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CHOCOLATE CYST – A COMPLEX OVARIAN ENDOMETRIOMA

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ABSTRACT

Chocolate cyst, a complex ovarian cyst, resembles that of a chocolate coloured sac, grows on the outer surface of the ovary containing old menstrual fluid and affects women of reproductive ages. The cause of its formation is unknown but many hypothesises are proposed. Ultrasonography and laparoscopy are the two conventional methods of diagnosis but present day researchers concentrate on use of biomarkers. Based on diagnosis of endometrial patches, it can be staged I-IV. These are treatable with hormones, painkillers, laparoscopy, laparotomy and oopherectomy, but are incurable. As it affects women of reproductive age group, it causes hindrance in fertility and assisted reproductive methodologies are recommended. The most challenging property of chocolate cyst is its recurrence nature which makes it incurable to date and finding its solution is an area of interest of present day researchers and can fetch a hope for the affected individuals.

KEYWORDS: **Chocolate cyst, Ovarian cyst, Endometrioma, Laparotomy and Oopherectomy.**

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INTRODUCTION

In many women a gynaecological condition called endometriosis develop in which endometrium (the tissue lining the uterus) is found outside the uterus, sometime forming one or more cysts filled with blood. The old blood within these cysts gives it a chocolate appearance so called “Chocolate cyst”. Other names for chocolate cyst are “endometrial cyst”, “endometrioma cyst”, and “chocolate ovarian cyst”. It was first identified by Baron Carl von Rokitansky in 1860[1]. Cells from the endometrium slough off and migrate to pelvic structures, in this case, the ovary. These cells with each menstrual cycle proliferate and then shed as a bleed. There is no escape for this blood, so each month the cyst grows as it fills with the trapped blood. Chocolate cyst is typically diagnosed in 6-10% women of reproductive age who has infertility[2]. Till now there is no cure for endometriosis, but it can be treated in a variety of ways, including pain medication, hormonal treatments, and surgery[3].

DEVELOPMENT OF CHOCOLATE CYST

A women with endometriosis will have tissue from the inner surface of her uterus (endometrium) attached to the ovary. These patches of endometrial tissue may form small cysts that multiply into even more cysts when stimulated by menstrual hormones. As the cysts spread they can become part of the ovary itself, replacing the normal tissue needed for ovulation. Inflammation and irritation of nearby organs may result from chocolate cysts spreading around the pelvic cavity[4] (Figure 1). Millions of women are reported to be affected by endometriomas each year. Approximately five to ten percent of all women will have one at some point during their life, typically during their childbearing years[4]. Endometriosis can occur in either ovary, but more common in the left. One of the critical problems with chocolate cysts is that they tend to reccur. Usually, the size of an endometrioma ranges from about half an inch (grape size) to four inches or more (softball size) in diameter.

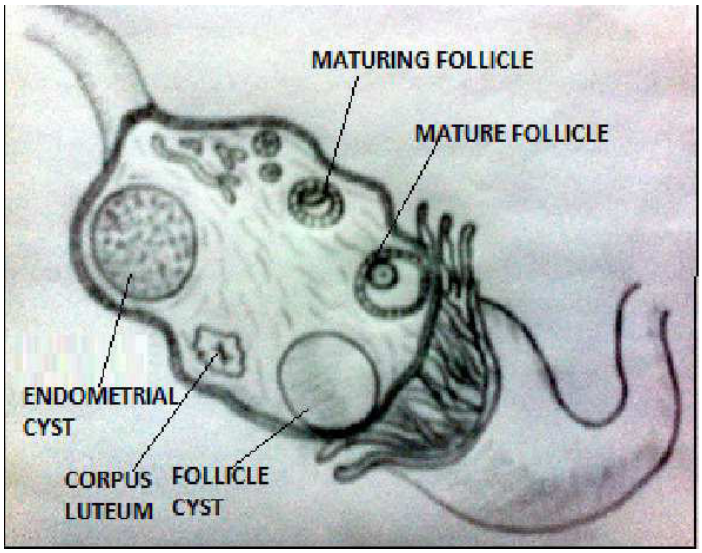

Figure 1
Schematic diagram showing the development of chocolate cyst or endometrial cyst in ovary.

EPIDEMOLOGY

- Chocolate cyst is affects 5-10% of women of reproductive age. But due to its diversified symptoms, severity and asymptomatic behaviour, it difficult to determine its prevalence[5].
- It’s prevalence in infertile women, was estimated to be between 25 and 40% [6].

- Commonly diagnosed in women in their 30s and less often under 20s [7].
- Traditionally, the diagnosis has not been commonly applied in adolescence but should be considered, as early recognition and treatment may be beneficial[8].

CAUSES

The exact cause is not known, but hypothesises proposed by gynaecologists are:

1. According to retrograde menstruation theory the blood flows backward instead of outward causing menstrual blood to go through the fallopian tubes to the pelvic and abdominal cavity, resulting in blood embedding on the outside of the ovaries, causing endometriomas[9].

2. Normally, the immune system will destroy endometrial cells which are located outside the uterus. If the immune system is weakened and not functioning normally, it will allow the endometrial tissues to attach and grow on the surface of the ovaries[9].

3. The adrenal glands produce cortisol during stress and emotion. Cortisol affects the body function of cleansing toxins which results in stimulating the growth of chocolate cyst or endometriomas[9].

4. According to the embryonic theory, during embryonic stage, some normal endometrial cells start developing in the ovaries instead of in the uterus[9].

5. During the reproductive years of women estrogen and progesterone are most active and chocolate cyst develops at this period of time. For a woman to conceive a hormonal balance of estrogen and progesterone is needed in each stage of the menstrual cycle. Any imbalance of hormones convert estrogen to bad estrogen and over-production of prostaglandins, leading the cervix to contract resulting in no escape of menstrual period, causing menstrual cramps and endometriomas. Nutritional deficiency can also be a cause of hormonal imbalance[9].

6. Chocolate cyst may be hereditary or it may be due to genetic errors, making some women more prone than others to develop the condition. Study shows that women are 6 times more susceptible to develop endometriomas if her sister has it[10]. So women are suggested to conceive in their early reproductive years.

7. Study suggests that individuals who are more exposed to toxins found in pesticides and some harmful waste products may have some hormonal and chemical influence, activating endomatriomas at the time of menstrual cycle, resulting in proliferation of endo-tissues to the ovaries[11].

8. Certain chemicals when interact with individuals body cause a disruption of the body's hormones resulting in over-production of estrogen converting to xenoestrogen to stimulate the growth of endometriomas[9].

9. Sexual intercourse during menstruation causes endometriosis tissue to travel into the fallopian tubes then into the ovary resulting in developing chocolate cyst [9].

SYMPTOMS

Patches of endometriosis can vary in size from the size of a pinhead to large clumps. In general, the bigger the chocolate cyst, the worse are the symptoms. However, majority are asymptomatic but few present with symptoms of varying severity which include: [12]

Pelvic pain

A major symptom of chocolate cyst is recurring pelvic pain. The pain can range from mild to severe cramping or stabbing pain that occurs on both sides of the pelvis, in the lower back and rectal area, and even down the legs[13]. Throbbing, gnawing, and dragging pain to the legs are reported more commonly by women with endometriosis[14]. The amount of pain a woman feels correlates poorly with the extent or stage (1 through 4) of endometriosis, with some women having little or no pain despite having extensive endometriosis or endometriosis with scarring, while other women may have severe pain even though they have only a few small areas of endometriosis[15]. Symptoms of endometriosis-related pain may include:

- **dysmenorrhea –** painful, sometimes disabling cramps during menses; pain may get worse over time (progressive pain), also lower back pains linked to the pelvis[12].

- **chronic pelvic pain –** typically accompanied by lower back pain or abdominal pain[14].
- **dyspareunia –** painful intercourse can produce pain in an ovary bound by endometrial implants or adhesion[9].
- **dysuria –** urinary urgency, frequency, and sometimes painful voiding[14].

Infertility

Many women with unexplained infertility may have endometriosis. As endometriosis can lead to anatomical distortions and adhesions (the fibrous bands that form between tissues and organs following recovery from an injury), the causality may be easy to understand; however, the link between infertility and endometriosis remains enigmatic when the extent of endometriosis is limited[16]. It has been suggested that endometriotic lesions release factors which are detrimental to gametes or embryos, or, alternatively, endometriosis may more likely develop in women who fail to conceive for other reasons and thus be a secondary phenomenon; for this reason it is preferable to speak of endometriosis-associated infertility[17].

Other

Other symptoms include constipation[18] and chronic fatigue[19]. Current research has demonstrated an association between endometriosis and certain types of cancers like, ovarian cancer, [20, 21] non-Hodgkin's lymphoma and brain cancer[22].

DIAGNOSIS

A health history and following examinations of patients lead the physician to suspect endometriosis or chocolate cyst.

Physical Examination

During normal pelvic examination, if the mass of chocolate cysts are large enough, they can be detected[9].

Ultrasonography

Two types of imaging are done which are as follows: [9]

(a) ultrasound - with a full bladder a high frequency waves will pass through the subject's abdominal region while a medical device move back and forth on the abdomen with a thin jellylike substance applied on the skin. Presence of chocolate cyst is captured in the image because of their darker shapes than other fluid filled cysts.

(b) Trans-vaginal ultrasound – In this case ultrasound is taken with a transducer inserted into the vagina. The trans-vagina ultrasound works well for measuring the thickness of the endometrosis, endometrial hyperplasia, cysts and cancer.

Laparoscopy

Endometriosis is usually confirmed by a laparoscopy. This is a small operation that involves making a small cut, under anaesthetic, in the abdominal wall below the umbilicus. A thin telescope-like instrument (a laparoscope) is pushed through the skin to look inside. Patches of chocolate cyst can be visualized by the doctors on the screen[23].

Use of markers

A small pilot research study published in 2009 showed that the diagnosis may be able to be confirmed by a new test. In the study, a small sample (biopsy) was taken from the inner lining of the womb (uterus) - the endometrium - of women with endometriosis. The sample was looked at in the laboratory for some specific 'markers' of endometriosis like c-fos gene and its protein expression. The results were that, in most cases, this new test was able to confirm the presence of endometriosis. So, if these results are confirmed by further studies, it may mean that in the future the diagnosis can be confirmed without the need for a laparoscopy (which involves a small operation)[7]. Another review in 2011 identified several putative biomarkers upon biopsy, including findings of small sensory nerve fibers or defectively expressed β3 integrin subunit[24].

The one biomarker that has been used in clinical practice over the last 20 years is CA-125[25]. However, its performance in diagnosing endometriosis sometimes fails to differentiate benign and malignant ovarian masses in premenopausal women because of the increased rate of false positives and reduced specificity. So an elevated CA-125 level is found in endometriosis. When levels

are elevated, serial monitoring can be helpful, as rapidly rising levels are more likely to be associated with malignancy than high levels which are static[26]. CA-125 levels appear to fall during endometriosis treatment, but have not shown a correlation with disease response.

STAGES OF CHOCOLATE CYST

On diagnosis of chocolate cyst it can be staged I–IV (Revised Classification of the American Society of Reproductive Medicine) [27]. A patient with Stage I endometriosis may have little disease and severe pain, while a patient with Stage IV endometriosis may have severe disease and no pain or vice versa. In principle the various stages show these findings:

Stage I (Minimal)

Findings restricted to only superficial lesions and possibly a few filmy adhesions.

Stage II (Mild)

Stage I plus some deep lesions are present in the cul-de-sac.

Stage III (Moderate)

Stage II plus presence of chocolate cyst on the ovary and more adhesions.

Stage IV (Severe)

Stage III plus large chocolate cyst, extensive adhesions.

TREATMENT

The main aims of treatment are to relieve symptoms such as pain and heavy periods, and to improve fertility if this is affected.

If chocolate cyst is left untreated, it becomes worse in about 4 out of 10 cases. It gets better without treatment in about 3 out of 10 cases. For the rest it stays about the same. Chocolate cyst is not a cancerous condition. Complications sometimes occur in women with severe untreated endometriosis. For example, large patches of endometriosis can sometimes cause a blockage (obstruction) of the bowel or of the tube from the kidney to the bladder (the ureter) [28].

There are various treatment options which are discussed below.

Hormonal medication

1. Progesterone or Progestins

They counteract estrogen and inhibit the growth of the endometrium. Such therapy can reduce or eliminate menstruation in a controlled and reversible fashion.

2. Products with Xenoestrogen

These were avoided as it increases endometrium wall.

3. Danazol

This works mainly by reducing the amount of gonadotrophins that is produced.

4. Hormone contraception therapy

Oral contraceptives reduce the menstrual pain associated with endometriosis[29]. They may function by reducing or eliminating menstrual flow and providing estrogen support. Typically, it is a long-term approach. Seasonale was approved to reduce periods to 4 per year. Continuous hormonal contraception consists of the use of combined oral contraceptive pills without the use of placebo pills which eliminates monthly bleeding episodes.

5. GnRH (gonadotrophin releasing hormone) analogues

These medicines block the pituitary from releasing gonadotrophins. This greatly reduces the amount of oestrogen that is produced in the ovaries. There are several GnRH analogue preparations which include buserelin, goserelin, nafarelin, leuprorelin, and triptorelin. Some preparations are taken as a nasal spray, some are given by injection[30]. A six-month course is usual. Lupron depo shot is a GnRH agonist used to lower the hormone levels in the woman's body to prevent or reduce growth of endometriosis. The injection is given in 2 different doses: 3-month-dose injections (11.25 mg); or a 6 month course of monthly injections, each with the dosage of 3.75 mg [31].

6. Aromatase inhibitors

These are medications that block the formation of estrogen and have become of interest for researchers who are treating endometriosis[32].

Side effects and risks

In general, taking the above medication may cause the side effects and risks like deep

vein thrombosis, stroke and heart attacks, weight gain, hormonal imbalance, suppression of menstruation, nausea, bloating, breast tenderness, male pattern hair growth and deepening of voice, indigestion, etc.

Painkillers

Paracetamol taken during menstruation periods is needed if symptoms are mild.

- Anti-inflammatory painkillers such as ibuprofen, diclofenac, naproxen, may be better than paracetamol.
- Codeine alone, or combined with paracetamol, is a more powerful painkiller. It may be an option if anti-inflammatories don't suit. Constipation is a common side-effect.

Other than paracetamols, NSAID, Opioids (Morphine sulphate tablets), Pentoxifylline, Angiogenesis inhibitors are prescribed.

Surgery

When fertility is a concern then

1. Laparoscopy

Most laparoscopies are completed in a hospital and usually performed under general anesthesia.

A laparoscopy is a medical instrument that is used by a doctor for viewing and removing tissues on the operation table. Through an incision at the abdominal wall, the thin instrument passes into the abdominal cavity. Laparoscopic hysterectomy is an operation that involve in removing the present of chocolate cyst during the course of the laparoscopy. Today, many physicians insert a slightly larger telescope through the umbilical port, which allows them to use a carbon dioxide laser to destroy the chocolate cyst[8]. Because the incisions are very small, there will only be small scars on the skin after the procedure, and all endometriosis can be removed, and patients recover from surgery quicker and have a lower risk of adhesions[33].

2. Laparotomy

Similar to laparoscopy, laparostomy is a surgery performed through a larger incision. Individual is required to stay 1 to 3 days in the hospital following the surgery. If exceedingly large ovarian cysts, ovarian cysts are found and suspicious for cancer.

Risks of this type of surgery

- Bleeding caused by medical instrument during operation.
- Injury to adjacent organs caused by medical instruments during surgery.
- Infection
- Anesthesia risk.

If the suspected individual is over 40 and fertility is not a concern then gynecologists recommend the removal of both ovaries by bilateral oophorectomy

1. Bilateral oophorectomy

Normally, it is done with a laparoscopic surgery. Laparoscope is a thin tube containing a tiny lens and light that inserts through a small incision in the navel with a camera on the other end that allows your doctor to see the abdominal cavity on a video monitor. Both ovaries are removed through a small incision at the top of the vagina.

2. Vertical incisions

Vertical incisions give the doctor better view of the abdominal cavity but it leaves some notable scar. If cancer is detected, a vertical abdominal incision is needed. After the incision the ovaries are removed.

3. Horizontal incision

If the ovaries are removed by horizontal incisions, it leaves a less notable scar.

Risk and side effects: [9]

- Heavy blood loss caused by medical instrument used during surgery.
- Heavy bleeding during or after operation
- Infection of the incision area may be caused by bacteria or medical instruments.
- Needed to stay in hospital for 2 - 5 days.
- Time to recover is longer. It may take 3 - 6 weeks to return to normal activity.

Not treating as an option

If symptoms are mild and fertility is not an issue then one may not want any treatment. In about 3 out of 10 cases, endometriosis clears and symptoms go without any treatment. One can always change your mind and opt for treatment if symptoms do not go, or become worse[29].

CHOCOLATE CYST AND FERTILITY

Some women with chocolate cyst can conceive naturally, but unfortunately for some, if the cyst grows large enough to block the extruding of egg into the fallopian tube. It is evidenced that chocolate cyst also affect the quality of egg and impair ovulation in some women[9].

Treatment with medication

In case of endometriosis interfere with production of the egg, fertility medication may be required for production of many eggs, resulting in increasing the chance of conception such as Clomiphene.

Treatment with artificial insemination

(a) In vitro fertilisation (IVF) - In IVF, sperm is introduced to the egg outside of women body, after fertilization, it will be implanted back to the woman's uterus[34].

(b) Intrauterine insemination (IUI) - IUI is a relatively simple infertility treatment. It places some selected sperms directly into the uterus[34].

(c) Gamet Intrafallopian transfer (GIFT) -If the chocolate cyst interferes with the function of the ovary, GIFT is helpful to assist reproductive treatment by placing the egg and sperm cells into one of the fallopian tubes[34].

(d) Intracytoplasmic sperm injection (ICSI) - For the same reason above, ICSI technologies inject one sperm cell directly into an egg, with a small, specialized needle[34].

RECURRENCE OF CHOCOLATE CYST AFTER LAPROSCOPIC ABLATION

Once the endometriosis has gone with treatment, it may recur again in the future. Further treatment may need to be considered if symptoms recur. A study to estimate the recurrence rate of chocolate cysts 3 to 12 months after ablative laparoscopic surgery was made with 73 consecutive women with chocolate cysts larger than 2 cm showed that laparoscopic cyst fenestration followed by capsule ablation is safe and effective treatment for preventing recurrence of chocolate cysts[35]. Another study has shown that endometriosis recurs at a rate of 20 to 40 percent within five years following conservative surgery[36], unless hysterectomy is performed or menopause reached. Monitoring of patients consists of periodic clinical examinations and sonography.

CONCLUSION

Chocolate cyst is better explained as a “complex ovarian cyst” as these endometriomas are treatable but incurable till date. Symptoms vary and worsen with time as the cyst increases every month fed by the old blood produced during menstrual bleeding which cannot escape. Even after surgery and proper medication there is a high possibility of recurrence of the chocolate cyst in the ovary. Moreover, women of reproductive ages are mostly affected by this syndrome and thus they are more liable to infertility. Individuals over 40 years (when fertility is not a concern) detected with chocolate cysts are recommended oophorectomy by doctors, which eradicate the chance of endometrial cancer in the long run, at the same time relieving individuals from pelvic pain. The recurrence nature of this syndrome makes it incurable. Finding solution to this challenging property of the syndrome is a good future line of work for the present day researchers. Moreover, if the proposed solution can be implemented in future, it will enhance the hope for better treatment of the affected individuals.

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