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When Myoma Causes Infertility

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Abstract :

Myoma is a benign neoplasm originated from connective tissues of the uterine smooth muscle. Based on an autopsy, Novak revealed that 27% of 25 aged year women had myoma nests, with a higher prevalence in dark skinned subjects. Uterine myomas have never been reported before menarche, whereas only 10% cases of myomas still develop after menopause. Uterine myomas occur approximately in 20% - 30% of women. In Indonesia, uterine myomas constitute 2,39% - 11,7% of all hospitalized gynecology patients. This tumor is frequently found in subjects aged 35-45 years old (less than 25%) and is less frequently experianced by 20 year aged women and post menopausal women..

A widely excepted opinion indicated that 50% of women with fibroids are completely asymptomatic, where as 30% may present with menorrhagia, with the remaining 20% presented with symptoms caused by supressions, that complicate reproductive assesments. Whether a fibroid is symptomatic or not possibly depends on the size, amount and anatomical site. Sub mucosal myomas may cause menstrual disorders, such as menorrhagia and intermenstrual bleeding. Due to its nature that distorts the uterine cavity, myomas may cause infertility and/or misscariages.

Based on these statistics, the author further ellaborated the association between Myoma and infertility, specifically myoma as a causative factor. This paper emphasizes on the causative relationship myoma has with infertility, not on the various approaches availabe to treat such cases.

Keywords: Myoma, Infertility

Introduction

Myoma is a benign neoplasm originated from connective tissues of the uterine smooth muscle (Nassera, 2004; Hee, 2010; Saravelos, 2011). Based on an autopsy, Novak revealed that 27% of 25 aged year women had myoma nests, with a higher prevalence in dark skinned subjects. Uterine myomas have never been reported before menarche, whereas only 10% cases of myomas still develop after menopause. Uterine myomas occur approximately in 20% - 30% of women. In Indonesia, uterine myomas constitute 2,39% - 11,7% of all hospitalized gynecology patients. This tumor is frequently found in subjects aged 35-45 years old (less than 25%) and is less frequently experianced by 20 year aged women and post menopausal women..

Myoma is a monoclone with each tumor considered as a product of single cell replication. The etiology proposed include the development of uterine muscle cells or arteries, that originate from metaplastic connective tissue transformations, and from persistant residual embryonic cells. Although a current study has identified a small amount of genes within the connective that undergo mutations, this does not apply in normal myometrial cells. A study has revealed that 40% of subjects were observed with chromosomal abberations specifically at the t(12;14)(q15;q24) arm.

Several available evidence indicate an increase in progesterone receptors, epidermal growth factor and insulin-like growth factor 1 production stimulated by estrogen. Anderson et al has demonstrated that the emergence of estrogen stimulated gene are higher in cases of myoma compared to the normal myometrium and may play an important role in the development of a myoma.

Classification

Myomas can be classified based on the affected location and uterine layers.

1. Location
   - Cervical (2,6%), generally grow towards the vagina causing infections
   - Isthmica (7,2%), frequently cause pain and urinary tract disturbances
   - Corporal (9,1%), the most common affected location, and frequently asymptomatic.

2. Uterine layer

The uterine myoma located on the corpus region, is classified in to the 3 following types based on anatomical site.

- Sub mucosal uterine myoma

Sub mucosal uterine myomas are clinically more significant compared to the remaining types. Although sub serosal or intramural uterine myomas are enlarged, these types are frequently asymtomatic. Likewise although sub mucosal myomas are small sized, it is frequently characterized by vaginal bleeding. The bleeding is frequently difficult to stop, eventually resulting in a hysterectomy.

- Sub serosal uterine myomas. This type is located adjacently to the uterine corpus subserous layer, usually presented as a simple bump or as a single mass connected to the uterus with a rod. Growth may be laterally directed towards the latum ligament known as an intraligamenter myoma.
- Intramural uterine myomas

  Also known as intraepithelial myomas. This type is usually multiple, causing no effects on uterine shape when presented as a small group, but would result in an irreguler uterine shape if enlarged, consequently causing an increased uterine size and shape. This type is frequently asymptomatic except for minor signs that include mild lower abdominal discomfort. Occasionally they grow to form subserousal myomas and less frequently into sub mucosal myomas.

Symptoms

Due to the none interfering nature of this type, nearly half the cases of uterine myomas were discovered by coincidence during routine gynaecological examinations. Symptoms highly depend on the anatomical site of myomas (cervix, intramural, sub mucosal, subserousal), size, and coexisting changes and complications. The symptoms are usually presented as follows :

1. Abnormal bleeding, disorders that generally occur include hypermenorrhea, menorrhagia and occasionally metrorrhagia.
2. Pain

   Pain is not a typical symptom but may occur due to blood circulating disorders in the myoma nest, accompanied by local necrosis and inflammation. On extracting sub mucosal myomas, myoma growth would narrow the cervical canal causing dysmennorrhea
3. Symptoms and signs of supression

   These disorders depend on the size and location of the uterine myoma. Bladder suppression would cause polyuria; urethral suprresion would subsequently result in urinary retension, hydro urether, and hydronephrosis; rectal suppression may result in obstipation and tenesmus; whereas vascular and pelvic lymphatic supresion may cause limb edema and pelvic pain.
4. Infertility and abortion

   Infertility may accour as a result of myomas nest closure or intertitial tubal supression, whereas sub mucosal myomas may facilitate an abortion due to the presence of a distorted uterine cavity. Rubin 1958 states that if all other causes of infertility have been excluded leaving myoma as the single cause of infertility, then a myomectomy is indicated.

Diagnosis

1. History taking

   A history taking is conducted to detemine the chief complaint together with other clinical symptoms, risk factors, and other possible complications.
2. Physical examination.

   Local examinations are conducted by palpating the abdomen. The uterine myoma maybe predicted by an external physical examination presented as a solid tumor, irregularly shaped, highly mobile with no pain on examination.

   a. Transabdominal and transvaginal sonography is usually useful in determining the presence of a uterine myoma. Uterine myoma typically produce a sonographic enlargement image with irregular borders.
   b. Laparscopic examination, which are highly beneficial to diagnose a smile sized uterine myoma due to the direct acces it provides.
   c. Urography, usually performed in cases of sub serosal, intra ligamenter, and cervical myomas, is used to determine the ureter anatomical site if myoma supressions were to take place.
   d. Diagnostic histerescopy, that facilitate a direct visualization of the uterine cavity, is used to diagnose structural abnormalities. In cases of sub mucosal myoma, histerescopy is the best diagnosis method to use.

e. MRI (Magnestic Resonanse Imaging) is highly accurate in describing the amount and location of myomas, although it is rarely required. In an MRI, a myoma is visualized as a dark, well bordered mass clearly differentiable from the normal myometrium. MRI examinations maybe used as an alternative for ultrasonographic imaging in inconclusive cases.

The main issue associated with reproduction is whether myomas can cause infertility, misscarriages, late pregnancy complications, such as premature delivery, complications during delivery that include malpresentations, delivery, dysfunctional uterine contractions, post partum complications that include bleeding, sepsis and uterine involution failure.

A widely excepted opinion indicated that 50% of women with fibroids are completely asymptomatic, where as 30% may present with menorrhagia, with the remaining 20% presented with symptoms caused by supressions, that complicate reproductive assesments. Whether a fibroid is symptomatic or not possibly depends on the size, amount and anatomical site. Sub mucosal myomas may cause menstrual disorders, such as menorrhagia and intermenstrual bleeding. Due to its nature that distorts the uterine cavity, myomas may cause infertility and/or misscariages. The effects of intramural fibroids highly depend on the size, the more enlarged the fibroid becomes, the more symptoms it produces. Although the anatomical site is essential, a large myoma located in the lower uterine segment tends to complicate delivery.

Sub serosal myoma is the most least symptomatic myoma although it may cause pain due to a torsioned pedinculum (Palomba, 2007; Neelanjana, 2009; Pritt, 2009; Sotirios et al, 2011).

Whether or not myomas cause infertility is still debateble. Various studies state that 5-10% of infertile women are observed with myomas, however only 2% - 3% are considered to cause infertility. A study reported that the insidence of myomas in unexplained cases of infertility is approximately 1% - 2,4%. Theoretically myomas alter fertility through various mechanisms. Myomas may also affect gamet transportation by obstructing the tubal ostium. Uterine enlargement and uterine contour distortion may affect implantation, uterine contractility, and eventually interrupt sperm cell migration and ovum transportation that depend on the size, amount and location. Until now, no prospective studies are available to compare fertility rates in a healthy women with or without a fibroid, a study of which would be difficult to design. Most of the data presented here are obtained from an indirect visualization of fibroid effects on reproductive outcomes. The results were frequently conflicting. One study compared pregnancy rates in fertile women with fibroids to women without fibroids, after previoulsy excluding male and tubal factors, with a significant negative effect (fertility level of 11 % in women with myomacompared to 25 % in subject without a myoma). Uterine myomas affected 0.1-3.9% of pregnancies, with a number of complications presented during the antenatal and puerperium periode considered to be directly associated with the presence of a benign tumor (Naserra, 2004; Ardhana, 2008).

Pathophysiology: How Uterine Myomas Cause Infertility

Although several studies have assesed the correlation between uterine myomas and infertility, the mechanism in which uterine myomas adversely affect reproductive functions still remains unknown. However, several theories have been proposed, including the list within the table below.

Table 1. Postulated mechanisms by which fibroids cause subfertility (Pritt 2009)

Interference with normal patterns of endocrine function
Distortion of the endometrium
Dysfunctional uterine contractility
Anatomical distortion of the uterine cavity
Distortion or obstruction of tubal ostia
Abnormal uterine vascularization
Chronic endometrial inflammation

- A theory has stated that a myoma associated-hyperestrogenic enviroment may cause pathological changes, such as subfertility
- Endometrial cavity contour distortion. Endometrial space distortion may reduce the level of implantation, which in this matter, the myoma anatomical location is a determining factor. A Sub mucosal myoma, located

adjacent to the internal cervical ostium, may prevent sperm from migrating to the uterine cavity and ovarian duct.

- When located near the cornual edge, an intramural or sub mucosal myoma may block sperm cells from migrating into the ovarian duct. Apart from which, myomas are adjacently located to the uterine cornuate, may cause fallopian tube distortion, narrowing or kinking due to pressure, contributing to the occurence of tubal constriction in the presence or absence of hydrosalphynx. Due to the presence of an enlarged uterine space, the distance in which sperm cells must undergo also increases.
- Dysfunctional uterine contractility is considered responsible for any disturbances that occur during normal sperm cell, ovum and embryonal transportation, which eventually interferes with the fertilizing process.
- Several events in the endometrium that include endometrial atrophy, gland distortion, and endometrial vein dilation and ulceration are involved in a mechanism that causes implantation failure. Deligdish and Lowenthal in 1970 described a prolonged gland atrophy and distorted period in myoma's anatomical site. They also presented evidence of adenomyosis and endometrial basal shedding and muscle fiber separation obtained from a subject undergoing curettage. Environmental changes due to myoma-excreted-hormones within the uterine cavity is considered a determining cause of substantial myoma changes, eventually creating an inappropriate environment for the embryo. Vasoactive amino secretion, local inflammatory changes and endometrial androgen-excreted hormones, may occur together due to the presence of the uterine myoma, resulting in an interrupted implantation process.
- Abnormal uterine vascularization. Myomas may also cause infertility by interrupting the endometrial blood supply, consequently resulting in a negative impact on the normal implantation process.
- Chronic endometrial inflammation. All of the above eventually result in a local inflammatory process caused by sub mucosal fibroid ulcers responsible in transforming a normal biochemical endometrial environment. This process possibly occurs in order to establish an inappropriate environment for sperm cells, consequently reducing reproductive potency.

However, studies evaluating the impact of sub mucosal, intramural and sub serosal fibroids on infertility have produced conflicting results. Generally, sub mucosal fibroids, and into a lower extent, intramural fibroids, are predicted to negatively affect infertility, especially in terms of pregnancies and implantation, whereas sub serosal myomas are considered to have an insignificant effect, if not at all, on fertility.

Effects of uterine myomas, based on amount, site, and size on infertility

In 95% of cases with corpus localized myomas, several knots are usually present. Presence of a myoma is associated with fertility issues. Several studies have been conducted to determine the correlation between fibroids and infertility. Unfortunately, a definitive conclusion concerning this matter has yet to be determined. Also, the myoma's anatomical site is considered an important element to determine the degree of infertility. The following anatomical site represents the degree of infertility in a descending sequence: sub mucosal, intramural and sub serosal. The current available data concerning different impact caused by sub mucosal, intramural and sub serosal myomas on infertility seem to be somewhat confusing and could potentially raise scientific debates.

The latest medical opinion states that sub mucosal myoma may cause different degrees of infertility in each study that was conducted. For example, Richards et al stated that a local inflammatory process may cause ulcerations due to the presence of slime that could eventually alter intrauterine biochemical characteristics, producing an inappropriate environment for spermatozoas. In addition to this fact, sub mucosal fibroids may interrupt endometrial blood supply, consequently affecting the embryonal implantation process. In a controlled study, an evaluation was conducted to determine whether the myoma's anatomical site could affect a woman's reproductive function and whether extracting myomas prior to implantation could increase pregnancy rates and preserve the survival of an ongoing pregnancy. Most of the results obtained from this study indicates an increased degree of infertility after an intervention was applied.

Myomas are not a rare phenomenon observed in women with reproductive issues. Even though a substantial amount of evidence support the negative effect of sub mucosal myomas distorting the endometrial cavity of a conceptual product (Pritts et al, 2009), this does not apply to women with a diagnosed intramural myoma. Until now, the possible effect of myomas on the reproductive product is still debated. It is not surprising then if controversy emerges concerning whether or not an intramural fibroid extraction would be effective to increase reproductive function. Until now, 2 meta-analysis concerning intramural fibroids, state that this fibroid type may negatively affect pregnancies and cause miscarriages (Pritts et al, 2009).

Considering the cumulative effect of a fibroid, it is advisable to evaluate its impact on fertility based on the anatomical site. Previously presented preliminary data state that myomas are frequently located in the sub mucosal region. Also, previous several studies have stated that all women are observed with intracavity

distortion, whereas current studies have concluded that women with myomas are presented with an undistorted space. Women with a sub mucosal fibroid, compared to infertile women without fibroid, are presented with a significantly decreased pregnancy rate, implantation rate, and ongoing pregnancy/ live birth rate, with a significantly increased abortion rate. No significant difference was observed in cases of prematurity. Women without any cavity disturbances are usually presented with significantly decreased implantation levels and pregnancy survival / live birth rates with an increased spontaneous abortion rate compared to control subjects.

To conclude, sub mucosal myomas seem to reduce fertility rates, however the presented data above are also observed in an undistorted uterine cavity. It seems advisable to subsequently evaluate this condition due to its location that affect fertility rate.

No significant difference was observed for each myoma measurement after comparing a group of women with sub serosal myomas with women without myoma. On the contrary women with intra mural myomas are usually presented with a significantly lower pregnancy rate, implantation rate, and ongoing pregnancy rate/ life birth rate with a significantly higher spontaneous abortion rate. After conducting a limited analysis on this study, using a high quality method to access the uterine cavity space, only implantation rates prevailed statistical significance.

Several studies have compared results of in vitro fertilization (IBF) in women with and without myomas. Some of these studies have reported reduced pregnancy rates in patients with a distorted uterine space compared to subjects without distortion and myomas (9% vs.. 29, 1% vs.. 25, 1 %, respectively). Other studies have showed that sub mucosal and intramural myomas affect implantation and pregnancy rate compared to women without fibroids (pregnancy rate 10% vs. 16,4% vs. 30% respectively), where as sub serosal fibroids have no such effect on pregnancy (Pritts et al, 2009).

The following table describes the effects of myoma based on its anatomical site. (Casini et al, 2006)

Table 2. Effect of fibroid location and treatment on pregnancy rates (Casini et al, 2006).

Group	Treatment	No. of patients	No. of pregnancies	Pregnancy rate (%)	*p* Value
SM ($n=52$)	With surgery	30	13	43.3	<0.05
	Without surgery	22	6	27.2	
IM ($n=45$)	With surgery	23	13	56.5	NS
	Without surgery	22	9	40.9	
SS ($n=11$)	Without surgery	11	7	63.6	
IM-SS ($n=31$)	With surgery	17	6	35.3	NS
	Without surgery	14	3	21.4	
SM-IM ($n=42$)	With surgery	22	8	36.4	<0.05
	Without surgery	20	3	15.0	

SM, submucosal; IM, intramural; SS, subserosal; IM-SS, mixed intramural–subserosal; SM-IM, mixed submucosal–intramural; NS, not significant.

The table above describes that myoma anatomical site, significantly affects fertility states and pregnancy preservation rates, according to this following descending order: sub mucosal, intramural and sub serosal.

Another study also states the effects of myomas that include size and anatomical site on infertility, as described in the following table.

Table 3.Description of the fibroid group (Oliveira, 2004)

	No. of patients	Pregnancy rate No. (%)	Abortion rate No. (%)
No. of fibroids			
1	152	75 (49)	20 (27)
2	66	31 (47)	15 (48)
3	18	7 (39)	0 (0)
4	9	4 (44)	1 (25)
Type of fibroid			
Subserosal (SS)	82	41 (50)	15 (35)
Intramural (IM)	130	63 (48)	17 (28)
IM-SS	33	13 (40)	4 (31)
Location (IM)			
Fundal	110	53 (48)	15 (28)
Corpus	53	23 (43)	6 (26)
Size of IM fibroid (cm)			
0.4–2.0	64	34 (53)*	9 (26)
2.1–4.0	58	30 (51)*	7 (23)
4.1–6.9	41	12 (29)	5 (41)

Note: * $P=.025$ (χ^2 for trend). There was a significant linear trend among the ordered categories. All other % were not statistically different (χ^2 test, Fisher exact test).

Oliveira. Uterine fibroids and IVF-ICSI outcomes. Fertil Steril 2004.

Effect of operative measures on myoma on infertility

The definitive treatment in cases of myomas is to conduct a surgical procedure, but determining the time and method to treat myoma still remains debatable. The following diagram describes the steps in approaching cases of myoma.

Myoma extraction is considered a beneficial procedure, where subjects who have undergone myomectomy are expected to recover with a higher pregnancy rate and a lower pregnancy rate compare to subjects with an unextracted fibroid.

In patients with sub mucosal myomas, subjects who have undergone surgical procedures are presented with a higher pregnancy rate but with a statistically insignificant ongoing pregnancy rate/live birth rate. Spontaneous abortion rates showed no significant changes. In women with intramural myomas, no significant changes were observed. However, an important note must be taken to underline the fact that these variables have not been intensively studied.

In infertile subjects without fibroids, myomectomy is expected to normalize fertility level compared to the control group. This is reflected in women with sub mucosal myomas, observed from: pregnancy rates, ongoing pregnancy/live birth rates, spontaneous abortion rates. The statistical conclusion obtained was similar to this control group (Pritts et al, 2009).

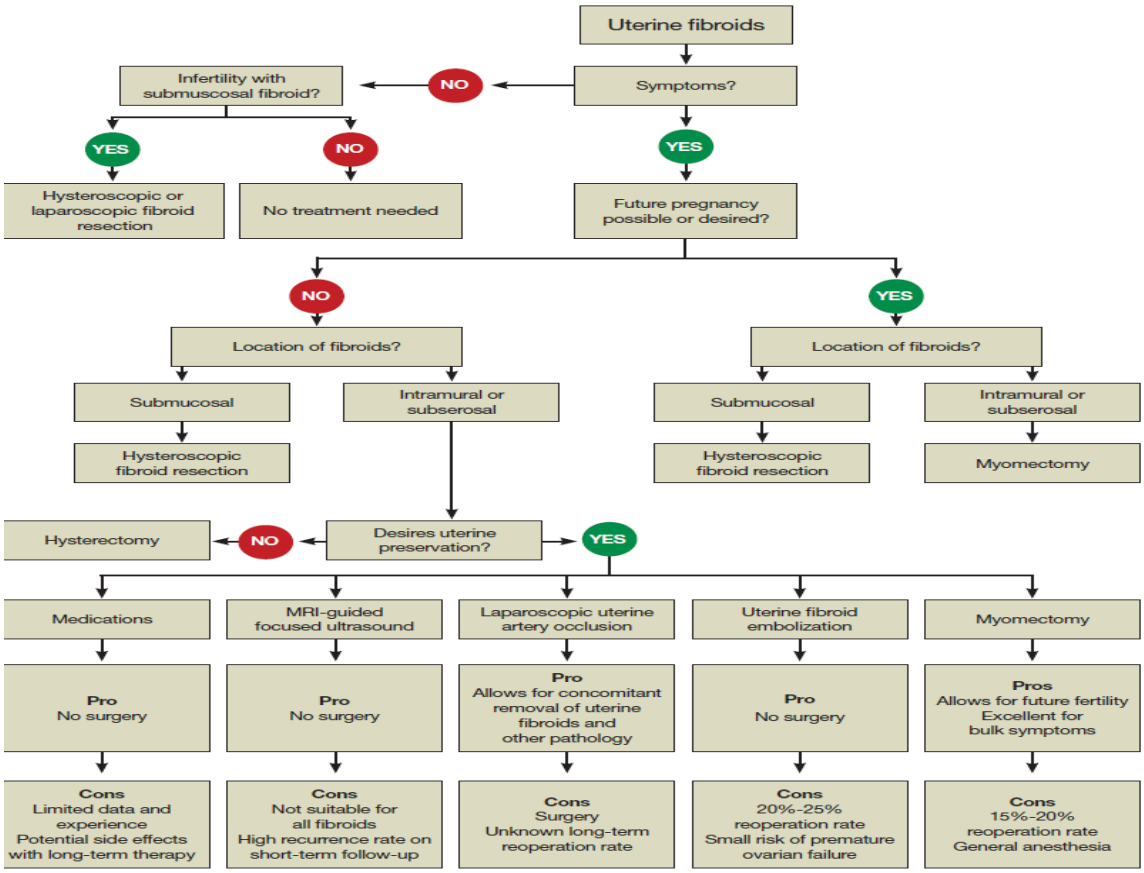

Figure 1. Diagram describing the steps in approaching cases of myoma. (Aradhana, 2008)

The effect of myomectomy in cases of sub mucosal fibroids on fertility is described in the following table. The data enlisted are statistically insignificant in terms of increased fertility rates.

Table 4. Sub mucosal fibroids: Effect of myomectomy on fertility. (Pritts, 2009)

Outcome	Number of studies/ substudies	Relative risk	95% confidence interval	Significance
A. Controls: fibroids in situ (no myomectomy)				
Clinical pregnancy rate	2	2.034	1.081–3.826	*P*=.028
Implantation rate	0	–	–	–
Ongoing pregnancy/live birth rate	1	2.654	0.920–7.658	Not significant
Spontaneous abortion rate	1	0.771	0.359–1.658	Not significant
Preterm delivery rate	0	–	–	–
B. Controls: infertile women with no fibroids				
Clinical pregnancy rate	2	1.545	0.998–2.391	Not significant
Implantation rate	2	1.116	0.906–1.373	Not significant
Ongoing pregnancy/live birth rate	3	1.128	0.959–1.326	Not significant
Spontaneous abortion rate	2	1.241	0.475–3.242	Not significant
Preterm delivery rate	0	–	–	–

Pritts. Fibroids and infertility. Fertil Steril 2009.

The effect of myomectomy in cases of intramural myomas on fertility is described in the following table. The data enlisted are statistically insignificant in terms of increased fertility rates.

Table 5. Intra mural fibroids (fibroids in situ controls): Effects of myomectomy on fertility (Pritts, 2009).

Outcome	Number of studies/ substudies	Relative risk	95% confidence interval	Significance
Clinical pregnancy rate	2	3.765	0.470–30.136	Not significant
Implantation rate	0	–	–	–
Ongoing pregnancy/live birth rate	1	1.671	0.750–3.723	Not significant
Spontaneous abortion rate	1	0.758	0.296–1.943	Not significant
Preterm delivery rate	0	–	–	–

Pritts. Fibroids and infertility. Fertil Steril 2009.

Subjects who have undergone myomectomy were observed with a higher pregnancy rate compared to untreated subjects (42% vs. 25%). (Bulletti et al 1999).

The following table is a recapitulation of studies that describes the effect of myomectomy on infertility in terms of reproductive outcome. (Neelanjana 2007, Aradhana & Mary 2008, Metwally et al 2010).

The role of laparotomy using myomectomy and laparoscopy using myomectomy in increasing fertility

Table 6. Impact of myomectomy, in case of infertility, on reproductive outcomes (Metwally et al, 2010).

Studies	Type of surgery	Number of women	Pregnancy rate		Miscarriage rate	
			Preop.	Postop.	Preop.	Postop.
Serracchioli (2006)	Laparoscopic	514	X	158	X	43
Marchionni (2004)	Abdominal	72	28	70	54	22
Seracchioli (2000)	Abdominal	65	X	55.9	X	12
	Laparoscopic	66	X	53.6	X	20
Campo (2003)	Abdominal	19	80	78.9	60	20
	Laparoscopic	22	50	63.6	63	7.1
Vercellini (1998)	Abdominal	138	10	87	88	13
*Buttram (1981)	Abdominal	76	X	54	41 (n = 1063)	19

X, No data available; *Review of three studies.

The table above describes post laparatomy myomectomy pregnancy rates reported in average 54% - 78.9% of cases with a 12% - 22% miscarriage rate. Based on several studies previously published, myomectomy is generally perceived as a method to increase conceptual products and pregnancy rates. Until now the most optimal results were obtained from young aged subjects with a single fibroid. Myomectomy using a laparotomy approach should be the main choice in cases of large sub serosal fibroids or multiple myomas (more than 5). A shorter period of infertility, possibly associated with a younger age in the absence of confounding factors of infertility, increases the chances of post operative success. Optimal timing in scheduling a surgical procedure is essential to provide opportunity for the patients to conceive one year post operatively. The procedure must follow the principals of a microsurgical procedure. Minimal vertical incision must be applied and posterior incision must be avoided if possible. This procedure would provide adequate information concerning intra cavity space and the possibilities of wound dehiscence in subsequent deliveries. Other obtained results that are considered more relevant than previous findings are sub mucosal fibroid detections and the presence of myomas suppressing the endometrial space.

Laparoscopy using myomectomy is one method in treating asymptomatic myomas that are associated with infertility. Results from a initial study published by Dubuisson & Faucooniere 2007 states that pregnancy rates improve after undergoing myomectomy procedures. Laparoscopy using myomectomy offers a shorter hospitalization period, an optimal recovery period, minimal adhesions, less post operative pain, decreased bleeding and minimal cosmetic damage compared to conventional approaches. However, it is clear that although performed by a trained gynecologist, patients must be strictly selected through a well conducted screening

procedure, based on the quantity, size and anatomical site of the myoma. One important matter that should be attended to is the post operative surgical scar and its impact on subsequent surgical deliveries.

Hurst et al in a review of laparoscopy using myomectomy concluded that this procedure is more acceptable compared to a more invasive approach, especially in subjects attempting a subsequent pregnancy. (Hurst et al 2005). Seracchioli et al studied 514 patients undergoing laparoscopy using myomectomy, 158 of which accomplished a successful pregnancy; 27.2% experienced spontaneous abortion with the remaining 2.6% found positive for an ectopic pregnancy. Twenty five percent of subjects underwent a vaginal delivery, whereas 74.5% underwent a cesarean section. No records of uterine rupture were stated in these studies. (Seracchioli et al, 2006)

Until now the available data have shown results of reproductive functions after undergoing myomectomy procedures using a laparoscopy or laparotomy approach. However, any type of myoma extracted using a laparoscopic approach is also extractable using a more invasive procedure, although this does not apply in the opposite direction. In cases of 2 or more myomas with the total size comparable to 12 weeks of a pregnant uterus, gynecologists are advised to perform a laparatomy, rather than a laparoscopy.

A randomized controlled trial (n = 109) on various surgical methods to perform myomectomy (abdominal vs. laparoscopic myomectomy) concluded no significant difference in pregnancy rates (55.9% with abdominal myomectomy vs. 53.6 % using laparoscopic myomectomy) or abortion rates (12% vs. 20%) in women with large myomas. A significantly higher post operative fever rate and a prolonged hospitalization period were found in subjects who previously underwent an abdominal myomectomy (Seracchioli et al, 2000).

In a study conducted in 91 infertile women treated with laparoscopic myomectomy, the two year post operative spontaneous intrauterine pregnancy events were observed in 44 % subjects. The percentage increases up to 70% in the absence of infertility factors associated with myoma and conversely decreases until 32 % in the presence of one or more factors associated with myomas. The obtained results showed that fertility rates increase in women in subjects who were previously treated using a laparotomy approach for infertility. Especially, if only patients without any associated infertility factors are considered, the observed conceptual rate differed slightly from the same rate observed in women treated with laparotomy. In a randomized clinical trial by seracchielli et al, patients with infertility or at least one myoma measuring more than 4 cm were observed with similar fertility rates between laparotomic and laparoscopic groups. The following table compares laparoscopic and laparotomic procedures and their affects on fertility on obstetric outcome.

Table 7. Laparoscopic versus abdominal myomectomy: outcome. (Seracchioli et al, 2000)

	Abdominal myomectomy	Laparoscopic myomectomy
Pregnancy rate (%)	55.9	53.6
Abortion rate (%)	12.1	20
Ongoing pregnancies	2	3
Ectopic pregnancies	0	1
Deliveries	27	20
Preterm deliveries (%)	7.4	5.0
Vaginal deliveries (%)	22.2	35.0
Caesarean sections (%)	77.8	65
Uterine rupture	0	0

Data from Seracchioli R, Rossi S, Govoni F, et al. Fertility and obstetric outcome after laparoscopic myomectomy of large myomata: a randomized comparison with abdominal myomectomy. Human Reprod 2000;15(12):2663–8.

Role of Myomectomy using Hysteroscopy in Increasing Fertility

Table 8. Sub mucosal fibroids: Reproductive outcome following myomectomy (Metwally et al 2010).

Study	Type	Fibroid	Number of women	Pregnancy rate (%)	Delivery rate (%)	Miscarriage rate (%)
Narayan (1994)	Hysteroscopy	SM	27	13/27 (48.2)	X	X/(23)
Bernard (2000)	Hysteroscopy	SM	31	11/31 (35.5)	9/13 (69.3)	3/13 (23)
Varasteh (1999)	Hysteroscopy	SM	36	19/36 (53)	13/36 (36)	(31.5)
Garcia and Tureck (1984)	Open	SM	15	8/15 (53)	7/15 (46)	1/16 (6)†
Vercellini (1999)	Hysteroscopy	SM	108	15/40 (38) 1 termination of pregnancy	14/40 (35)	1/15 (6)
Goldenberg (1995)	Hysteroscopy	SM	15	7/15 (47)	*6/15 (40)	X
Fernandez (2001)	Hysteroscopy	SM	59	16/59 (27)	6/59 (10)	X

*One ongoing pregnancy; †One woman conceived twice; X, No data available; SM, Submucosal fibroid.

Most cases of sub mucosal fibroids may easily be dissected by a transcervical hysteroscopy resection with relatively lower morbidity rates compared to other forms of myomectomy. Compared to laparotomy and myomectomy, hysteroscopic myomectomy is associated with a low risk of rupture during pregnancy and vaginal delivery. Pelvic adhesions, that usually occur after undergoing a conventional myomectomy, is usually preventable. In various studies, several authors have reported that sub mucosal myoma resections may cause and increase pregnancy rates.

In a study conducted on 134 infertile women undergoing hysteroscopy and myomectomy using lasers or scissors, Ubaldi et al reported a 58.9 % pregnancy rate. Unfortunately, no control group was included in this study. Even though, this study concluded that hysteroscopy and myomectomy is a safe and effective procedure in increasing fertility (Ubaldi et al, 1995). Ketsz et al reported increased pregnancy rates in women undergoing polypectomy and myomectomy using hysteroscopy during routine hysteroscopic examinations to assess intra uterine cavity as a parameter of infertility compared to infertile women with a normal intra uterine cavity (Ketsz et al, 1998). Bernard et al reported fertility and pregnancy outcome rates after undergoing hysteroscopy and myomectomy suitable to the characteristics observed from the association between sub mucosal myomas and intramural myomas. Higher pregnancy rates were observed in women with a single sub mucosal myoma resection compared to 2 subjects with 2 or more fibroids (P= 0.02). No significant difference was observed in pregnancy and births rates based on the size and anatomical site of the sub mucosal myoma involved. Likewise, patients with an absent associated intramural myoma were observed with a significantly higher birth rate ($P < 0.03$) and a significantly shorter delay in the fertilizing process ($P = 0.05$) compared to patients with sub mucosal and intramural myomas (3.1 months and 4.8 months respectively). This paper concluded that the apparent advantage of hysteroscopy and myomectomy include lower surgical risks, resulting in selecting sub mucosal myoma resection as a procedure that could enhance fertility in an infertile women (Bernard et al, 2000).

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