Contemporary Management of Fibroids

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Abstract

Introduction**: More women are delaying child-bearing such that gynaecolgists can no longer resort as frequently to definitive treatments, such as a hysterectomy, in the management of uterine fibroids. A review of newer conservative medical, radiological and surgical therapies and minimal access approaches to the organ-preserving myomectomy operation are discussed. **Materials and Methods**: Data from published literature describing newer modalities of treatment and reviewing updated information of the impact of fibroids and myomectomy on fertility potential were collated. **Results**: Medical treatments serve to retard the growth of fibroids temporarily and have short-term success in the amelioration of symptoms. Uterine artery embolisation is a novel non-surgical approach to debulking of uterine fibroids and the relieve of symptoms. Hysterectomy is a treatment choice that is curative. Laparoscopic hysterectomy carries a 3% risk of major complications compared to 1% via a laparotomy. Laparoscopic myomectomy is a viable alternative to open myomectomy but due diligence must be exercised in ensuring meticulous and secure myomectomy defect repair. The risk of uterine dehiscence has been reported to be about 0.5% which is comparable to that in traditional open myomectomy which has been somewhat understated. Hysteroscopic resection of submucous fibroids is very efficacious and preserves reproductive potential. This procedure and myomectomy of intramural fibroids associated with intracavitary distortion are clearly indicated as these types of fibroids have been implicated as a cause of infertility and pregnancy loss at least 2 to 3 times higher than controls. This relationship prevailed in patients undergoing assisted reproduction. **Conclusion**: The management of uterine fibroids has undergone a revolution in the past few decades with better understanding of its impact on fertility and technical advances in endoscopy and radiologic embolisation techniques and also pharmaceutical alternatives such as gonadotrophin-releasing hormone agonist and progesterone intrauterine contraceptive devices. Advances in molecular biology may provide an opportunity to manipulate receptors and cellular biology in order to arrest tumourigenesis altogether.

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Introduction

Fibroids are the most common, solid benign pelvic tumours occurring in about 30% of women beyond the age of 30.[1] They are asymptomatic in most women. When symptoms do occur, they range from excessive uterine bleeding, pelvic pressure and pain to urinary symptoms and, in some cases, recurrent pregnancy loss and infertility, especially when the fibroids are submucous or intramural and distorting the uterine cavity.[2]

The pathophysiology and pathogenesis of uterine fibroids remain unclear. It certainly involves steroid hormones (oestrogen and progesterone), peptide growth factors (epidermal growth factor), and the availability of an adequate blood supply.[3] The concentration of cytoplasmic oestrogen and progesterone receptors in fibroids has been shown to be significantly greater than that found in the myometrium[4] and explains the increased sensitivity of fibroids to exogenous and endogenous sex steroids. Interesting epidemiological associations include the high incidence amongst women of African origin[5] and also the protective effect of tobacco smoking.[6]

There are 2 main methods by which fibroids are managed surgically. Hysterectomy is the treatment of choice in women who have completed child-bearing, especially if the resultant menorrhagia is causing anaemia or the uterus is enlarged to beyond 12 weeks' size. However in recent times, patients have chosen the organ preserving, yet more complex alternative – myomectomy – involving the extirpation of the fibroids with preservation of the uterus even in instances where child-bearing has been completed. Non-surgical methods, such as the use of gonadotrophin-releasing analogues or uterine embolisation, have also come into vogue. Minimal access approaches have evolved with developments in endoscopic instrumentation and cameras which enable surgeons, with the appropriate skills, to perform laparoscopic myomectomy or

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myolysis and hysteroscopic fibroid resection.[3]

Medical Treatment of Fibroids

In the 1980s, with the introduction of newer pharmaceutical agents that can induce a hypoestrogenic state, such as gonadotrophin-releasing hormone agonists, medical management of uterine fibroids,either as primary treatment or preoperative adjunct, has evolved based on the fact that fibroid growth is oestrogen dependent.[4]

Prolonged administration of gonadotrophin-releasing hormone agonists inhibits the secretion of gonadotrophins and sex steroids by a process of pituitary desensitisation and down-regulation. This brings about a reversible suppression of gonadal activity[4] and decrease in the size of fibroids.

Use of these agents as a primary medical therapy for fibroids have yet not been shown to be successful in the long-term, especially in view of the potential for irreversible bone loss from demineralisation caused by the hypoestrogenic state induced by the gonadotrophin-releasing hormone agonist. In addition, cessation of therapy is often associated with prompt regrowth of both the fibroid and uterus to near its pretreatment size, with the majority of patients experiencing recurrence of symptoms.[7]

Palomba et al[8] showed that long-term (2 years) administration of an agonist (leuprolide acetate) with an "add-back" hormone replacement (tibolone) reduced hot flushes and prevented significant bone loss without changing the lipid profile. Statistically significant symptom relief and myoma size reduction occurred within 6 months and persisted through the therapy period without impact on the efficacy of agonist treatment from the "add-back" tibolone therapy. "Add-back" hormone replacement therapy helps to alleviate hypoestrogenic symptoms, minimises bone loss and enables longer-term use of the agonist.

Gonadotrophin-releasing hormone agonists can produce a shrinkage in volume of the fibroids by an average of 12.5 mL and the uterus by about 159 mL (greater in women with larger uteri) and reduction of uterine blood flow. These findings have led to the investigation of their role as a preoperative adjunct to surgery.[9]

Lethaby et al[9] carried out a systematic review of 21 studies using preoperative gonadotrophin-releasing hormone agonists and found convincing evidence of an increase in preoperative haemoglobin and haemotocrit of 1.3 g/dL and 3.1%, respectively. Although this might make it possible to carry out autologous blood transfusion in some cases, overall these increases, whilst positive, may not be of major clinical importance.

The review also showed the value of these agents in reducing intraoperative blood loss for both myomectomy and hysterectomy as evidenced by the marginal improvements in postoperative haematologic indices. However, the studies reviewed were of a small number of patients and no benefit in terms of reduced transfusion requirement had been demonstrated. A reduction of only about 5 minutes or <10% of the total operating time has been demonstrated in women undergoing hysterectomy. As for myomectomy in pretreated women, the common difficulty encountered by gynaecologists is that the fibroid capsule becomes less evident making it difficult to "shell out" the fibroid, resulting in a more difficult and less complete extirpation of the fibroids.[10] In addition, there is a higher recurrence rate post-myomectomy in treated (65%) compared to untreated (28%) women, presumably because the shrunken, smaller fibroids are not detected at the time of surgery.[11]

Whilst there is insufficient evidence to recommend the use of gonadotrophin-releasing hormone agonists in all women with uterine fibroids undergoing hysterectomy or myomectomy, they can be proposed for reversal of preoperative anaemia or where a transverse (Pfannenstiel-type) rather than a midline incision would be feasible because of the overall reduction in the size of the uterus. By the same token, some women would benefit from a less invasive vaginal rather than abdominal approach when undergoing a hysterectomy.[9] The same argument has been used to promote the minimal access approach, i.e., laparoscopic and laparoscopically-assisted mini-laparotomy or transvaginal methods in other studies.[11]

Is the use of gonadotrophin-releasing hormone agonist a cost-effective treatment? The answer to this question was addressed by Farquhar et al[11] in a complex analysis looking at the cost and inconvenience of 3 months of agonist treatment and the putative benefits in surgical outcome, symptom relief and side effects of agonist treatment. The paper concluded that the benefits from pre-surgical treatment (i.e., avoiding vertical incisions or abdominal approach) do not justify the cost. The reduction in surgical time (6 minutes) for a hysterectomy resulted only in marginal savings compared to the use of pretreatment with the agonist for 3 months. For a myomectomy, agonist pretreatment results in an increased risk of having a recurrence associated with an additional cost for subsequent treatment. Fibroid recurrence rates were less than a third in those without pretreatment compared to a recurrence rate of two-thirds in those who received treatment.

In this study, the net cost effectiveness of agonist treatment and benefits, such as reduction in pain scores after surgery and reduced hospital stay compared against the side effects of agonist treatment and additional visits the patient needs to undertake for the treatment, was evaluated to be unfavourable, i.e., the putative benefits of treatment did not

justify the cost. Furthermore, a willingness-to-pay response was studied to provide evidence on the value women place on various outcomes. Even under a more favourable scenario, where the actual costs were assumed to be 50% less and the effectiveness twice as great, the total cost of a vaginal approach or a transverse incision outstrips the monetary value placed on the outcome by women compared to an abdominal vertical incision.

Overall, the medical treatment of fibroids with agonist has many criticisms. Although there is no question that the drug can reduce uterine volumes by 30% to 45%, it follows, however, that a reduction of the fibroid diameter of only 7% to 15% is required to shrink the volume by 30% to 40% using the formula for volume of a sphere. Furthermore, normal myometrium contributes more to that shrinkage than the fibroid.[12]

Embolisation of Uterine Fibroids

The fluoroscopic, transcatheter occlusion of specific blood vessels, particularly arteries that supply an organ or tumour, in order to reduce its vascularity and secure complete haemostasis is not an entirely new concept. It has been successfully used by interventional radiologists to embolise the uterine arteries to arrest postpartum haemorrhage, operative haemorrhage, bleeding in trophoblastic disease and cancers and to occlude arteriovenous malformations. Ravina et al[13] reported the first use of uterine artery embolisation as a preoperative measure to decrease blood flow to the fibroids in order to lessen the blood loss during myomectomy. Since then, more than 5,000 procedures have been performed.[14]

Thus, although relatively new, transcatheter uterine artery embolisation is becoming popular because it is an alternative to surgery. Due to the tortuosity of the uterine artery, angiographic transcutaneous placement of the catheter, to discharge particles of polyvinyl alcohol (PVA) of 300 to 500 μm, is at a point past the major branches supplying other vital structures, i.e., the superior gluteal and aberrant branches feeding the ovaries. The particles are injected in boluses until blood flow in the vessels cease. The procedure is repeated by withdrawing the catheter from the uterine artery complex and passed over the aortic bifurcation into the opposite side.[14]

The efficacy of this procedure, in terms of fibroid size and uterine volume shrinkage, has been significant, varying from 40% to 69%.[14] If no shrinkage is seen, then adenomyosis or sarcomatous change must be investigated. There is a reported 80% improvement in menorrhagia and bulk-related symptoms.[14]

Although some procedures have been carried out in women of child-bearing age, it is best discouraged because the outcome of pregnancy following this procedure is as yet not established; in particular, its impact on fertility, fetal growth and uterine integrity.[14]

Complications of uterine artery embolisation include unsuccessful or unilateral cannulation with resultant poorer clinical benefit – vessel spasm with premature thrombosis and anatomical distortion being the usual reasons.[15] The impact of the radiation on the ovaries [the total dose of radiation is 5 to 10 times that of a pelvic computed tomography (CT) scan] is also of concern.[16] Vascular injuries, such as perforation or dissection of the uterine artery orifice, have been reported. Fibroid expulsions are common with submucous or pedunculated intracavitary fibroids – prior hysteroscopic resection can avert this complication.[15] Severe pain can arise from the ischaemia and can be minimised by using larger particles and potent analgesia.[15]

Amenorrhoea and ovarian compromise reported in 6 out of 81 patients[15] can be catastrophic, as is unintended hysterectomy from post-embolisation sepsis from necrosis of a large mass of tissue especially in women of child-bearing age.[14]

Thus, uterine artery embolisation, which promises high patient satisfaction, may be associated with serious complications that could result in a hysterectomy – a complication that may be higher than that following abdominal myomectomy.[16]

Cryomyolysis or Cryoablation of Myomata

This is a recent method of conservative therapy where, using magnetic resonance (MR) imaging guidance, transabdominal cryoprobes were placed into the fibroids. Initial data showed improvement of symptoms and an average 66% uterine volume reduction.[17] However, this treatment is too preliminary to be adopted as a standard therapy.

Surgical Management of Uterine Fibroids

Surgery has been the mainstay of treatment for symptomatic uterine fibroids, the definitive procedure being the hysterectomy. For women of child-bearing age, the conservative, organ-preserving myomectomy may be performed.

Hysterectomy

The most common major gynaecological procedure in the world is the hysterectomy, fibroids being the commonest indication.[18] Both the abdominal and vaginal approaches have prevailed for decades but a new method, the laparoscopic approach, first described in 1989,[19] has raised questions about the most suitable type of procedure. A fairly recent prospective observational study of more than 10,000 hysterectomies performed in Finland[20] showed that

the overall complication rate was 17.2% for abdominal, 23.3% for vaginal and 19% for the laparoscopic approach. Infection was the most common problem. In addition, a significant difference between the various routes was that, ureteric injury was more common in the laparoscopic than the vaginal route (incidence of ureteric injury for laparoscopic, abdominal, vaginal hysterectomy was 13.9, 0.4 and 0.2 per thousand, respectively).

Lumsden et al[21] carried out a randomised comparison between laparoscopic and abdominal hysterectomy which suggested that significant complications occurred in only 1% of the abdominal group, compared to 3% in the laparoscopic hysterectomy group. Minor complications occurred in 8% in laparoscopic and 14% in abdominal hysterectomy. However, as in other studies, complications were more likely when hysterectomy involved the removal of a fibroid uterus.

Nevertheless, hysterectomy is associated with high level of satisfaction, even when compared to endometrial ablation.[16] This is especially so when the presenting symptom is that of menorrhagia. Hence, alternative treatments must achieve the same rate of "cure" of symptoms as a hysterectomy. Gynaecologists should therefore counsel their patients carefully, especially when they request a myomectomy with its inherent problems of recurrence and the significant operative morbidity of secondary myomectomy even when child-bearing was not an issue.

The prevailing view amongst many gynaecolgists is that for women, who no longer need to retain the uterus for child-bearing, there should not be the need for an alternative to hysterectomy. However, this must be tempered by the preferences of women who, having completed their families, are psychologically unprepared to lose their uteri. The psychological effect on a woman's concept of her femininity and sexuality must be duly addressed along with a meticulous discussion of the morbidity of a myomectomy in comparison to a hysterectomy. Herein lies the dilemma, faced by patients and their gynaecologists, as to the best way to alleviate symptoms troubling them, without replacing them by concerns and difficulties relating to womanhood and sexuality. The debate still prevails regarding the place of subtotal and total hysterectomy if one believes that the cervix and its preservation are important in sexual function. The subtotal hysterectomy has had a "rebirth" with the advent of the laparoscopic approach, with the putative benefits being preservation of sexual function and the decreased risk of ureteric and bladder injury.[20]

Myomectomy

Myomectomy is the appropriate operation for women who plan to have pregnancies or for those who want to retain their uterus for other reasons. As such, any decision to perform this procedure must be evaluated with the following issues in mind.

(i) Should the fibroids be removed at all?
(ii) Are there less invasive alternatives?
(iii) What is the impact of myomectomy on fertility, especially in view of the fact that it is a very adhesiogenic procedure?
(iv) Is there therefore any benefit in the extirpation of myomata in improving the potential for conception?
(v) How often would there be a need for additional procedures, i.e., a secondary myomectomy with increased operative morbidity and unfavourable impact on overall fertility or subsequent hysterectomy?
(vi) The concern over the integrity of repair of the uterine myomectomy defect, especially with the advent of the laparoscopic approach and the reports of uterine dehiscence during pregnancy after laparoscopic myomectomy resulting in catastrophic fetal sequelae.
(vii) Decisions relating to the best approach with respect to expeditious and safe surgery.

Myomectomy as a surgical procedure is not new. Washington Atlee described the abdominal removal of a pedunculated subserous fibroid in 1844, at a time when surgery generally involved the ligature, transection and exteriorisation of pedicles.[22] As to the modern operation of myomectomy, characterised by enucleation of these tumours embedded in the uterine wall, this was first described by William Alexander in 1893 but the procedure was plagued by problems of haemorrhage and sepsis. It regained popularity only after being championed during the 1920s by Bonney[23] in England and Kelly, Noble, Mayo and Rubin in the United States.[22]

The classic description of the myomectomy operation that has stood the test of time to this day is that by Victor Bonney published in 1946.[24] Having reported nearly 800 cases, Bonney had high regard for reconstructive surgery, preserving the reproductive function of young women, desirous of future child-bearing and with large uterine fibroids, rather than having to succumb to the more radical hysterectomy.[24]

Changes in societal norms have seen an increasing need to conserve the uterus and reproductive potential in women who have delayed child-bearing, resulting in an increased prevalence of gynaecological conditions, such as uterine fibroids, endometriosis and ovarian disorders. Hence, the present day gynaecologist is faced with frequent instances when, women with uterine fibroids present with or without symptoms, and the dilemma of whether treatment, if at all, should be offered.

Myomectomy as a surgical technique had remained relatively unchanged for many decades until recently. The advent of preoperative preparations, such as gonadotrophin-

TABLE I: UTERINE RUPTURE AFTER LAPAROSCOPIC MYOMECTOMY

Study	Location of fibroid	Size of fibroid (cm)	Defect sutured	Cavity entered	Pregnancy duration (weeks)
Friedmann et al[35]	Intramural	5	Not stated	Yes	28
Mecke et al[34]	Intramural	Not stated	Not stated	Yes	30
Dubuisson et al[32]	Intramural	3	Yes	No	32
Harris[31]	Not stated	3	Yes	Not stated	34
Pelosi and Pelosi[33]	Subserous	5	No	No	33

* all cases occurred before onset of labour
* all cases resulted in live births except [33] which resulted in a still birth

releasing hormone agonist and uterine artery embolisation, had modified the technique as discussed before. However, more revolutionary was the introduction of the minimal access laparoscopic approach, made possible by advances in laparoscopic instrumentation and minutiarisation of the charged-coupler device, single-chip and now three-chip, cameras providing high-resolution images.

The laparoscopic approach lends the myomectomy operation the advantages of small minimal access incisions, reducing the need for analgesia, increasing post-surgical comfort and shortened hospitalisation. It also enables the gynaecological surgeon to survey the entire abdomen for concomitant pathology. The potential for reduction of *de novo* adhesion formation[25] has been considered an advantage of laparoscopic surgery. However, poor tissue handling and haemostasis due to inadequacies in skill and instrumentation or poor case selection can quite easily translate this advantage to a major handicap.[22]

Yet another disadvantage of the wholly laparoscopic approach is the laborious and time-consuming process of tissue extirpation of multiple, large fibroids. Hence, it is generally recommended that the situation best suited for a laparoscopic myomectomy is one where there is 1 large (up to 8 cm) fibroid or no more than 4 fibroids. When the surgeons are sufficiently experienced technically and select appropriate cases, this technique does not involve a greater risk of perioperative complications.[26]

In order to attain a sound knowledge of the various surgical techniques of myomectomy, the reader is referred to descriptions of the open myomectomy by Buttram et al;[27] laparoscopic myomectomy by Miller et al;[28] and to overcome some of the above-mentioned problems of the totally laparoscopic approach, the laparoscopically-assisted mini-laparotomy technique of Nezhat et al;[29] Tulandi et al;[30] and the laparovaginal approach of Nair.[22]

Debates and Controversies

Obstetric Quality of Laparoscopic Myomectomy Scars

At a glance (Table I), it might appear that because at least 5 instances of uterine rupture during pregnancy have been reported[31-35] in the short period that laparoscopic myomectomy had been performed, it is at present a procedure that leaves behind insecure uterine scars.

Dubuisson[26] contends that the risk of rupture after laparoscopic myomectomy is probably small. The cases reported in Table I were done in isolation, without indication of the number of pregnancies occurring after the laparoscopic myomectomy. Furthermore, as is the case for any new technique, ruptures occurring after laparoscopic myomectomy may have been reported compared to those occurring after an "open" myomectomy or a Caesarean section.[26]

The incidence of uterine rupture in a reputable institution, known for its surgeons' skill in laparoscopic surgery, was reported as 1% (95% CI 0-5.5) amongst 100 deliveries.[32] Dubuisson[26] reported that data on pregnancies after laparoscopic myomectomy in 8 other teams[28,36-43] did not show any uterine rupture (Table II). Hence, if all the studies are considered, it appears that laparoscopic myomectomy is associated with an overall rate of 0.5% of uterine rupture (Table II).

Although many old and more recent studies have attested to the good reputation of myomectomy via a laparotomy,[44,45] some of the largest series are outdated and the rate of cases lost to follow-up is not specified. Uterine ruptures after myomectomy via a laparotomy is, however, not unheard of and these have been reported regularly in the literature.[46-49]

TABLE II: OBSTETRIC OUTCOME AFTER LAPAROSCOPIC MYOMECTOMY

Study	No. of pregnancies	No. of deliveries	No. of ruptures (%)
Hasson et al[37]	15	11	-
Reich et al[38]	14	11	-
Darai et al[39]	19	11	-
Miller et al[28]	30	26	-
Stringer and Strassner[40]	5	3	-
Seinera et al[41]	5	5	-
Nezhat et al[42]	42	30	-
Ribeiro et al[43]	18	14	-
Dubuisson et al[36]	145	100	1 (1)
Total	293	211	1 (0.5)

A retrospective study of patients in a large maternity hospital showed a rate of rupture, observed during labour after myomectomy, as being 4.4%![50] However, the only definitive way to answer the question as to whether laparoscopic myomectomy when performed by experienced surgeons, adhering to the above-mentioned principles, can ensure a safe obstetric outcome, is to perform a large comparative trial.

Recurrence after Laparoscopic Myomectomy

Pretreatment with gonadotrophin-releasing hormones agonists can shrink fibroids to a size that escapes detection during myomectomy. The problem is further compounded by the inability to palpate the myometrium thoroughly during laparoscopic myomectomy, resulting in a cumulative recurrence rate of about 51% at 5 years,[51] higher than that observed in a laparotomy (20%).[52]

Post-myomectomy Adhesions: Laparoscopic versus Laparotomy

Bulletti et al[53] demonstrated that laparoscopy as an approach to myomectomy was associated with a lower degree of postoperative adhesions, both in extent in a patient and in the proportion of patients with adhesions. This study were controlled for size, location and type of fibroids.

When there has been systematic, second-look laparoscopic documentation of adhesions post-myomectomy via the laparoscopic and laparotomy approach, once again laparoscopy (51.1%) was associated with lower adhesions compared to laparotomy (89.6%). Nevertheless, although the differences could be influenced by factors such as size and number of fibroids, it is very likely that, laparoscopy, which respects the principles of microsurgery and has been shown in other types of surgery to reduce postoperative adhesions, affords this same very crucial benefit to myomectomy, particularly important in women who need to preserve their reproductive potential.[26]

Aside from surgical measures, adhesion barriers have been used to prevent postoperative adhesions. These include Interceed, Intergel, Preclude membrane and Seprafilm which have been shown to reduce adhesion scores, but have not been proven to, consistently and uniformly, prevent postoperative adhesion formation.[54]

Fibroids and Infertility: Recent Reviews

The impact of uterine fibroids on fertility remains questionable. However, when fibroids are distorting the cavity or are endocavitary, there is sufficient evidence to suggest impairment of implantation rates and pregnancy rates. Pritts,[55] in a systematic review of 11 studies, showed that women with submucous fibroids had lower pregnancy and implantation rates (Table III) than infertile controls. However, the subgroup analysis of the data failed to show any effect on fertility of fibroids that did not have a submucous component.

If all fibroid locations were considered together, then the impact of myomectomy was inconclusive. When women with submucous fibroids were considered separately, the pregnancy rates after myomectomy compared with infertile controls was increased (RR 1.72; 95% CI, 1.13-2.58) and delivery rates post-myomectomy became equivalent to infertile women without fibroids (RR 0.98; 95% CI, 0.45-2.41). Therefore, Pritts' evaluation of the data suggested that only those fibroids with a submucosal or an intracavitary component were associated with decreased reproductive outcome, and that hysteroscopic myomectomy is of distinct benefit.

Hysteroscopic myomectomy is indeed a major advance made possible by technology borrowed from

TABLE III: EFFECTS OF FIBROIDS ON FERTILITY AND PREGNANCY OUTCOME*

Fibroid location	Pregnancy RR (95% CI)	Implantation RR (95% CI)	Delivery RR (95% CI)
Subserosal; intramural and/or submucosa	1.02 (0.89-1.17)	0.75 (0.63-0.89)	0.83 (0.68-1.01)
Subserosal; intramural or both, no intracavitary component	0.96 (0.82-1.12)	0.86 (0.73-1.02)	0.98 (0.80-1.19)
Only subserosal	1.11 (0.60-1.72)	-	1.09 (0.58-1.86)
Only intramural	0.94 (0.73-1.2)	0.81 (0.60-1.09)	1.01 (0.73-1.34)
Submucosal and abnormal endometrial cavity	0.32 (0.13-0.7)	0.28 (0.10-0.72)	-

RR: relative risk; CI: confidence interval

* A systematic literature review, comparing infertile women with and without fibroids by Pritts EA[55]

For fibroids without submucous component, subgroup analysis showed no effect on fertility; if it is present, there is a significant fall in pregnancy and implantation rates.

transurethral electrosurgical loop resection of the prostate, which has a more than 30-year history. It is not only excellent in correction of menorrhagia which is a frequent presentation in women with submucous fibroids, but it is also organ-preserving in that the fibroid can be extirpated transcervically via operative hysteroscopy. A review of 7 studies on the outcome of hysteroscopic myomectomy showed that, a conception rate of 55% and a live birth rate of 80%, similar to those of myomectomy via laparotomy, are attainable.[56]

When fertility is not an issue, the use of the intrauterine levonorgestral contraceptive device has shown a reduction in menstrual blood loss and also a reduction in the size of the fibroids.[57] However, these studies involved small numbers of patients with short follow-up duration. Nevertheless, the levonorgestral intrauterine contraceptive device (Mirena) appears to be promising in the non-invasive, non-surgical treatment of menorrhagia from uterine fibroids.[58]

With regards to the impact of fibroids in infertility, uncertainty is greater in the case of asymptomatic women with mostly intramural and subserous fibroids and otherwise unexplained infertility. The data available in this area are largely that on assisted conception and in-vitro fertilization. There have been 2 retrospective cohort studies[59,60] and 1 retrospective matched-pairs study[61] that examined the impact of fibroids between women with and without fibroids (controls).

The pregnancy rate per embryo transfer for women with submucous, intramural and subserosal fibroids were 9%, 16% and 37%, respectively, compared to a 30% rate in controls. Again, the miscarriage rates showed a similar picture: submucous (40%); intramural (33%); subserosal (33%) and controls (16.4%), indicating that women with submucous and possibly intramural fibroids should have them removed prior to assisted conception. However, subserous fibroids are not likely to cause problems and hence the patient can be spared a myomectomy. There is a paucity of data on the impact of size and number of fibroids. However, Li and Bajekal[56] suggested that, if there is a significant reproductive history of recurrent miscarriages and fibroids in excess of 5 cm, then myomectomy might need to be considered.

To study the impact of abdominal myomectomy on infertility, Vercellini[62] reviewed 27 trials in the English literature. It appears that the efficacy of myomectomy in women with otherwise unexplained infertility was reasonably good with two-thirds of women becoming pregnant within a year of surgery. This is higher than in couples with no demonstrable cause of infertility followed without treatment.

The presence of additional infertility factors reduced the pregnancy rate to approximately 20%. With regards to time taken from surgery to conception, survival analysis of 3 studies in this survey[62] showed cumulative pregnancy rates of 57% to 67% at 1 year and 63% at 5 years. The recurrence rate of fibroids was between 4% and 47%, with a re-intervention rate for recurrent fibroids between 0 and 14%.

It was unclear, in this analysis, if the number, diameter and location of removed fibroids had a role in influencing the postoperative pregnancy rate. Nevertheless, to draw definitive conclusions on the effectiveness of this time-honoured conservative surgical procedure, a prospective, randomised, matched-pairs comparison with expectant therapy is required.

Conclusion

In the contemporary management of fibroids, the gynaecologist of today is presented with a wide array of treatment modalities. What he can offer his patients depends largely on the setting of the practice, the skills of the gynaecologist and the cultural preferences of the patients.

In deliberating whether a treatment should be offered as opposed to expectant therapy, a thorough knowledge of the nature and efficacy of each therapy followed by a discussion of these options with the patient is mandatory

It is tempting to embrace novel and fashionable therapies, e.g., laparoscopic myomectomy, without appropriately appreciating its cost-effectiveness, clinical efficacy and long-term effects. Minimal access must not be misconstrued to mean minimally invasive as the surgical intervention can be fraught with irreversible impact on the health and fertility potential of the patient and complications that could have been averted if more traditional therapies were offered. Indications for surgery may get modified from the belief that surgery would be a less daunting experience because of small incisions. However, we must remember that the strategy for surgery should always be for the potential benefits of alleviation of symptoms, preservation and enhancement of fertility compared against risks of adhesions, synechiae, integrity of uterine scars and obstetric outcome and also the dangers of iatrogenic hysterectomy. The dictum we must all remember is, "primum, non nocere" – first, do no harm.

Research into the pathogenesis of fibroids and its growth would hopefully provide us with more efficacious, cost-effective and non-invasive methods in the management of fibroids. Molecular biology, gene and stem cell research and manipulation of receptors and cellular physiology might eventually help arrest tumourigenesis of fibroids before it makes a clinical impact.

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QUESTIONS

1. In the medical therapy of uterine myomata, gonadotrophin-releasing hormone agonists
   a) have been reported to reduce the volume of fibroids by an average of 12.5 mL and the uterus by 159 mL.
   b) were used by Palomba et al as a long-term primary treatment of fibroids with tibolone "add-back" hormone replacement therapy.
   c) as a 3-month preoperative adjunctive treatment, was reported by Farquhar et al to be a cost-effective treatment choice for women undergoing myomectomy.
   d) preoperatively enabled surgeons performing myomectomy to reduce their operating time by 50 minutes.
   e) predisposed women to a recurrence rate of fibroids of 28%.

2. In uterine artery embolisation for the treatment of myomatous uteri,
   a) interventional radiologists perform this procedure using particles of polyvinyl alcohol (PVA) measuring 300 to 500 mm to occlude the uterine arteries.
   b) Braude et al reported uterine volume and fibroid size shrinkage of between 40% and 69%.
   c) there is a risk of premature menopause due to inadvertent compromise of ovarian blood supply.
   d) unintended hysterectomy due to complications is lower than that following abdominal myomectomy.
   e) women with submucous or intracavitary myomata should have hysteroscopic evaluation and resection prior to embolisation.

3) The surgical treatment of myomatous uteri
   a) may include hysterectomy either by the abdominal, laparoscopic or vaginal approach in women who have completed childbearing.
   b) should address the risk of ureteric injury when laparoscopic hysterectomy is planned, which is quoted in the series by Makinen et al as being 0.2 per thousand.
   c) by the laparovaginal approach enables removal of myomata expeditiously and secures multi-layered repair of the uterine defect through a colpotomy, while retaining the advantages of laparoscopy.
   d) when it is a laparoscopic myomectomy, has been reported to result in uterine ruptures even prior to the onset of labour.
   e) cannot result in a recurrence of myomata if, during myomectomy, all fibroids are removed.

4. Relating to uterine fibroids and myomectomy,
   a) a 4.4% risk of uterine dehiscence during labour had been reported in a large maternity hospital where only open (laparotomy) myomectomies were performed.
   b) at second-look laparoscopy the risk of postoperative adhesions after laparoscopic myomectomy was 26.3%.
   c) in laparoscopic myomectomy liberal use of bipolar electrosurgery within the myoma defect is recommended.
   d) in a review of 7 studies on hysteroscopic myoma resection, a conception rate of 55% and a live birth rate of 80%, similar to that of a myomectomy via a laparotomy, have been reported.
   e) the cumulative recurrence rate of myomata 5 years after laparoscopic myomectomy was 51%.

5. Fibroids and infertility.
   a) In women with unexplained infertility, the cumulative pregnancy rates after myomectomy are 2% at 1 year and 3% at 5 years.
   b) The "relative risk" of pregnancy, when there are submucosal fibroids distorting the cavity, is 0.32.
   c) The miscarriage rate in women with submucous fibroids in an *in vitro* fertilisation population was reported to be 16.4%.
   d) Unlike subserous and intramural myomata, submucous myomata and intramural myomata distorting the uterine cavity are associated with a reduction in pregnancy and implantation rates.
   e) in women undergoing *in vitro* fertilisation, the pregnancy rate per embryo transfer for women with submucous fibroids was 9% compared with a rate of 30% amongst controls.

Uterine fibroid is a slowly growing benign smooth muscle tumor. Approximately 25% of women after the age of 35 years harbor uterine fibroid. Most of these women are asymptomatic and in general, they do not need any treatment.Â Surgery is the conventional treatment of uterine fibroid. Indications for surgery include persistent abnormal uterine bleeding, pelvic pain, pressure symptoms, and rapidly enlarging fibroid. Surgery may also be indicated for treatment of fibroid-related infertility and recurrent pregnancy loss. Contemporary management of uterine fibroids: focus on emerging medical treatments [2015]. Health Quality Ontario. Magnetic Resonanceâ€“Guided High-Intensity Focused Ultrasound (MRgHIFU) Treatment of Symptomatic Uterine Fibroids: An Evidence-Based Analysis [2015]. Magnetic Resonance-Guided High-Intensity Focused Ultrasound (MRgHIFU) for Treatment of Symptomatic Uterine Fibroids: An Economic Analysis [2015]. Society of Obstetricians and Gynaecologists of Canada. Medical Management of Symptomatic Uterine Leiomyomas â€“ An Addendum [2019].Â Magnetic resonance guided focused ultrasound for fibroid treatment--results of the second radiological gynecological expert meeting [2015]. International. AAGL. Symptomatic Fibroid Management: Systematic Review of the Literature, Havryliuk Y et al. 12Julyâ€“September 2017 Volume 21 Issue 3 e2017.00041 JSLS www.SLS.org. 23. Ascher-Walsh CJ, Capes TL.Â management of symptomatic uterine fibroids from 2006 to 2016? 3. What are the short and long-term clinical outcomes with a uterine conserving approach versus a hysterectomy in the. management of symptomatic uterine fibroids from 2006 to 2016? Figure A2. Continued. Symptomatic Fibroid Management: Systematic Review of the Literature, Havryliuk Y et al. 18Julyâ€“September 2017 Volume 21 Issue 3 e2017.00041 JSLS www.SLS.org. Table A1. Alternatives to hysterectomy: management of uterine fibroids. Obstet Gynecol Clin North Am. 2016;43(3):397â€“413. 16. Maratea D. Repeated-intermittent use of ulipristal acetate for the management of uterine fibroids: an Italian pharmacoeconomic evaluation. Minerva Ginecol. 2016;68(1):15â€“20. Surgical intervention of fibroids within the first two trimesters is ...Â Fibroids are also associated with malpresentation, preterm labour and an increase in caesarean section rates. 4. The UK currently has no national guidance on the management of fibroids in pregnancy. This article discusses the complications of fibroids and their management options in pregnancy. Classification of fibroids. Fibroids are located within the body of the uterus, cervix or broad ligament.Â 16 Lee HJ , Norwitz ER , Shaw J . Contemporary management of fibroids in pregnancy . Rev Obstet Gynecol 2010 ; 3 : 20 â€“ 27 . PubMed Web of ScienceÂ® Google Scholar.