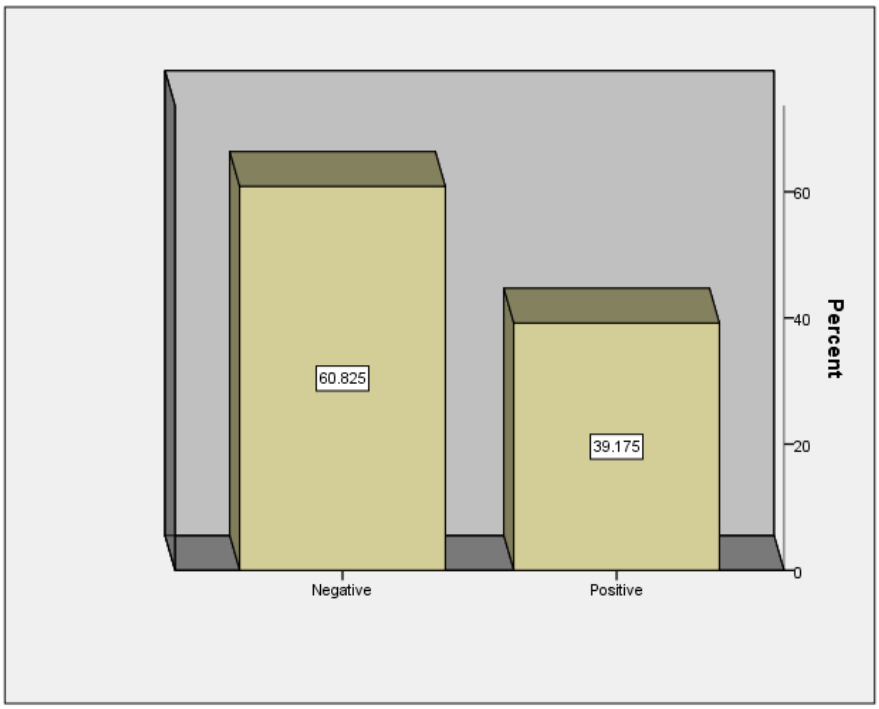


Figure (4.5) frequency distribution of risk factors

Table (4.7) frequency distribution type of risk factors

Risk factors	Frequency	Percent	Valid Percent	Cumulative Percent
Hereditary	19	19.6	19.6	19.6
No risk	61	62.9	62.9	82.5
Obesity	11	11.3	11.3	93.8
Weight loss	6	6.2	6.2	100.0
Total	97	100.0	100.0	

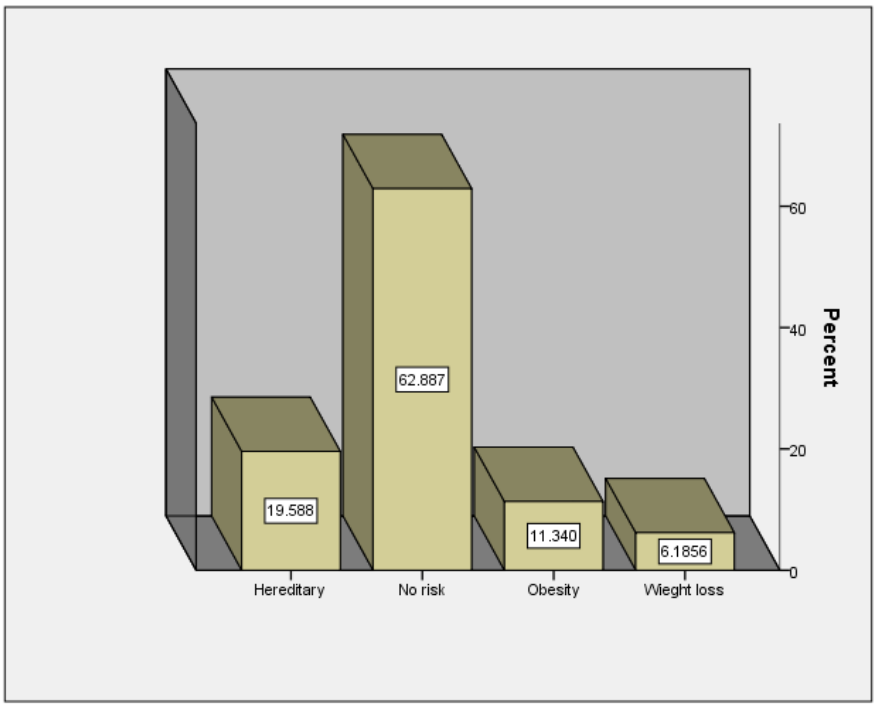


Figure (4.6) frequency distribution of risk factors

Table (4.8) frequency distribution of laboratory results

Lab results	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	79	81.4	81.4	81.4
Positive	18	18.6	18.6	100.0
Total	97	100.0	100.0	

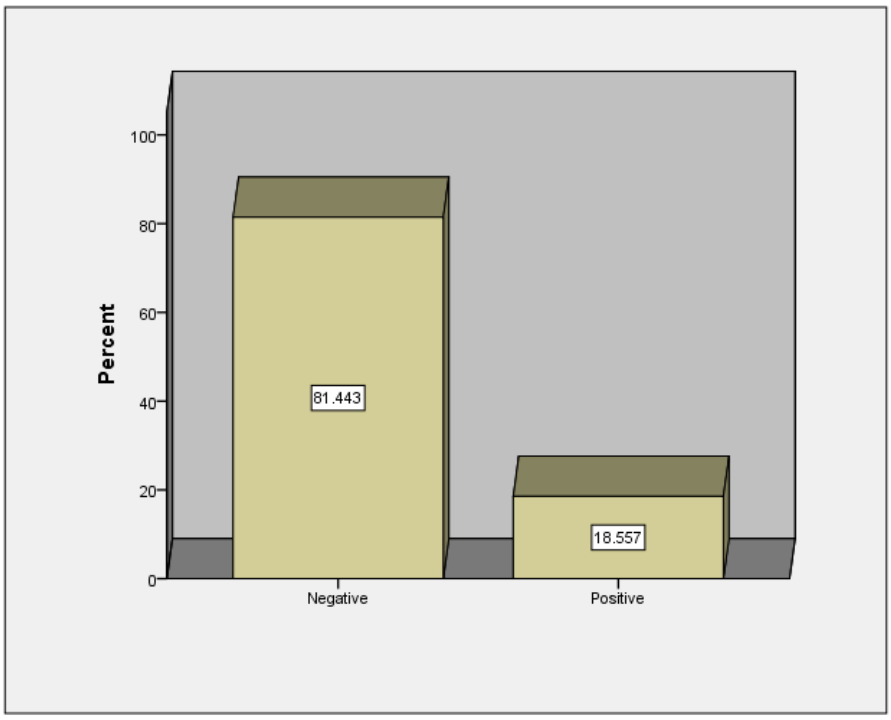


Figure (4.7) frequency distribution of laboratory results

Table (4.9) frequency distribution of HSG

HCG	Frequency	Percent	Valid Percent	Cumulative Percent
Abnormal	5	5.2	5.2	5.2
No HSG	14	14.4	14.4	19.6
Normal	78	80.4	80.4	100.0
Total	97	100.0	100.0	

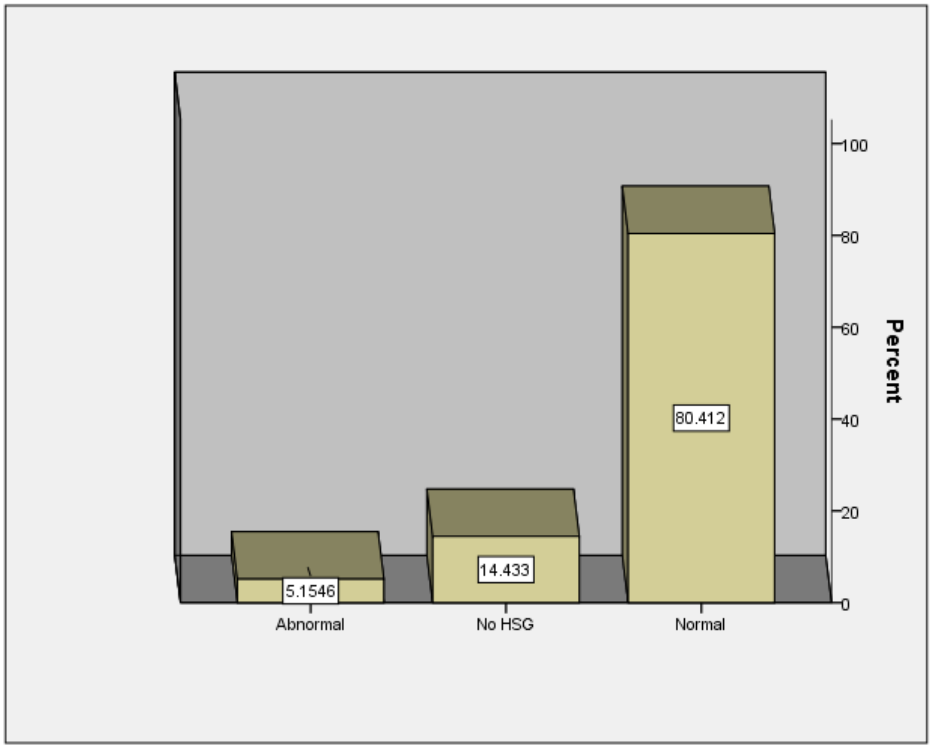


Figure (4.8) frequency distribution of HSG

Table (4.10) frequency distribution of ultrasound findings

US findings	Frequency	Percent	Valid Percent	Cumulative Percent
Congenital anomaly	7	7.2	7.2	7.2
Mass and fibroid	6	6.2	6.2	13.4
No finding	31	32.0	32.0	45.4
PCO	34	35.1	35.1	80.4
PID	4	4.1	4.1	84.5
Premature ovarian failure	15	15.5	15.5	100.0
Total	97	100.0	100.0	

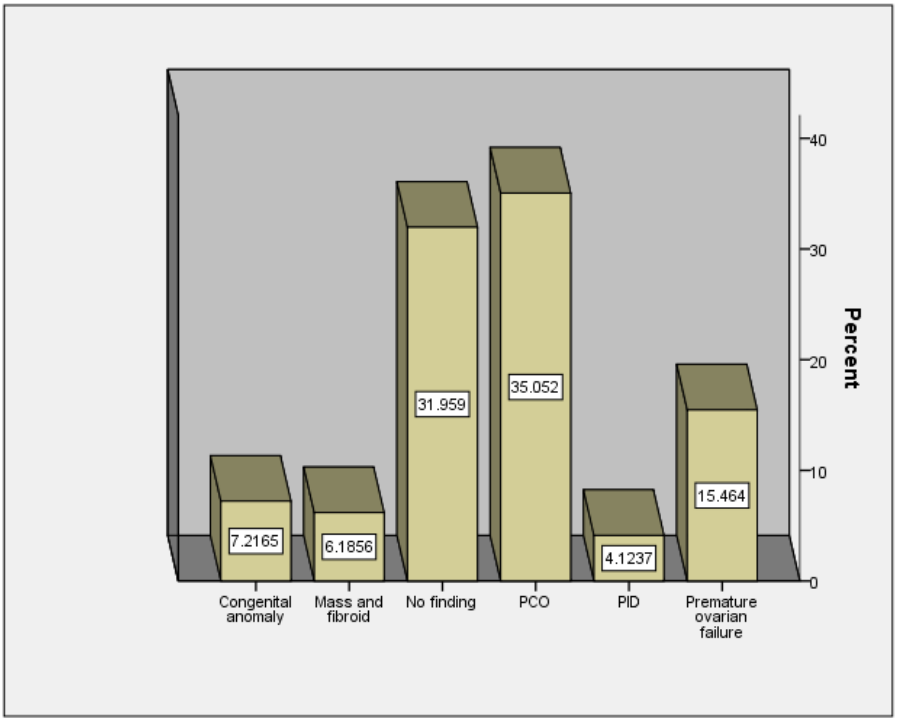


Figure (4.9) frequency distribution of ultrasound findings

Table (4.11) frequency distribution of male lab findings

Male findings	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	41	42.3	42.3	42.3
Not done	5	5.2	5.2	47.4
Positive	51	52.6	52.6	100.0
Total	97	100.0	100.0	

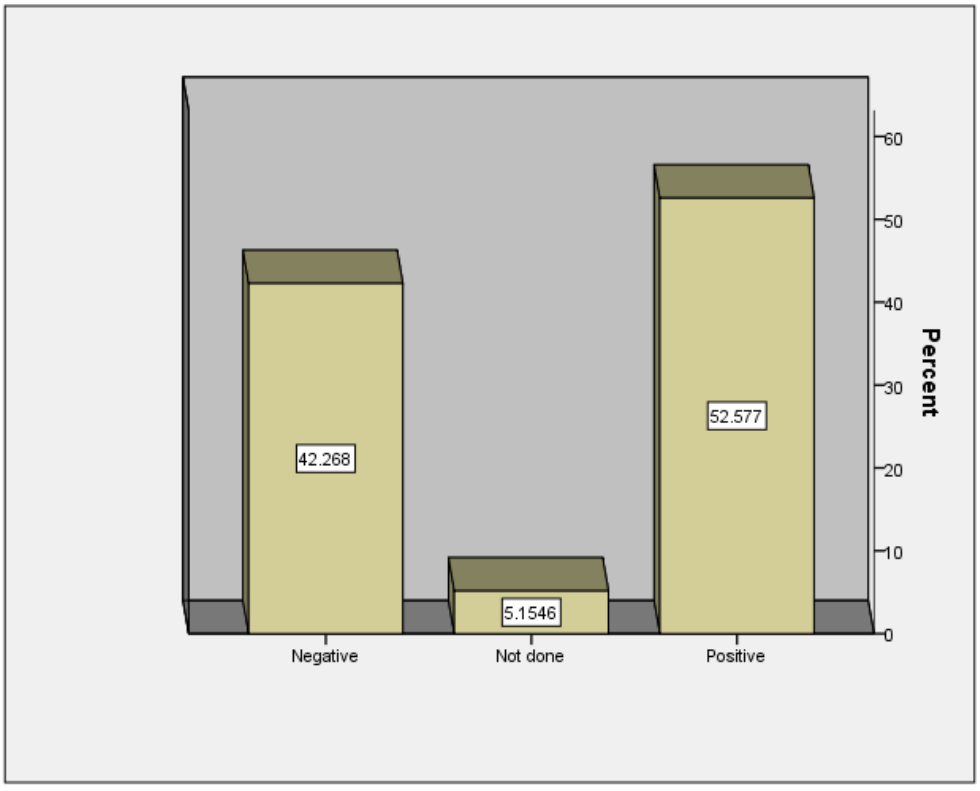


Figure (4.10) frequency distribution of male lab findings

Table (4.12) frequency distribution of monitoring of follicular size \mm

Follicle size \mm	Frequency	Percent	Valid Percent	Cumulative Percent
5	1	1.0	1.4	1.4
6	8	8.2	11.4	12.9
7	3	3.1	4.3	17.1
8	1	1.0	1.4	18.6
9	2	2.1	2.9	21.4
11	1	1.0	1.4	22.9
12	4	4.1	5.7	28.6
13	2	2.1	2.9	31.4
14	1	1.0	1.4	32.9
15	2	2.1	2.9	35.7
16	3	3.1	4.3	40.0
17	1	1.0	1.4	41.4
18	6	6.2	8.6	50.0
19	13	13.4	18.6	68.6
20	15	15.5	21.4	90.0
21	5	5.2	7.1	97.1
24	1	1.0	1.4	98.6
25	1	1.0	1.4	100.0
Total	70	72.2	100.0	
Not measure	27	27.8		
Total	97	100.0		

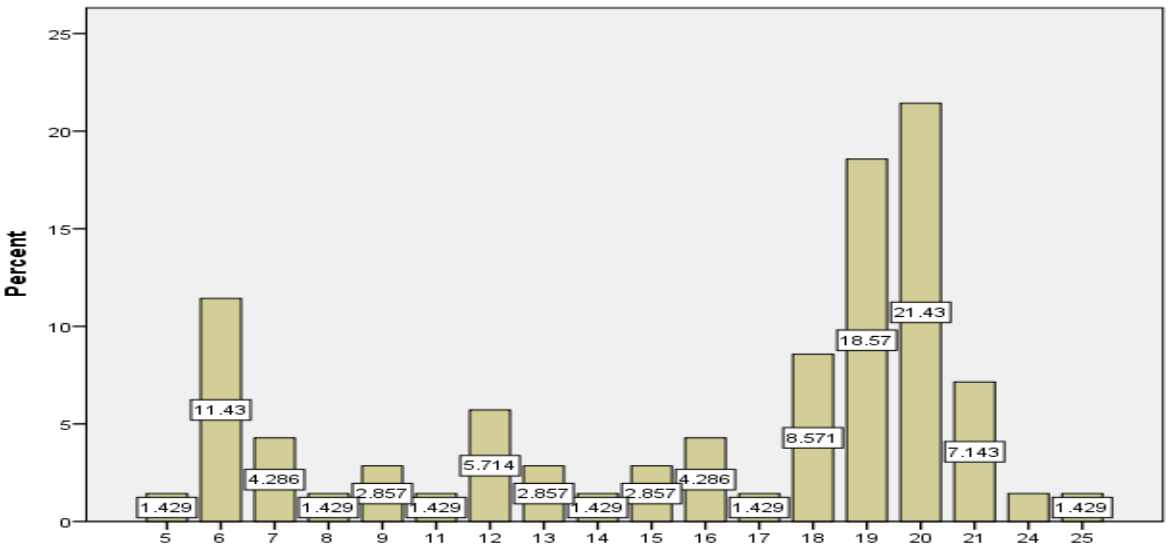


Figure (4.11) frequency distribution of monitoring of follicular size \mm

Table (4.13) frequency distribution of monitoring of endometrial thickness

Endometrial thickness	Frequency	Percent	Valid Percent	Cumulative Percent
3	6	6.2	7.1	7.1
4	6	6.2	7.1	14.1
5	10	10.3	11.8	25.9
6	7	7.2	8.2	34.1
7	7	7.2	8.2	42.4
8	9	9.3	10.6	52.9
9	14	14.4	16.5	69.4
10	17	17.5	20.0	89.4
11	5	5.2	5.9	95.3
12	2	2.1	2.4	97.6
15	1	1.0	1.2	98.8
19	1	1.0	1.2	100.0
Total	85	87.6	100.0	
Not measure	12	12.4		
Total	97	100.0		

\mm

Table (4.14) frequency distribution of response

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Artificial insemination	13	13.4	13.4	13.4
Egg collection	10	10.3	10.3	23.7
Embryo transfer	7	7.2	7.2	30.9
No response	67	69.1	69.1	100.0
Total	97	100.0	100.0	

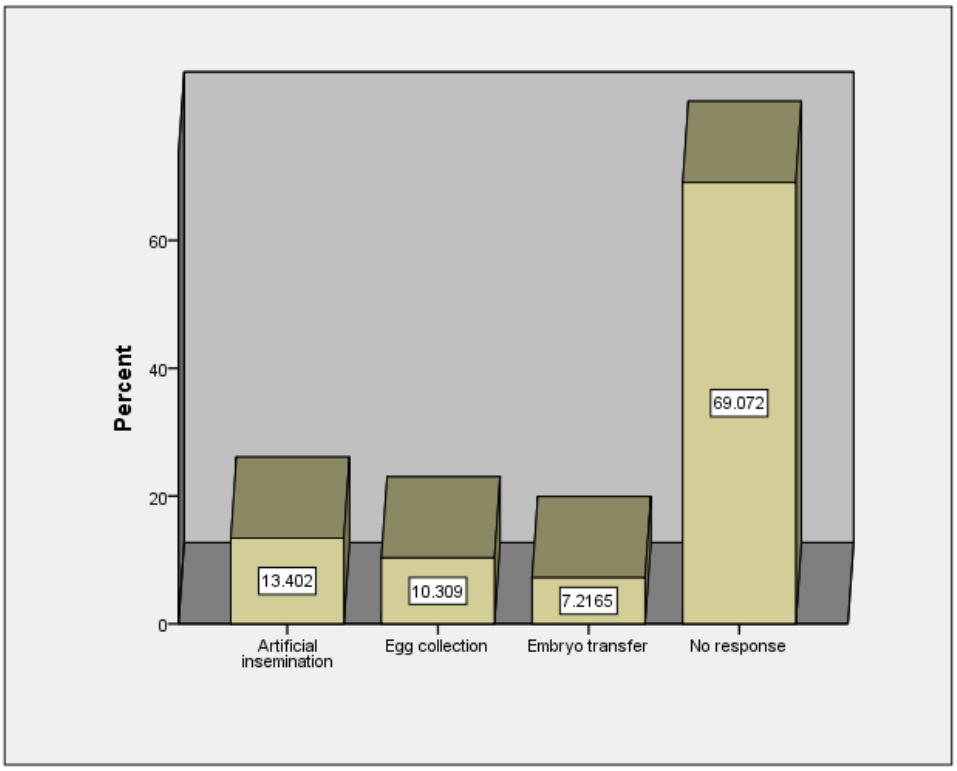


Figure (4.12) frequency distribution of response

Table (4.15) frequency distribution of complications

Complication	Frequency	Percent	Valid Percent	Cumulative Percent
No	87	89.7	89.7	89.7
Yes	10	10.3	10.3	100.0
Total	97	100.0	100.0	

Figure (4.13) frequency distribution of complications

Table (4.16) frequency distribution of finding in cases with complications

	Frequency	Percent	Valid Percent	Cumulative Percent
OHSS	8	8.2	8.2	8.2
adnexal torsion and OHSS	2	2.1	2.1	10.3
No	87	89.7	89.7	100.0
Total	97	100.0	100.0	

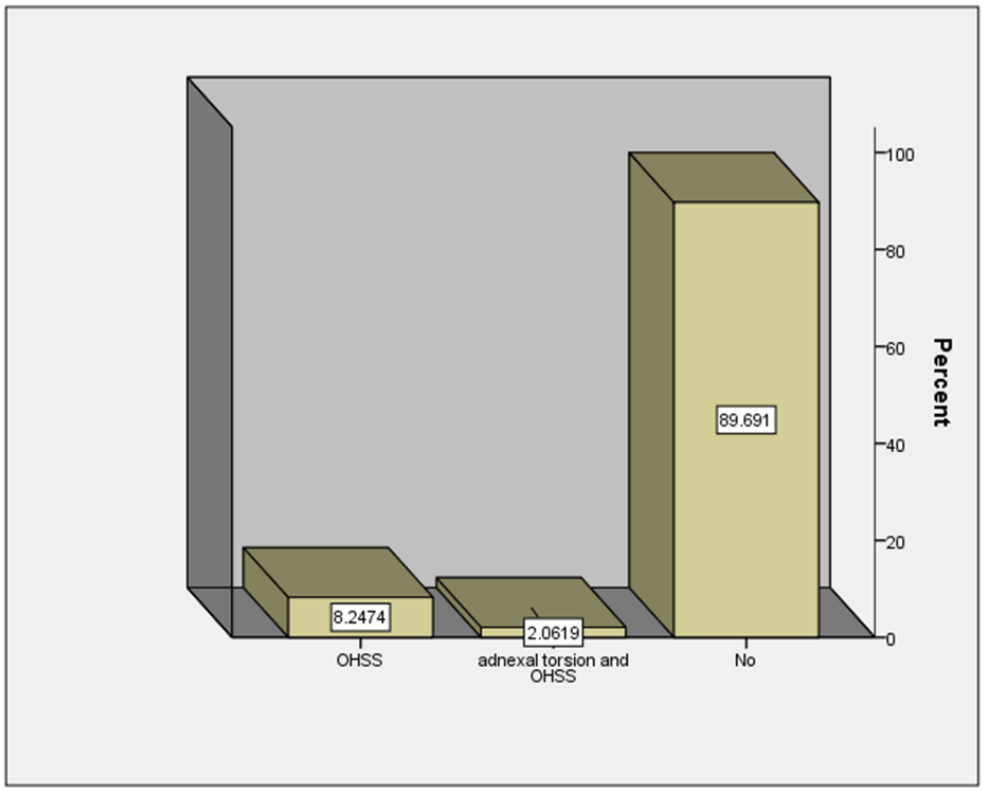


Figure (4.14) frequency distribution of finding in cases with complications

Table (4.17) cross tabulation age group and ultrasound findings

Age	Ultrasound finding						Total
	Congenital anomaly	Mass and fibroid	No finding	PCO	PID	Premature ovarian failure	
15-20 Years	1	0	5	8	1	1	16
21-25 Years	1	0	6	4	0	2	13
26-30 Years	0	0	12	15	1	1	29
31-35 Years	1	1	4	4	2	2	14
36-40 Years	2	2	2	2	0	3	11
41-45 Years	2	3	2	1	0	5	13
46-50 Years	0	0	0	0	0	1	1
Total	7	6	31	34	4	15	97
P value =0.021							

Table (4.18) cross tabulation type of infertility and ultrasound findings

Infertility	Ultrasound finding						Total
	Congenital anomaly	Mass and fibroid	No finding	PCO	PID	Premature ovarian failure	
Primary	7	4	30	29	4	12	86
Secondary	0	2	1	5	0	3	11
Total	7	6	31	34	4	15	97
P value = 0.166							

Table (4.19) cross tabulation symptoms and ultrasound findings

Symptom	Ultrasound finding						Total
	Congenital anomaly	Mass and fibroid	No finding	PCO	PID	Premature ovarian failure	
No disorder	4	0	23	6	1	2	36
Menstrual disorder	3	4	8	27	1	11	54
Pelvic pain	0	1	0	1	2	2	6
Vaginal bleeding	0	1	0	0	0	0	1
Total	7	6	31	34	4	15	97
P value = 0.000							

Table (4.20) cross tabulation complications and ultrasound findings

Complications	Ultrasound findings						Total
	Congenital anomaly	Mass and fibroid	No finding	PCO	PID	Premature ovarian failure	
OHSS	0	0	1	6	1	0	8
adnexal torsion and OHSS	0	0	0	1	0	1	2
No	7	6	30	27	3	14	87
Total	7	6	31	34	4	15	97
P value = 0301							

Table (4.21) cross tabulation follicle size and ultrasound findings

Follicle size	Ultrasound findings						Total
	Congenital anomaly	Mass and fibroid	No finding	PCO	PID	Premature ovarian failure	
5	0	0	0	1	0	0	1
6	0	0	1	7	0	0	8
7	0	0	2	1	0	0	3
8	0	0	0	1	0	0	1
9	0	0	0	2	0	0	2
11	0	0	0	1	0	0	1
12	0	0	0	4	0	0	4
13	0	0	0	1	0	1	2
14	0	0	0	1	0	0	1
15	0	1	0	1	0	0	2
16	0	0	0	3	0	0	3
17	0	1	0	0	0	0	1
18	0	0	1	4	1	0	6
19	0	0	12	1	0	0	13
20	1	0	11	3	0	0	15
21	0	0	4	1	0	0	5
24	0	0	0	1	0	0	1
25	0	0	0	0	1	0	1
Total	1	2	31	33	2	1	70
P value = 0.0000							

Table (4.22) cross tabulation endometrial thickness and ultrasound findings

Endometrial thickness	Ultrasound findings						Total
	Congenital anomaly	Mass and fibroid	No finding	PCO	PID	Premature ovarian failure	
3	1	1	0	1	0	3	6
4	1	0	0	1	1	3	6
5	2	2	0	2	0	4	10
6	2	0	3	2	0	0	7
7	0	0	0	5	1	1	7
8	0	0	3	4	0	2	9
9	0	0	6	7	1	0	14
10	1	1	12	3	0	0	17
11	0	0	5	0	0	0	5
12	0	0	0	2	0	0	2
15	0	0	1	0	0	0	1
19	0	0	0	1	0	0	1
Total	7	4	30	28	3	13	85
P value = 0.005							

Table (4.23) cross tabulation response and ultrasound findings

Ultrasound finding	Response of treatment				Total
	Artificial insemination	Egg collection	Emryo transfer	No response	
Congenital anomaly	0	0	0	7	7
Mass and fibroid	0	0	1	5	6
No finding	9	6	5	11	31
PCO	4	4	1	25	34
PID	0	0	0	4	4
Premature ovarian failure	0	0	0	15	15
Total	13	10	7	67	97
P value =0.007					

Table (4.24) cross tabulation male factors and ultrasound findings

US finding	Male lab			Total
	Negative	Not done	Positive	
Congenital anomaly	4	0	3	7
Mass and fibroid	5	0	1	6
No finding	4	1	26	31
PCO	16	2	16	34
PID	3	0	1	4
Premature ovarian failure	10	1	4	15
Total	42	4	51	97
P value = 0.009				

Table (4.25) cross tabulation Risk factor and Female ultrasound findings

Count

Female altrasound		Risk		Total
		Negative	Positive	
	Congenital anomaly	6	1	7
	Mass and fibroid	3	3	6
	No finding	24	7	31
	PCO	17	17	34
	PID	2	2	4
	Premature ovarian failure	7	8	15
	Total	59	38	97

P VALUE .116

Table (4.26) cross tabulation Female Ultrasound finding and HSG

Count

		HSG			Total
		Abnormal	No HSG	Normal	
F_Altrasound	Congenital anomaly	1	1	5	7
	Mass and fibroid	0	1	5	6
	No finding	1	2	28	31
	PCO	1	6	27	34
	PID	0	1	3	4
	Premature ovarian failure	2	3	10	15
	Total	5	14	78	97

Table (4.27) cross tabulation Female Altrasound Female Lab

Count

		F_Lab		Total
		Negative	Positive	
F_Altrasound	Congenital anomaly	7	0	7
	Mass and fibroid	5	1	6
	No finding	27	4	31
	PCO	27	7	34
	PID	3	1	4
	Premature ovarian failure	10	5	15
	Total	79	18	97

Chapter Five

Discussion, conclusion & recommendations

Chapter Five

Discussion, conclusion &recommendations

5.1 Discussion:

This study was done in 97 infertile patient with age grope from16 to 50 year Table (4.1) .the collective clinical history finding of this study is 88.7% are primary infertility and 11.3% re secondary Table (4.2), this finding disagree Farhi J, et,al2011 . Infertility factors in the woman alone in 38. % of cases and the man alone in 26. %. Two combined infertility factors were found in 25.8 % this study found a male factor is present in approximately 52.6% of infertility cases. This finding agree Farhi J, et, al2011 which found a male factor is present in approximately 50% of infertility cases.

The collective result of female lab finding is 81.4% is normal. Table (4.27) Collective Ultrasound finding of this study show the causes of infertility as fallowing 35.1% polycystic ovary,7.2% Congenital anomaly,6.2% Mass and fibroid,32% No finding,4.1% pelvic inflammatory disease and premature ovarian failure Table (4.10).

.This study found polycystic ovary Most common 35% Table (4.10).most cases seen on age grope 26 -30 Table (4.17). 50 %(17 cases) positive Risk factor (8 hereditary 6 obesity and 3 other) Table (4.25).This study found 27/34(79.4%) Female lab finding about the levels of 'male' hormones (androgens) in the blood is negative result Table (4.27) are. This may be due to an error in the lap result duo to the patient under medication. But `all cases diagnose by ultrasound imaging.

This study found polycystic ovary is most common 35%.theses agree with Study by Farzana Arain, et, al, 2008.This study show high hereditary risk factor .this mean there is strong relation sheep between genetic factor and cause of polycystic ovary syndrome.This study show only 6/34 (17.6) % are

Obese Table (4.25) this finding is disagree with. Study by Mamatha M, et al 2016 study which found obesity occurs in approximately 30% to 60% of women with PCOS. After medication Ultrasound collective finding of monitoring ovarian follicles and endometrium thickness show 1o/34(29.4%) mature follicle Table (4.21) 13/34(38%) show endometrium thickness above 9 mm Table (4.22) .9/34(26.4%) are response to the treatment (4 egg collection,5 artificial insemination) Table (4.23).7/3(20.5%)have complication 6 ohss and 1 ovarian torsion Table (4.20) this agree with mayo clinic staff which bsay:most of ohss ocure incases which there Age younger than 35 and have Polycystic Ovarian Syndrome

This study found the incidence of premature ovarian failure increase by age This study show high hereditary risk factor(4/15) 26.6%.this mean there is strong relation sheep between genetic factor and cause of premature ovarian failure I agree with. Study by Marozzi A,et,al, 01 Mar 2000 .after medication Ultrasound scan show No follicles seen in all cases Table (4.21), No response to treatment Table (4.23) and 100%have no treatment complication Table (4.20)

This study show fibroid is not common disorder 6.2% Table (4.10). Prevalence of fibroids is higher in age grope above 35 (5/6 cases) Table (4.17) this result is agree with Bizjak T, et, al, 2016. This study show all fibroid cases in normal range of Wight this result disagree Bizjak T, et, al, 2016This study show 4/6 Table (4.18) is primary infertility this agree with Some studies, of small numbers of women, have indicated that women who have had two live born children have one-half the risk of developing uterine fibroids compared to women who have had no children. After medication Ultrasound scan show no follicle 4/6 cases (ovarian failure) Table (4.21), 5/6 endometrium not able to receive pregnancy Table (4.22), 6/6 have no response Table (4.23) and 6/6 have no treatment complication. Table (4.20)

This study show Pelvic inflammatory Disease is rare disorder 4.1% Table (4.10) I disagree with. Study by Farzana Arain, et,al2008, All cases seen on age grope <35 .After medication Ultrasound scan show All cases have Endometrium thickness less than 9 mm 4/4 is no response1/4 was complicated (OHSS)

This study show Congenital anomaly Not common disorder 7.3% Table (4.10) this agree with Roupa Zoe,2009.After medication Ultrasound scan show 5/7 cases have ovarian failure Table (4.21) Endometrium not able to receive embryo 6/7 less than 10 mm.

This study show Normal ultrasound finding is 32% Table (4.10) of all infertility cases, Male lab finding (83.9%) positive Table (4.24),female lab finding is 27/31 is normal Table (4.27) After medication Ultrasound scan show 28/31 (90%) devolope mature follicle Table (4.21) and 24/31(77%) show endometrium thickness above 9 mm Table (4.22) 20/31(64.5%) are response to the treatment Table (4.23) (6 egg collection, 14 artificial insemination)1/31 have complication ohss. Table (4.20)

From all above results we found The main aetiological factor for females, with infertility was due to unovulatory cycle (.57%).this agree with osman,2010. Polycystic Ovarian Syndrome turned out to be the most common cause of female related infertility. But as the international literature shows it had very good out come after medical treatment this agree with Farzana Arain, et,al2008,

30.9% of all infertility cases use Ultrasound guide procedure after response to medication Table (4.14)

5.2 Conclusion

Male factor is present in approximately half of infertility cases.

ovulatory disorders is most common cause lead to female infertility.

Ultrasound is very important in diagnose the cause of infertility importance of ultrasound even higher than lab because lab can give normal result especially if case are chronic or the patient under medication.

After medication Ultrasound scan of monitoring ovarian follicles and endometrium thickness, and complication of the treatment is very important. The importance of ultrasound even higher than estradiol because it is impossible to differentiate between one big, some medium or many small follicles with hormone assays.

Ultrasound guide procedure is facilitate the egg collection and artificial insemination after response to medication

5.3 Recommendation

Further studies with large sample to satisfy more accurate result

Don’t depend on lab result only in diagnose and treatment of infertility cases because it not give accurate result if case is chronic or under medication and not differentiate between one big, some medium or many small follicles

Use the transvaginal ultrasound and not depend on Transabdominal ultrasound in diagnose and treatment of infertility

I recommend the doctor to for farther research use of a mild hormone called dehydroepiandrosterone (DHEA) in women with POF to increase spontaneous pregnancy rates in premature ovarian failure.

Further research about Relation sheep between fibroid, congenital anomaly and ovarian failure.

REFRANCE

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Appendices A

data sheet

Sudan University of Science and technology

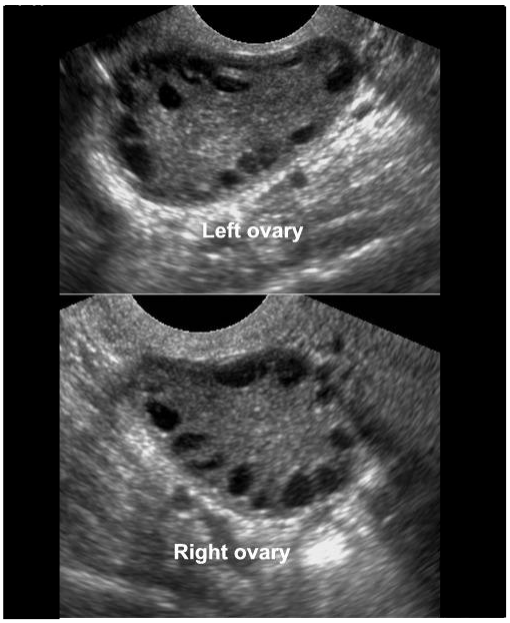
College of graduate studies

A Study of female Infertility using Ultrasonography

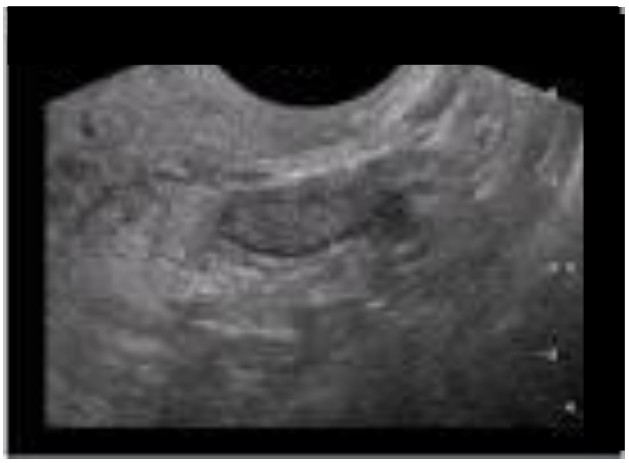
Age	Infertility	Period	Feature	Symptomatic	Risk	Factor	F_Lab	HSG	F_Altrasound	M_Lab	Monitoring1	Monitoring	Response	Complication	Complication1	Complication2	Complication3	Complication4

Appendices B

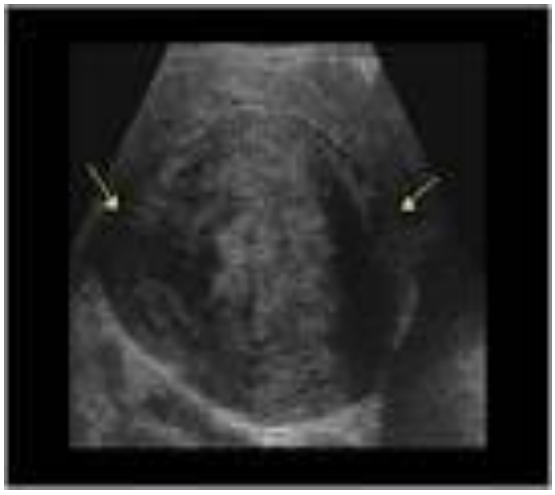
Images



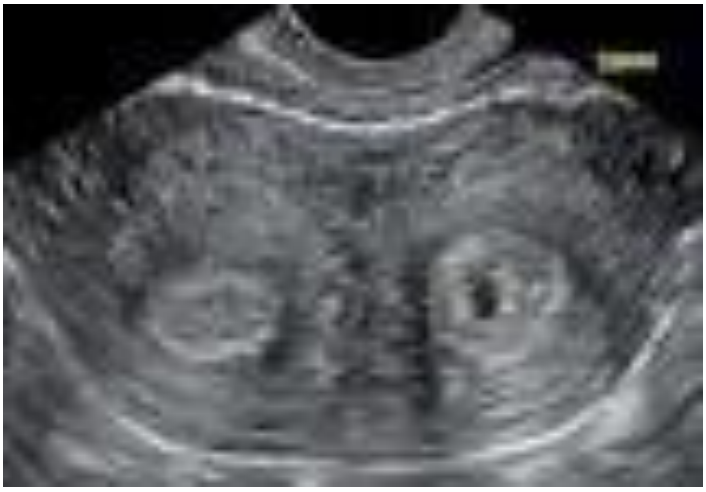
Polycystic ovary



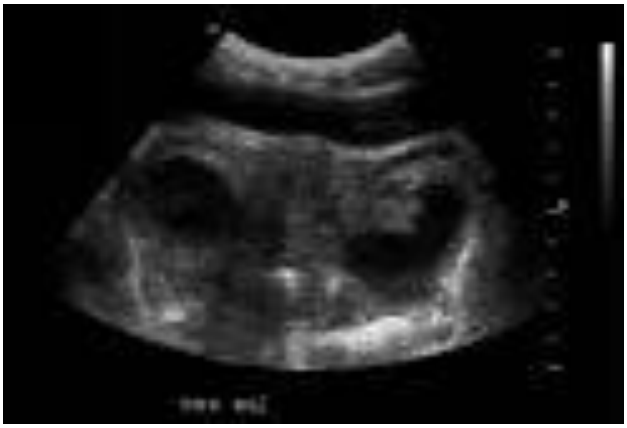
Ovarian failure



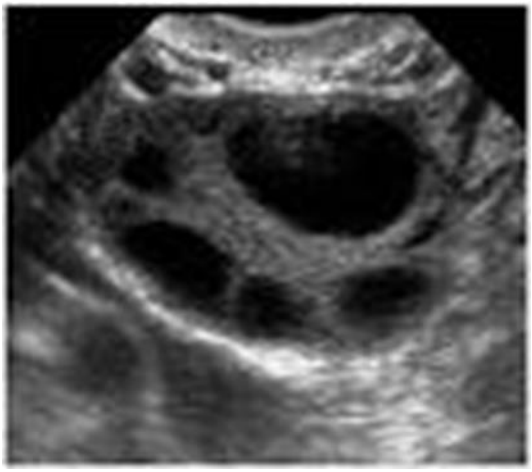
intramural fibroid



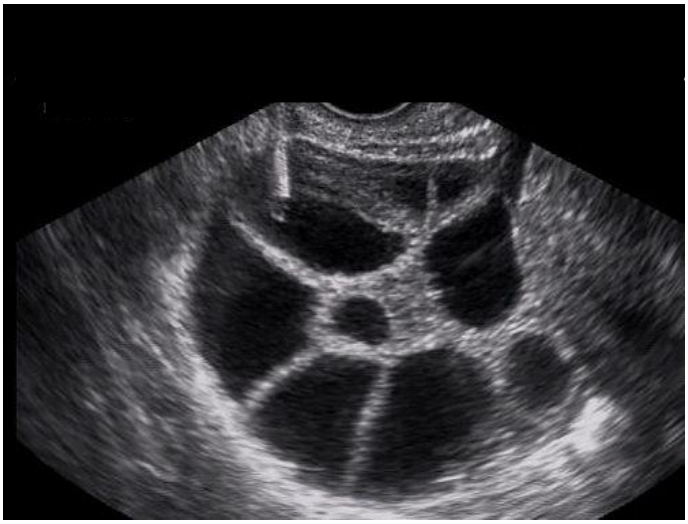
Bicornuat uterus



Pelvic inflammatory disease



multiple follicles



Ultrasound guided procedure oocyte collection the needle entering a large follicle