Myomectomy

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Disclosures - NONE
Prevalence

- Found in 20-25% of all women in the reproductive age range
- By the age of 50, fibroids can be detected in
  - nearly 70% of white women
  - greater than 80% of African–American
- Only 20-50% of all women with myomas are symptomatic
Diagnosis

- Pelvic examination
- Ultrasound
- MRI
- CT
- Surgery
# FIGO Classification of Leiomyoma

<table>
<thead>
<tr>
<th>Subclassification</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>S – Submusosal</td>
<td>0 Pedunculated intracavitary</td>
</tr>
<tr>
<td></td>
<td>1 &lt; 50% intramural</td>
</tr>
<tr>
<td></td>
<td>2 ≥ 50% intramural</td>
</tr>
<tr>
<td>O – Other</td>
<td>3 Contacts endometrium; 100% intramural</td>
</tr>
<tr>
<td></td>
<td>4 Intramural</td>
</tr>
<tr>
<td></td>
<td>5 Subserosal ≥ 50% intramural</td>
</tr>
<tr>
<td></td>
<td>6 Subserosal &lt; 50% intramural</td>
</tr>
<tr>
<td></td>
<td>7 Subserosal pedunculated</td>
</tr>
<tr>
<td></td>
<td>8 Other (specify e.g. cervical, parasitic)</td>
</tr>
</tbody>
</table>

## Hybrid leiomyomas
(impact both endometrium and serosa)

Two numbers are listed separated by a hyphen. By convention, the first refers to the relationship with the endometrium while the second refers to the relationship with the serosa. One example is below:

<table>
<thead>
<tr>
<th>Subclassification</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-5</td>
<td>Submusosal and subserosal, each with less than half the diameter in the endometrial and peritoneal cavities, respectively.</td>
</tr>
</tbody>
</table>
Leiomyoma: symptoms

- Asymptomatic
- Bleeding
  - Increased menstrual flow
  - Inter-menstrual bleeding, at times very heavy
- Pain
  - Dysmenorrhea
  - Dyspareunia
  - Abdominal pain / complicating pregnancy (infarction / degeneration)
- Vaginal discharge
- Infertility (?)
- Pregnancy wastage / pregnancy loss
Leiomyomas: infertility

It is generally accepted that

- Clinically significant submucosal fibroids negatively impact fertility
- Subserosal fibroids have NOT been consistently demonstrated to negatively impact the ability to conceive
Submucosal Leiomyomas

Women with submucosal fibroids, compared with subfertile women without fibroids, have significantly

- lower clinical pregnancy rates
- lower implantation rates
- lower ongoing pregnancy/live birth rates
- significantly higher spontaneous abortion rates
- no difference in preterm delivery rates
Subserosal Leiomyoma

There is NO convincing evidence that subserosal myomas negative impact a woman’s ability to conceive.
Intra-mural Leiomyomas

- The fertility effect of intramural fibroids remains a controversial and highly debated topic.
- There is mounting evidence, however, to support a potential association of intramural fibroids with subfertility.
- Studies suggest a negative effect of intramural fibroids on pregnancy outcomes when distortion of the uterine cavity is present.
- As a result, the utility of removing intramural fibroids for optimizing fertility is equally unclear.
Potential Mechanisms of Subfertility

- The impact of fibroids on fertility is thought to be most significant at the level of implantation.
- Mechanical distortion of the endometrial cavity.
- Blocking tubal ostia
- Altering uterine contractility and peristalsis
- Persistence of intrauterine blood or clots
- Compression or distortion the overlying endometrium, diminishing receptivity to the embryo during the window of implantation
- Disruption of the junctional zone within the myometrium may negatively affect the initial stages of implantation and subsequent placentation
- Abnormal expression of endometrial growth factors and cytokines, including those guiding cell proliferation and differentiation, and angiogenesis
- Inflammation and fibrosis in the overlying endometrium, may also reduce rates of implantation
Treatment of Uterine Leiomyomata

- Based mostly on symptoms
  - Bleeding
  - Pain
  - Patient concerns
  - Infertility
- Age
- Size
- Location
- Clinical acumen
Available Treatments for Uterine Leiomyomata

Medical management

- Conservative Expectant Management
- GnRH-a
- OCP’s
- Anti-fibrinolytics
- Progesterone releasing IUD
- Selective Progesterone receptor modulators
  - Ulipristal acetate
  - Mifepristone
- Aromatase inhibitors (eg, letrozole)
Available Treatments for Uterine Leiomyomata

- Uterine Artery Embolization – generally, available locally
- MR guided high frequency US *
- VizAblate (Transcervical, intrauterine ultrasound-guided radiofrequency ablation) *
- Acessa (Laparoscopic radiofrequency ablation)*

* Not available locally or anywhere in Kansas
Available Treatments for Uterine Leiomyomata

Surgical

- Hysterectomy
- Myomectomy
  - Hysteroscopic
  - Laparotomic
  - Laparoscopic / Robotic
An incision-free approach to treating Fibroids
The Acessa Procedure is not currently FDA cleared for use with women desiring to maintain fertility.

When Erin Robinson's Fibroid Pain Got Real, She Chose Story Over Silence - (Forbes - 5/17/17)

'Amazing Race's' Erin Robinson Shares Her Fibroid Story - (CBS Los Angeles - 5/14/17)
Myomectomy

- It is reasonable, justifiable, indicated, appropriate AND may be the standard care to remove uterine leiomyomata that are causing bleeding and pain.

- Myomectomy for “infertility” however is much less definitive
Pre-operative Evaluation & Mgmt

- YOU ALWAYS NEEDS AN IMAGING STUDY !!
- Informed consent(s)
- Endometrial sampling in women with abnormal bleeding
- Laboratory testing
  - CBC (Hgb or Hct)
  - Ovarian reserve (function) testing (?)
  - Type and screen (?)
  - Other labs, EKG, CXR as indicated
Pre-operative Evaluation & Mgmt

Imaging

- Without a doubt the best imaging study is MRI
- Ultrasound is acceptable in many cases
- Don’t discount SIS or HSG – they may be very useful (be sure YOU do the study or YOU review the images)
Pre-operative Evaluation & Mgmt

Informed consent should include:

- Discussion of proposed procedure(s)
- Anticipated outcome(s)
- Potential risks and complications
- Alternatives therapies
Operative morbidity / Informed Consent

- Anesthetic
- Blood loss, necessitating transfusion
- Adhesions - intra-abdominal
- Adhesions - intra-cavitary
- Uterine compromise
  - Uterine rupture
  - Need for operative delivery
- Risk of recurrence
- Possible hysterectomy (~1%)
- Post operative complications
  - Infection
  - Wound breakdown
  - Pain
Operative morbidity / Informed Consent

- Anesthetic
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  - Pain
Hysteroscopic

- Another discussion; another lecture; another time
- Reference: look for AAGL guidelines
  - AAGL Practice Report: Practice Guidelines for the Diagnosis and Management of Submucous Leiomyomas 2012 JMG
- Few things regarding instrumentation and fluids
Myomectomy: Hysteroscopic

Truclear

Myosure
Myomectomy: Hysteroscopic
Myomectomy: Hysteroscopic
Myomectomy: Hysteroscopic

Distending media

- Normal saline
- 5% glucose
- 1.5% glycine
- 5% dextrose
- 5% mannitol
- 3% sorbitol
- Mannitol/sorbitol
- 32% dextran 70 (Hyskon)
# Myomectomy: Hysteroscopic

## Table 1

<table>
<thead>
<tr>
<th>Liquid distending media (osmolality)</th>
<th>Tonicity</th>
<th>Contains physiologic electrolytes</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iso</td>
<td>Hypo</td>
<td>Hyper</td>
</tr>
<tr>
<td>Normal saline (NaCl 9%)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5% Glucose</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>1.5% Glycine</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>5% Dextrose (D5W)</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>5% Mannitol</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>3% Sorbitol</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Mannitol/sorbitol (Purisol)</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>32% Dextran 70 (Hyskon)</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
Myomectomy: Hysteroscopic

- Hypotonic and electrolyte-free media can create fluid and electrolyte disturbances if absorbed in excess amounts.

- Including:
  - Hyponatremia
  - Related issues as well as heart failure (which can also be caused by absorption of conductive media such as normal saline).
  - Pulmonary edema
  - Cerebral edema
Myomectomy: Hysteroscopic

- Sodium-potassium adenosine triphosphatase (NA1/K1-ATPase) “pump” helps to regulate intracellular osmosis.

- Under conditions of hyponatremia, water moves into brain cells, causing cerebral edema, which can lead to pressure necrosis and progression to brain stem herniation (and occasionally, though rarely death).

- In premenopausal women the Na1/K1-ATPase pump is inhibited (suppressed) by female sex steroids, most likely estrogens.
Myomectomy: Hysteroscopic

- In the context of hyponatremic encephalopathy, premenopausal women are 25 times more likely to die or have permanent brain damage than men or postmenopausal women.

- The sex steroid–related impact on the Na1/K1-ATPase pump can be preempted by the preoperative administration of GnRH analogs.
Strategies to minimize intra-operative absorption of fluid

- Use only the minimum pressure necessary to distend the uterine cavity
- Close monitoring of I & O
- Automated fluid management system
Strategies to minimize intra-operative absorption of fluid

- Pre-operative GnRH – α (sub-mucus myomas)
  - Muzii et al., fluid deficit 378 mL vs 566 mL (p<0.005)
  - Mavrellos et al., fluid deficit 300 mL vs 500 mL (p<0.84)

All studies evaluating fluid deficit for “endometrial resection” noted a statistical significant decrease in fluid deficit in women pre-treated with GnRH - α
Strategies to minimize intra-operative absorption of fluid

- Pre-operative intra-cervical injection of vasopressin
  - Corson et al, OR 15% in the intervention group
  - Phillips et al, fluid deficit 491 mL in the intervention group; 897 mL in the control group (p<0.05)

Concentration of Vasopressin

- Corson 0.5 U/mL
- Phillips 0.05 U/mL
Strategies to minimize intra-operative absorption of fluid

Vasopressin for intra-cervical injection

- Current recommendations < 0.4 U/mL
- Generally no more that 6 units total per case
- Dilute solution*
Special note regarding FIGO Type 2 myomas

- Be cognizant of this distance
- Pre-operative imaging is critical
- Sometimes two procedures are necessary (important part of the consent process)
Abdominal (open or laparoscopic)

- Indications
- Risk of uterine rupture post myomectomy
- Likelihood of recurrence of myomata following myomectomy
- Minimizing blood loss
- Post operative adhesions
- Surgical technique(s)
Indications

The most controversial indication for surgical management of leiomyomas is to treat or prevent adverse reproductive outcomes.

Surgical Management of Leiomyomas for Fertility or Uterine Preservation. Falcone et al, 2013
Indications

A recent Cochrane review of the three randomized controlled studies involving myomectomy for fertility concluded that insufficient evidence exists on the role of myomectomy for *improving fertility* in the circumstance of intramural or subserosal leiomyomata.
Uterine Rupture in Pregnancy Following Myomectomy

- The majority of studies and case reports have documented spontaneous uterine rupture in the preterm period and prior to labor than during labor.
- In a retrospective review of 19 cases of uterine rupture after laparoscopic myomectomy the majority involved single layer closure of uterine defects, and/or extensive electrocautery for hemostasis.
Uterine Rupture in Pregnancy Following Myomectomy

The prevalence of uterine rupture following myomectomy—all types of surgery—(0.79 %) is comparable with that after cesarean section. Based on the available evidence, there is no significant difference between the incidences of a rupture during pregnancy following a laparoscopic (1.2 %) versus an open myomectomy (0.4 %).
Recurrence of Uterine Leiomyomata Following Myomectomy

- Number of myomas
- Size of myomas
- Age
- Race

- All appear to be independent predictors of the likelihood of recurrence
Recurrence of Uterine Leiomyomata Following Myomectomy

- Recurrence after removal of:
  - Single leiomyoma
    - 27% had recurrent tumors
    - 11% required hysterectomy
  - Multiple leiomyomas
    - 59% experienced recurrent tumors
- Of the women in the multiple leiomyoma group, 26% required repeat myomectomy, hysterectomy, or both procedures
Minimizing Intra-operative Blood Loss

- **Tourniquets**
  - Cervical (require dissection / development of a “bladder flap”
  - Infundibulo-pelvic (IP) ligaments

- **Intra-myometrial injections of vasopressin**
  - Dilute solution*
  - 5-6 U (total)
  - \(\frac{1}{2}\) life = 20 minutes

- **Cell-saver**

- **Tranexamic acid (TXA)** ???
Post Operative Adhesions

- 26 patients undergoing laparotomy / myomectomy
- 2nd look laparoscopy 6 weeks after laparotomy
- pregnancy rates 33% at 6 months and 67% at 12 months

<table>
<thead>
<tr>
<th>Location of uterine incision</th>
<th>posterior</th>
<th>anterior/fundal</th>
</tr>
</thead>
<tbody>
<tr>
<td>adhesions</td>
<td>94%</td>
<td>56%</td>
</tr>
<tr>
<td>degree of adhesions</td>
<td>22 pts</td>
<td>2.7 pts</td>
</tr>
</tbody>
</table>

Tulandi T. Obstet & Gynecol 1993; 82:213-5
Post Operative Adhesions

- Meticulous attention to good surgical technique
- Blood is intensely adhesio-genic
- Minimizing use of electro-thermal energy
- Appropriate use of anti-adhesion barriers
  - Interceed – re-oxygenated methylcellulose
  - Sepraﬁlm – modiﬁed hyaluronic acid (HA) & carboxymethylcellulose (CMC)
Post Operative Adhesions

“Second-look” laparoscopy
Surgical Technique - Laparotomy

- Choice of skin incision – vertical is best for “large” myomas
- Vertical midline uterine incisions when / where possible
- Minimize incisions on the posterior uterine wall
- Avoid incisions near the utero-ovarian ligament
- Avoid incisions near the origin of the fallopian tube(s)
- Plan incisions to remove as many myomas as possible through the fewest uterine incisions as possible but avoid “tunneling”
Surgical Technique - Laparotomy

- Thoroughly palpate the uterus to ensure complete removal of all myomas.
- Develop a “bladder flap” if necessary.
- Use “absorbable” suture; barbed suture is considered acceptable.
Surgical Technique - Laparotomy

- The gynecologic surgeon must pay "Special Attention" if / when the endometrial cavity is breached during myomectomy.
- Close the endometrial defect with 4-0 absorbable suture, trying to avoid placing sutures completely through the endometrium

Tulandi T. Obstet & Gynecol 1993; 82:213-5
Surgical Technique - Laparotomy

- Multi-layer closure of the myometrium
- 0 or 2-0 suture for the deeper layers
- 2-0 or 3-0 for more superficial layers
- 3-0 or 4-0 for a sero-muscular closure
Surgical Technique - Laparotomy

- For large myomas anticipate moderate to heavy blood loss
- Anti-adhesion barriers are indicated and approved under certain surgical conditions:
  - “dry” surgical field
  - “complete” removal of all “excess” irrigation fluid
- Peritoneal closure – surgeon’s choice
- Fascial closure – surgeon’s choice
- Skin closure – surgeon’s choice
Surgical Technique - Endoscopic

For the most part the guidelines and recommendations for endoscopic myomectomy are the same as for open procedures.
Surgical Technique - Endoscopic

- Getting the myomas off of the uterus and getting the myomas out of the abdominal cavity are two entirely different issues.
- Advanced planning in necessary to ensure a efficient removal of myomas.
- The use of power morcellators at this time is considered – sub-standard care.
- Myomas should be removed “whole” or “morcellated” in a containment system.
Surgical Technique - Endoscopic

- Location of myometrial incisions should be similar to that of an “open” procedure.
- The same closure techniques used for an “open” procedure apply to endoscopic procedures.
- As a general rule it is easier to close transverse incision as compared to vertical incisions.
Surgical technique
Surgical technique

- Deep closure
- Sero-muscular closure
Too much electro-cautery might give you this

myoma
Myomectomy
Fertility Rates After Myomectomy

Depend largely upon

- patient age
- ovarian reserve
- other fertility diagnoses
- location of fibroids
- the incidence of postoperative pelvic adhesive disease and tubal blockage
- the development of intrauterine adhesive disease following surgery
Submucosal Myomectomy

Removal of submucosal myomas

- Achieve pregnancy within 1 year (43.3 versus 27.2%).
- Live birth rate increased from 3.8 to 63.2%.
- Miscarriage rate decreased from 61.6 to 26.3%.
Pregnancy rates following myomectomy

- Johns Hopkins Hospital
- retrospective chart review of 37 cases of laparotomy and myomectomy
- life table analysis: 57% pregnancy rate and 48% live birth rate
- presence of adhesions at the time of myomectomy greatly reduced the chances for successful pregnancy
- 68% of patients that had a second operative procedure had pelvic adhesions

Gelbach DL. Internat’l J Obstet & Gynecol 1993;40:45-50
Endoscopic vs “Open” myomectomy

Endoscopic

- Longer operative time
- More expensive
- Smaller incisions
- Probably few (less) adhesions
- Greater likelihood of missing myomas
- Probably should be limited to patients with < 7 or 8 myomas and < 10-12 cm

“Open”

- Shorter operative time
- Less expensive
- Larger incisions
- Probably more adhesions
- Less likelihood of missing myomas
- Not constrained by number or size of myomas
- Easier to do a multi-layer closure (??)
Our approach at CFRM

Endoscopic
- High BMI
- Posterior or low cervical myomas
- H/O multiple prior abdominal surgical procedure
- Number of myomas ≤ 8
- Patient preference**

Open
- Low BMI
- Solitary anterior myoma
- No prior abdominal surgery (?)
- Number of myomas > 8
- Intra-mural or subserosal myoma > 12 cm*
- Patient preference**
Alexis®
Contained Extraction System

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>BAG VOLUME</th>
<th>BAG OPENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT87</td>
<td>Alexis Contained Extraction System with 12x100mm K® Balloon Sheath Tip System</td>
<td>1.00 T</td>
<td>6000 mL</td>
<td>17mm diameter</td>
</tr>
<tr>
<td>GT817</td>
<td>Alexis Contained Extraction System with CellPOINT® Manual Advanced Access Platform</td>
<td>1.00 T</td>
<td>6000 mL</td>
<td>17mm diameter</td>
</tr>
<tr>
<td>GT827</td>
<td>Alexis Contained Extraction System with CellPOINT Advanced Access Platform</td>
<td>1.00 T</td>
<td>6000 mL</td>
<td>17mm diameter</td>
</tr>
</tbody>
</table>

Center for Reproductive Medicine – Wichita, KS
Myomectomy
Myomectomy
Removing “large” myomas - laparoscopically
Removing myomas

- < 5-6 cm
  - direct removal through the Gel-Point Mini

- > 5-6 cm
  - Alexis Contained Extraction System (ACES)
  - Large GelPoint
Center for Reproductive Medicine – Wichita, KS

Myomectomy
Center for Reproductive Medicine – Wichita, KS

Myomectomy
GYNECARE VERSAPOINT™
Bipolar Electrosurgery System
For complete instructions refer to Owners Manual
Dilute solution of vasopressin

- One ampule = 20 U
- One ampule in 100 mL = 0.2 U/mL (max = 30 mL)
- One ampule on 50 mL = 0.4 U/mL (max = 15 mL)
Myomectomy