INTRODUCTION

Uterine anomalies were described in the 1800s by Cruveilhier and Von Rokitansky ***(Cruveilhier et al., 1978).*** It is unclear what the exact rate of müllerian abnormalities is in the general population, because no good cross-sectional studies of healthy patients have been performed. It is believed that the incidence is in the range of 1% to 6% ***(Troiano and McCarthy, 2004)***, with the reported prevalence ranges from 0.16% to 10%. These disorders are associated with various gestational complications, including spontaneous abortion, intrauterine growth restriction, abnormal fetal lie, preterm labor, and preterm birth ***(Deutch and Abuhamad, 2008)***. Women with recurrent pregnancy loss (RPL) appear to have a much higher incidence of anomalies relative to the general population.

A uterine septum is believed to develop as a result of failure of resorption of the tissue connecting the two paramesonephric (mullerian) ducts prior to the 20th embryonic week. The true prevalence of the uterine septum is difficult to calculate as many uterine septum defects are asymptomatic, but appear to range between 1 to 2 per 1,000 to as high as 15 per 1,000 ***(Valle and Ekpo, 2013).***

Septate uteri have a spectrum of configurations including incomplete/partial septate to complete septate uterus. A partial septate uterus refers to a single fundus and cervix with a uterine septum extending from the top of the endometrial cavity toward the cervix. The size and shape of the septum can vary by width, length, and vascularity.

Initially, uterine septa were believed to be predominately fibrous tissue. However, biopsy specimens and magnetic resonance imaging (MRI) suggest that septa are composed primarily of muscle fibers and less connective tissue ***(Pellerito et al., 1992; Dabirashrafi et al., 1995; Sparac et al., 2001; Gouhar and Siam, 2013).***

With the development of gynecological endoscopic technology, the diagnostic and treatment techniques of uterine septum are continuously being improved and perfected. Transcervical resection of the septum (TCRS), with advantages such as shorter operating time, less surgical trauma, and fewer complications, has become increasingly popular in clinical application.

The common methods of TCRS include electroresection, microscissors, and laser. Microscissors do not require cervical os dilation or cause thermal damage to surrounding tissues and organs, and they can reduce the electrosurgical risks and occurrence of water intoxication. However, their drawbacks include the impossibility of synchronized bleeding stop, a relatively long operating time and excessive equipment wear, and the requirement for regular replacement of the scissors. Laser surgery has a short operating time, a lower amount of bleeding, a good haemostatic effect, and no damage to surrounding organs, and it can be used in all types of uterine distention fluids. However, it still has some disadvantages-its high cost, high operation requirements, and increased risk of gas embolism caused by application of some gases.

Comparatively, the procedure of hysteroscopic electrosurgical excision of the uterine septum is more widely accepted and used among endoscopists. If the separation is too deep, damage may be caused to the uterine muscle wall, resulting in heavy bleeding or even uterine perforation, whereas if the separation is too shallow, residual septum may occur, affecting the surgical outcomes ***(Wang et al., 2013).***

AIM OF THE WORK

The aim of this study was the assessment of the histological features of the uterine septum as regard the proportion of muscle fibers in relation to fibrous tissue to decide the best management whether incision or excision.

Research hypothesis

In women with uterine septum, study of histologic features of the septum may help in selecting the best management whether incision or excision.

Research Question

In women with uterine septum, does the study of histologic features of the septum help in selecting the best treatment whether excision or incision?

HYSTEROSCOPE

Hysteroscopy is the process of viewing and operating in the uterine cavity through a transcervical approach. It is a minimally invasive intervention that can be used to diagnose and treat many intrauterine and endocervical problems. Diagnostic hysteroscopy provides information not obtained by blind endometrial sampling, such as detection of endometrial polyps, submucous leiomyomas or uterine septum ***(Trew, 2004).***

Parts of Hysteroscopy

The hysteroscope consist of 3 parts: the eye piece, the barrel, and the objective lens, the focal length and angle of the distal tip of the instrument are important for visualization. Angle options include 0°, 12°, 15°, 30° and 70°, A 0 hysteroscope provides apanoramic view, where as angled one might improve the view of the ostia in an abnormally shaped cavity ***(Petrozza and Attaman, 2010).***

Each hysteroscope is attached to an internal or external light source for illumination at the distal tip. Energy sources include tungsten, metal halide, and xenon. A xenon light source with a liquid cable is considered the superior option ***(Siristatidis et al., 2010).***

Types of hysteroscopy

The rigid hysteroscope

Rigid hysteroscopes are the most commonly used instruments. Their wide range of diameters allow for in-office and complex operating-room procedures. Of the narrow options (3-5mm in diameter), the 4 mm telescope (lens) offers the sharpest and clearest view. It accommodates surgical instruments but is small enough to require minimal cervical dilatation ***(Petrozza and Attaman, 2010).***

Operative hysteroscopes typically range from 8 mm to 10 mm in diameter and contain a working element. They require increased cervical dilatation for insertion. Therefore, they are most frequently used in the operating room with intravenous sedation or general anesthesia. An outer sheath fits over the telescope to introduce and remove distending media from the intrauterine cavity and to provide ports to accommodate large and varied surgical instruments ***(Bettocchi et al., 2003).***

The flexible hysteroscope

Flexible (fiberoptic) hysteroscopes range in diameter from 2.7mm to 5mm and have a bendable tip that can be deflected into two directions ranging from 120 degrees to 160 degrees. Most also contain an operating channel for tubal catheterization or endometrial biopsy. The flexible hysteroscope is most commonly used for office hysteroscopy.

Its most appropriate use is to accommodate the irregularly shaped uterus and to navigate around intrauterine lesions ***(Corfman, 1988).***

They generally do not require cervical dilation, and have a longer working length than rigid hysteroscopes. The smaller outer diameter compared to a rigid hysteroscope is advantageous in patients with nulliparity or prior cervical conization, and the longer working length is helpful in morbidly obese patients ***(Munro et al., 2015).***

However, use of flexible hysteroscopes is potentially hampered by higher costs for purchase and maintenance of the equipment; increased effort for cleaning, disinfection, and sterilization; a reduced image size in the monitor screen compared to panoramic full-size view with standard hysteroscopy; and greater fragility of the equipment ***(Cicinell et al., 2005).***

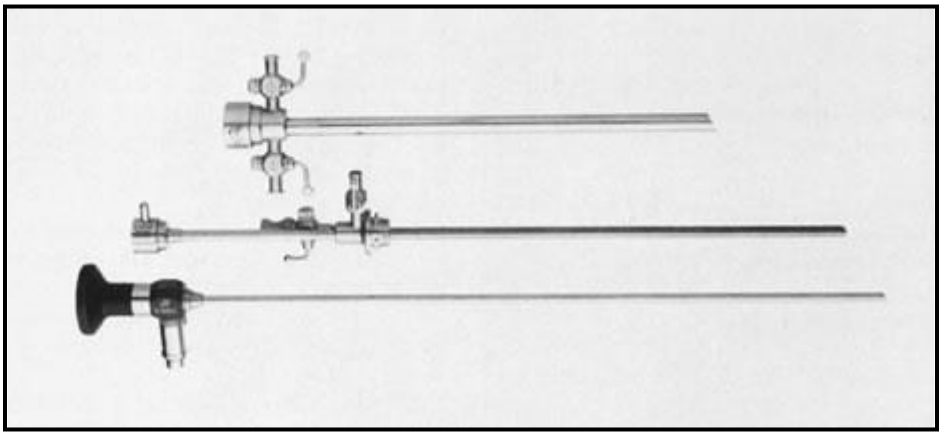

Figure (1): Parts of hysteroscope.

Special instruments

Light source

Each hysteroscope is attached to an internal or external light source for illumination at the distal tip. The cold light source means that light is away from the patient and is transmitted via optical cables, which avoids the dissipation of heat inside the uterine cavity. Energy sources include tungsten, metal-halide, and xenon. A low power source of about 150 watts is adequate for simple diagnostic hysteroscopy, but if a video camera is used, a higher intensity xenon or halogen light of at least 250 watts is essential ***(Trew, 2004).***

Energy sources and uses

Monopolar and bipolar electricity, as well as laser energy, all have uses in hysteroscopy.

a) Monopolar cautery

The resectoscope is a specialized instrument often used with a monopolar, double-armed electrode and a trigger device for use in hypotonic, nonconductive media, as glycine. It cuts and coagulates tissue by means of contact desiccation with resistive heating ***(Brill, 2000).***

The depth of the thermal damage is based upon several factors, endometrial thickness, speed, pressure, and duration of contact during motion and setting ***(Luciano, 1995).***

A thin electrode can cut tissue, where as one with a large surface area such as a ball or barrel, is best suited for coagulation ***(Indman, 2000).***

b) Bipolar Cautery:

The versa point system (Gynecare, Inc, Someville, NJ), uses bipolar circuitry for electrosurgury, which can be performed in isotonic conductive media, this system includes aspiring tip for haemostatic vaporization of large areas and a ball tip for precise vaporization and a twizzle tip for haemostatic resection and morcellation of tissue, there is also a cutting loop similar to traditional resectoscopy ***(Brill, 2000).***

c) Laser techniques

Several fiberoptic lasers are available for gynecologic use. The potassium-titanyl-phasphate (KTP) and argon lasers have different wave length, 0.532mm and 0.458-0.515mm (Respectively), but have very similar effects. Both are visible as green light and can pass through flexible fibers and fluids. They are absorbed by darkly pigmented tissue and penetrate to a 1 to 2 mm depth with minimal scatter. Both are effective in cutting tissue, but the argon laser has the unique effect of blowing smoke, odor, fluids, and blood out of the area of use, increasing its visual field of operation. The neodymium: yttrium-aluminum-garnet (Na: YAG) laser with a wave length of 1.064, also can pass through flexible fibers and fluid, it transmits easily through liquid media and not absorbed by water or clear tissue, but it penetrates deeply into tissue before being absorbed, scattering on contact, thus making it poor for cutting but useful in coagulation ***(Nappi et al., 2016).***

Distension media for optimal visualization

The use of media is critical for panoramic inspection of the uterine cavity. The medium opens the potential spaces of the otherwise uterine cavity. Intrauterine pressures needed to adequately view the endometrim are around 70-120 mmhg. The refractive index of each medium affects magnification and visualization of the endometrium ***(Umranikar et al., 2010).***

A variety of media have been used: fluids mainly electrolytes (normal saline, dextrose or lactated ringer) or non electrolytes (mannitol, sorbitol, dextran, and glycine) and gases such as carbon dioxide (CO2) ***(Cheong and Ledger, 2007).***

The choice of the type of the distention medium depends on the type of the procedure: fluids can be used for both diagnostic and operative procedures, but CO2 distension is only for diagnostic procedures ***(Cooper et al., 2011).***

a) Gases

Carbon dioxide (CO_2) is rapidly absorbed and easily cleared from the body by respiration. The refractory index of COa is 1.0, which allows for excellent clarity and widens the field of view at low magnification. The gas easily flows through narrow channels in small-diameter scopes, making it useful for office-based diagnostic hysteroscopy. However, this method offers no way to clear blood from the scope ***(Bakour et al., 2006).***

With CO_2, a hysteroscopic insufflator is required to regulate flow and limit maximal intrauterine pressure. A flow rate to 40-60 mL/min at a maximum pressure of 100 mm Hg is generally accepted as safe to decrease the risk of gas embolization and passage of gas into the peritoneal cavity, which can result in referred shoulder pain ***(Finkenzeller and Altman, 2010).***

b) Fluids

The advantage of fluid over gas is the symmetric distention of the uterus with fluid and its effective ability to flush blood, mucus, bubbles, and small tissue fragments out of the visual field.

Both low-viscosity and high-viscosity fluid media can be used for distention. A pressure of 75 mm Hg is usually adequate for uterine distention; rarely is more than 100 mm Hg required, and pressures higher than this can increase the risk of intravasation of medium ***(Paschopoulos et al., 2006).***

c) Sodium chloride 0.9% solution and lactated Ringer solution

Normal sodium chloride solution and lactated ringer solution are isotonic, conductive, low-viscosity fluids that can be used mainly for diagnostic hysteroscopy. Their excellent conductivity precludes procedures that use standard monopolar electrosurgery. However newer generation resectoscopes use bipolar energy, which allows an electrolyte medium to be used for hysteroscopic surgery. Using normal saline medium has advantages over hyponatraemic solutions (glycine, sorbitol) as it can avoid the risk of hyponatremia (eliminating the problem of the accumulation of the free water), but an excessive intravasation still remains a risk and might cause cardiac overload ***(Murakami et al., 2005).***

d) Mannitol 5%, sorbitol 3%, and glycine 1.5%

The hypotonic, nonconductive, low-viscosity fluids mannitol 5%, sorbitol 3%, and glycine 1.5% improve visualization when bleeding occurs. They can be used in diagnostic as well as operative hysteroscopy. All impose a risk of volume overload and hyponatremia from intravascular absorption (particularly >3L). Therefore, careful fluid monitoring is required during their use ***(Kaijser et al., 2007).***

When intravasation of mannitol 5% occurs, it stays in the extracellular compartment and treatment of this condition is discontinuing the procedure and administering diuretics. Sorbitol 3% is broken down into fructose and glucose and therefore has an added risk of hyperglycemia when absorbed in excess. Use 1.5% glycine with caution in patients with impaired hepatic function because glycine is metabolized to ammonia ***(Hahn, 2006).***

e) Dextran 70

The only high-viscosity medium available, Dextran 70 in 10% dextrose (Hyskon) is a non-electrolytic, non-conductive fluid that can be used in all types of procedures. It is immiscible with blood and minimally leaks through the cervix and tubes, allowing for excellent visibility during surgical procedures ***(Munro et al., 2015).***

Absorption of more than 500 mL may lead to fluid overload as with each 100 mL of Dextran 70 absorbed, the intravascular volume increases by 800 mL. Allergic reactions and anaphylaxis, fluid overload, disseminated intravascular coagulopathy are adverse effects of this medium ***(Hahn, 2006).***

Pressure control systems

i. Gravity fall system

Raising the bag to an adequate height (90-100 cm) above the patient perineum is sufficient to achieve pressure of 70 mm Hg.

ii. Pressure cuff

Similar to sphygrnomanometer raising the pressure always to 80 mm Hg as it drops as the bag empties.

iii. Electronic suction and irrigation pump

Automatically controlled suction and irrigation are very important to maintain a clear field of view. The following settings are generally used: flow rate 200mm Hg, outflow pressure 75 mmHg, and suction pressure of 0.25 bar ***(Palshetkar et al., 2012).***

Basic principles of diagnostic hysteroscopy

Preparation of the patient

Accurate bimanual examination to evaluate the position, morphology and volume of the uterus. Intramuscular or sublingual administration of atropine proves useful in preventing vagal reflexes ***(Bettocchi and Selvaggi, 1997).***

The patient is placed in the low dorso-lithotomy position with her legs placed to provide vaginal access. Cervix is thoroughly cleansed with cotton soaked in a non-foaming antiseptic or physiological solution with a cervical forceps applied on the front lip ***(Baggish, 1989).***

Technique of hysteroscopy

Before inserting the hysteroscope into the cervical canal, let the CO2 flow freely through the system, to eliminate air thus decreasing the incidence of gas embolism. Introduce the scope with a 30 degree angle downward into the cervix, in case of slight stenosis of the isthmus, atraumatic dilatation can be achieved with the uniform tip of the endoscope by resting it against the mucosa. After passing the isthmus, wait for a second to fully distend the uterine cavity then rotate the endoscope to fully visualize the uterine cavity and the uterine cornua ***(Palshetkar et al., 2012).***

Measurement of the endometrial thickness can be done by passing the hysteroscopic sheath against the endometrium to detect the thickness ***(Baggish, 1999).***

Office hysteroscopy

Office hysteroscopy is safe, rapid, well tolerated and highly accurate in the diagnosis of excessive uterine bleeding. It permits patients and physicians to discuss more treatment options before surgery including out patient operating hysteroscopic procedures. The most appropriate distention medium is CO_2. The flow rate should never exceed 100 ml/min and the intrauterine pressure should never exceed 150 mmHg. Usually no premedication analgesia or anesthesia is needed so the operation can be performed in the consulting room and on