# Complications due to endometriosis in Laparoscopic surgery

## How to manage and their prevention

Presentation Objectives

General aspects: endometriosis treatment and complications risks

Ovarian endometriomas treatment options

Conservative Vs excisional surgery

Prevention and management of GIT, urological, vascular complications

Symptoms and diagnosis of complications during laparoscopic treatment of pelvic endometriosis and DIE

Scarring in the female reproductive tract - mechanisms and management

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ESHRE Campus
SIGs RS & Endometriosis
Edinburgh

***Vasilios Tanos**, MD, PhD.*

*Professor in Obstetrics and Gynaecology*

ARETAEION HOSPITAL

University of Cyprus

# Surgical strategy in endometriosis

## A Wattiez et al Dec 2012

- Endometriosis is common & affects young women
- Clinical manifestations pain and infertility can dramatically affect quality of life
- Many questions about treatment remain unanswered
- Strong evidence supports the use of laparoscopic surgery to improve pain relief and fertility
- Systematisation of strategy is essential to make surgery more reproducible, safer and less time-consuming
- Even in the most expert hands, complications may occur
- Further investigations needed to compare the different approaches
- Outcomes must, include pain, fertility, organ dysfunction, and quality of life

**(Best Practice & Research Clinical Obstetrics & Gynaecology)**

# Complications of Laparoscopic Surgery for Endometriosis

JT Wright FRCOG 2008 pp34-42

- Complications of laparoscopic surgery are in fact fewer than those reported for laparotomy
- the failure to diagnose them quickly and treat them effectively, lead to late diagnosis with catastrophic results
- Inadvertent bowel injury at laparotomy is regarded as a recognized hazard, particularly during adhesiolysis
- Such enterostomies are usually immediately recognized and repaired with minimal postoperative sequelae.

# Complications of Laparoscopic Surgery for Endometriosis

JT Wright FRCOG 2008 pp34-42

- Superficial peritoneal endometriosis overlie great vessels of the pelvis, ureter, bowel, important vascular network, especially in the ovarian fossa, on the uterosacral ligaments and in PoD
- Adhesiolysis performed by high energy sources and may cause ischemic damage that is not apparent at the time of operation
- Operative laparoscopy always carries the potential for severe complications
- There are strategies for avoiding and reducing these as much as possible

# Pathophysiology of Endometriosis

- Continuous Inflammation

  - a spontaneously regressive phenomenon
  - even after treatment high risk of recurrence

  (M Nisolle - Cur Opin in Obst Gyn, 2002)

causing

- Adhesion formation (scarring)
- Derangement of the affected tissue normal function Neovasvularization
- Distortion of normal anatomy (micro and macro)

# Endometriosis treatment by Surgery

- The evidence based endometriosis surgery results generate from the clinical manifestations and the course of the disease it self

**Surgery can only**

A ) partly repair anatomy and probably

b ) can contribute minimally to reestablish part of the physiology of the affected tissue

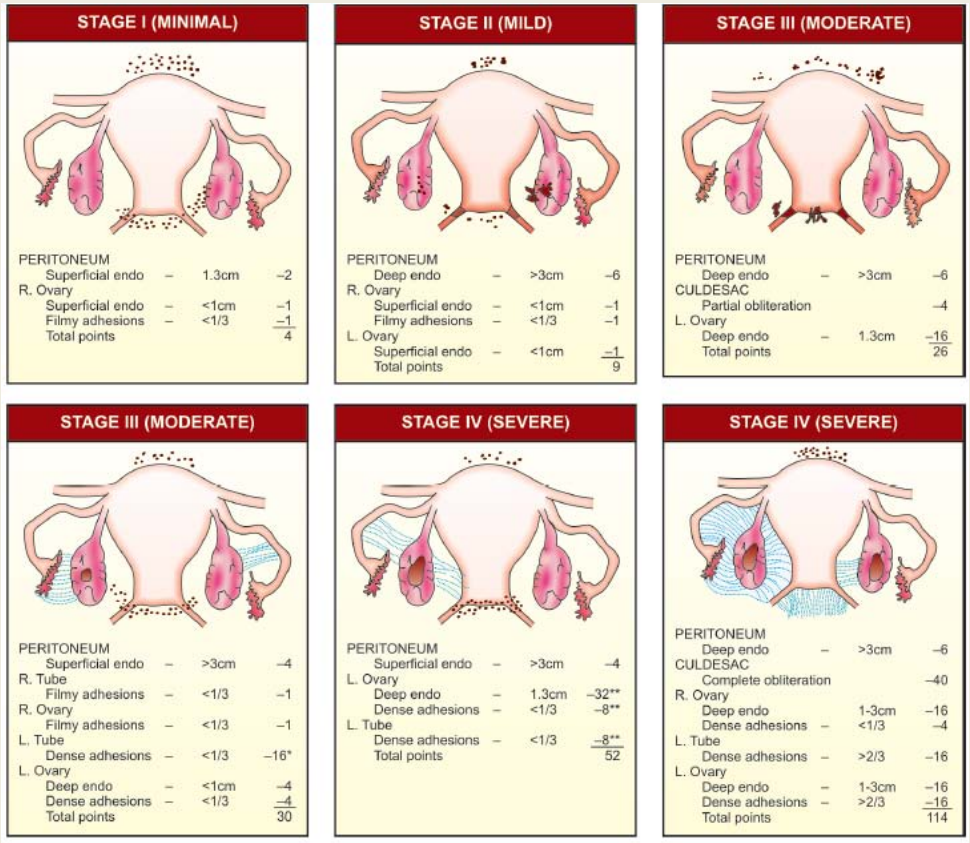
c) probably will prevent or delay further progress of the disease in combination with medical treatment

# Indications for operating endometriosis

- Pelvic pain, Dysmenorhoea, Dyspareunia
- Subfertility, to improve fertility and /or treat infertility
- Combination of infertility treatment & alleviation of pain improving quality of life
- Restore anatomy (ureter involvement hydronephrosis, bowel compression and dyschesia)

# Localization of endometriosis and the risk of complication

- Ovarian
- Peritoneal
- Bowel involvement
- Bladder
- PoD
- DIE – bowel, bladder, vaginal involvement



# Operating endometriosis
## Various levels of risks and difficulties

- Focal or diffused
- Localization (ovaries …. bowel, DIE etc)
- Extension of the disease (ovary upto whole pelvis)
- Adhesions (light, curtain like, dense, hard, severe, etc)
- Concomitant pathology (myomas, PCO, etc)

# Operative options for endometriosis treatment

- Laparotomy
- Laparoscopy (abdominal / transvaginal )
  - Dissection: dissecting forceps, scissors/digit ?
  - Excision: scissors, bipolar, sealing techniques monopolar, knife, blant ?
  - Haemostasis: bipolar, monopolar, sutures, LASER, plasma-jet,
  - Time consuming operation (time …. morbidity)

# Laparoscopy Vs Laparotomy

- Better visualization by
  - magnification
  - 30$^{o}$ optic
  - less hospitalization stay
- Probably
  - less damage to healthy tissue due to handling
  - better end result
  - less pop pain
  - less adhesions
- Higher risk for complications and their delayed diagnosis (blind entry)

- Less operation time
- Longer hospitalization stay
- Probably
  - better ergonomy
  - more pop pain
- More vulnerable to normal tissue due to bigger instruments
- Overall more complications than laparoscopy !

# Role of conservative surgery for pain caused by endometriosis

- Surgery is efficacious

- 2RCT: pain is reduced by surgical removal of endometriotic lesions (Sutton et al 1994; Abbott et al 2004)

- Pain reduction in > 70% of patients after surgical removal of DIE (Angioni et al 2006; Chapron et al 2001; Possover et al 2000; Donnez et al 2004)

# The difference between Ovarian & peritoneal endometriosis: In Fertility perspective

- infertility cases main concern is the choice of treatment medical or surgical
- Take in consideration the results of

  IVF Vs medical treatment Vs combined therapy

Conclusion: Whatever type of surgery is performed the IVF results / ET are not impaired, especially if ovarian cortex stays intact

M Nisolle - Current Opinion in Obstetrics and Gynecology, 2002

# Risks and complications when operating ovarian endometriosis

- Spillage and spreading of the disease
- Create adhesions
- Diminish healthy ovarian tissue
- Damage to microcascularization network
- Damage to big vessels - ovarian artery
- Cause ovarian atrophy – POF
- Potentially lower yield of oocytes in a stimulated cycle

# Ovarian endometriomas derange the physiological mechanisms of ovulation

Advanced Endometriosis causes

- lower reproductive performance
- is due to the lower number of oocytes achieved
- not due to lower oocyte quality.

- mechanical and vascular effects due to adhesions may decrease the number of M2-oocytes retrieved

(M.Vilela et al Argentina P-473 Poster ESHRE 2010)

# Surgical Approach of Ovarian Endometriosis

The surgical approach has to be chosen

Coagulation of the site of eversion

(Brosens et al)

Endometrioma fenestration and vaporization

(Donnez et al;Hemmings et al; Saleh and Tulandi)

Ovarian Cystectomy (Canis et al)

# Ovarian Endometriosis Large Endometrioma > 3 cm in diameter

- Adhesiolysis
- Aspiration of chocolate fluid
- Vaporization of peritoneal lesions
- Cystectomy or combined treatment
- Medical therapy and Second look laparoscopy (debatable)

# Risk of Recurrence of Ovarian Endometriosis at 1 year

| | EXCISION | COAGULATION |
|---|---|---|
| Hemmings et al (Retro ;1998) | 8% | 12% |
| Beretta et al (RCT; 1998) | 6% | 18% |
| Salehand Tulandi (Retro;1999) | 6.1% | 21.9% |
| Alborzi et al (RCT; 2004) | 5.8% | 22.9% |

# Excisional surgery versus ablative surgery for ovarian endometriomata: a Cochrane Review

- There is some evidence that excisional surgery for endometriomata provides a more favourable outcome than drainage and ablation with regard to the

- -recurrence of the endometrioma
- -recurrence of symptoms
- -subsequent spontaneous pregnancy

(Hart et al.Hum Rprod 2005; 11:3000-7)

# Residual ovarian volume after surgery

- Lack of correlation between residual ovarian volume and cyst diameter…

- Resection of even small endometrioma means also significant loss of ovarian volume.

Exacoustos et al. Am J Obster Gynec, 2004

Ivo Brosens 1978

# Surgery and Ovarian reserve

## IVF-ET outcome after endometriomas removal: Retrospective studies

**No decrease in the IVF-ET Outcome**

Cystectomy

Al-Azemi et al (2000)

Canis et al (2001)

Geber et al (2002)

Marconi et al (2002)

Garcia – Velasco (2004)

Cyst wall vaporization-Cystectomy

Donnez et al (2001)

**Decrease in the IVF-ET outcome**

Cystectomy

Somigliana et al (2003)

Bengaglia et al (2010)

# Endometriotic ovarian cysts Reduce ovulation rate

**Q - ovarian reserve is damaged after excision of ovarian endometriomas ?**

**Q - gonadal damage caused by the existence of endometriosis per se ?**

- **- 70 women with monolateral endometriomas operated**
  **- serial US followed to determine the side of ovulation**

Results

- **Ovulation occurred in the affected ovary in 22 cases (31%; 95% CI: 22–43%)**
  **Assuming that the expected rate of ovulation in both ovaries in healthy women is similar, this difference was of statistical significance (*P* = 0.002).**

- **Conclusion: The physiological mechanisms leading to ovulation are deranged in ovaries with endometriomas.**

Laura Benaglia et al. 2010

# The effect of Endometrioma size and Number ovarian reserves

**70 women mean age 35,**

- **45 (64%) dysmenorrhoea, 21 (30%) dispareunia and 21 (30%) chronic pelvic pain**
- **36 (51%) patients were infertile**
- **One cyst was present in 54 (77%) cases**
- **More than one cyst in 10 (23%).**
- **The endometrioma(s) affected the right ovary in 33 (47%) and left ovary in 37 (53%) cases**
- **The mean+SD diameter of the cysts was 31±16 mm**

- **Results:**
- **Ovulation occurred in the affected ovary in only 22/70 cases (31%)**
- **The rate of ovulation was affected according to the number of endometriomas present**

**19% when one cyst and when 2 cysts 35%**

**The impact of the dimension of the cysts, focused on women with only one endometrioma**

- **when the diameter of the cyst was 30mm ovulation was 34%**
- **when cyst >30mm was 36%**

Edgardo Somigliana et al 2010

# IVF–ICSI outcome after bilateral endometriomas surgery

**Women selected for IVF–ICSI, previously underwent bilateral endometriomas cystectomy, were matched (1:2) for age and study period with patients who did not undergo prior ovarian surgery**

- **68 cases and 136 controls**

- Results:
- **had higher withdrawal rate for poor response (*P* < 0.001) and needed higher doses of HMGs**
- **Significantly lower number of**
  **- follicles (*P* = 0.006) - oocytes retrieved (*P* = 0.024)**
  **- embryos obtained (*P* = 0.024)**
  **- clinical PR in cases 7% and controls 19 % (*P* = 0.037)**
  **- delivery rate in cases 4% and controls 17 % (*P* = 0.013)**

- **IVF outcome is significantly impaired in women operated on for bilateral ovarian endometriomas.**

**Edgardo Somigliana et al 2010**

# Ovarian reserve after endometrioma surgery

## one step Vs 3 step surgery

- PRS – 20w with endometriomas
  laparoscopic cystectomy for endometrioma (group 1)
  "three-step procedure" (group 2)
- Before and 6 months after laparoscopy all patients were evaluated
  - 12 months postoperatively they underwent ultrasound scan examination
  - ovarian reserve damage was estimated alterations AMH, antral follicle count, FSH, LH, E2 and inhibin B

Results:

- Mean serum AMH
  Group 1 3.9 to 2.90 ng/mL significant reduction
  Group 2 4.5 to 3.99 ng/mL
- Ovarian reserve determined by AMH is less diminished after the three-step procedure compared with cystectomy of endometriomas.

Tsolakidis et al 2010

# Role of Laparoscopic surgery in Endometriosis and Infertility - Review

- There is good enough evidence endometrioma >3cm should be excised
- There is no RCT that specifically address if laparoscopic surgery in moderate or severe endometriosis improve Pregnancy Rate

*Contd...*

| *Author* | *Sample size* | *Classification* | *Selection criteria* | *Intervention* | *Follow-up* | *Outcome* | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *PR* | *LBR* | *MR* | *ER* |
| Jones and Sutton 2002 | 39 | rAFS | Moderate/severe endo endometrioma (2-25 cm) | Lap KTP laser, Diathermy | 12 months | 39.5% | | | |
| Porpora et al 2002 | 47 | rAFS | Adnexal adhesion Tubal status | Lap excise, Ablate adhesiolysis | 12-60 months | 64.4% | | | |
| Elsheikh et al 2003 | 151 | rAFS | Endometriosis | Laparoscopy, No or medical treat | 2 year | 53% | | | |
| Vercellini et al 2003 | | rAFS | Endometrioma | Lap cautery or laser Lap cystectomy | Variable | 24-60% | | | |
| Alborzi et al 2004 | 100 | rAFS | Endometrioma > 3 cm | Lap excision Lap fenestration and coagulation of wall | 12 months | 59.4% 23.3% | | | |
| Godinjak et al 2005 | 45 | rAFS | Endometrioma | Lap cystectomy | 1 year | 35% | | | |

PR—Pregnancy rate, LBR—Live birth rate, MR—Miscarriage rate, ER—Ectopic pregnancy rate (number): Number of cases in relation to sample size, rAFS—Revised American Fertility Society

G Premkamar J Laproscopic Surgery 2008

# Surgical management of endometriosis in infertility is an ongoing controversy

- Complete resolution of endometriosis is not yet possible and current therapy has three main objectives:

  (1) to reduce pain
  (2) to increase the possibility of pregnancy
  (3) to delay recurrence for as long as possible

- Probably a consensus will never be reached on the optimal treatment of minimal and mild endometriosis.
- In cases of moderate and severe endometriosis-associated infertility, the combined operative laparoscopy with GnRHa may be the 'first-line' treatment.
- The mean PR of 50% following surgery provides scientific proof that RS should be the first choice in order to give patients the best chance of conceiving naturally.

- In cases of rectovaginal endometriotic nodules, surgery is essential.

J Donnez et al 2004

# Conservative surgery for DIE

- Try for a complete resection - as much as possible
- Avoid complications, DIE is a complex surgery
- Hysterectomy is not needed for treatment of DIE
- Preoperative detailed assessment

  (US, CTS, MRI, ba-enema, ureter stenting, bowel prep)
- Multidisciplinary approach (gen surgeon, psychiatry etc)
- Specialized centres

# Risk factors GIT complications

- SEVERE ENDOMETRIOSIS is the main contributing factor for bowel injuries in patients with no previous surgery. Chapron C *et al.* , 2001, Nezhat C, 1992

- during the installation phase:

  adhesions and anterior laparotomy are found in 68% of bowel injury

- during endometriosis surgery: 65% (ISGE 2001)

# Mechanism of GIT injuries

- direct trauma (instruments, forceps)
  - manipulation
  - adhesiolysis, enterolysis (bowel adhesions separation)
- thermal trauma
  - bipolar
  - monopolar ++
  - ultracision, thermofusion, sealing methods

# Prevention of gastrointestinal complications

## Prior to Surgery:

- PV / PR examination
- Trans Vaginal / Trans Rectal ultrasound
- Imaging dynamic / spiral CTS / MRI
- bowel preparation?! In high risk cases such in severe endometriosis involving the colon and recto-vaginal space and patients with history of previous GIT operation

## Intraoperative:

- Nasogastric tube / mask ventilation (avoid stomach distention)
- Avoid Nitrous oxide
- Vaginal packing / uterine manipulator
- To opt for the lateral dissection
- Attention to the electrical current used / bipolar is by far better

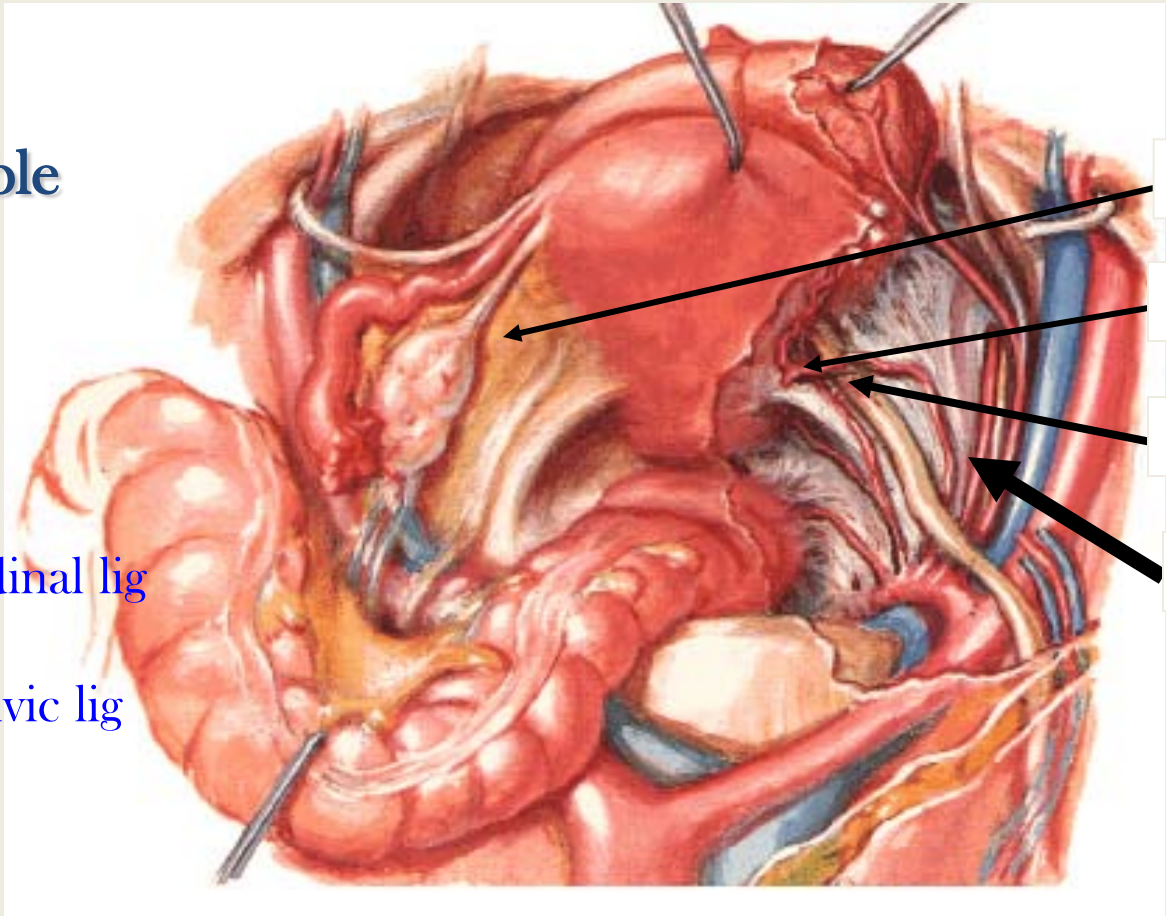
# Urinary Tract Complications

- ureteral injuries, bladder injuries, fistulas
- bladder injuries are identified more often (87%) than ureteral injuries
- The rate increase with the difficulty of technique
  - 1,6% major laparoscopic procedures
  - 3% hysterectomies
  - Pelvic endometriosis: causes 65% risk of ureter injury
  - risk increases according to spread and depth of endometriosis
  - 50-75% of ureteral lesions occur during surgery of benign lesions, described as easy surgeries by the surgeon.

# Ureteric lesions: sites

## Ureter is vulnerable

- at the fossa ovarica
- at the Uterine artery
- at the uterosacral/cardinal lig
- at the Infundibulo-pelvic lig

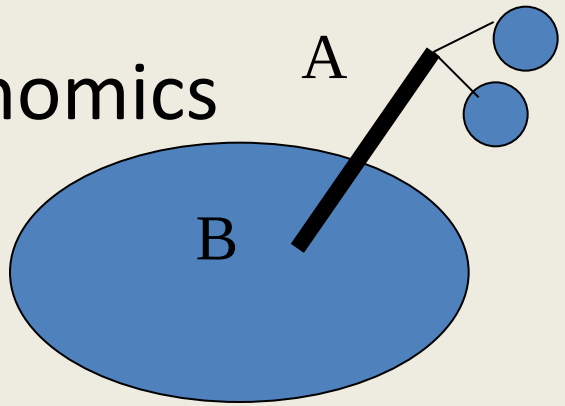



Bishoff JT et al. 1999

# Atraumatic dissection: some rules

- no brutal manipulation
- do not pull and do not push the ureter
- do not grasp the ureter with your forceps
- use atraumatic forceps
- control of forces: ergonomics

**If A=B** *precision & force*
**If A>B** *to much force*
**If B>A** *no precision*

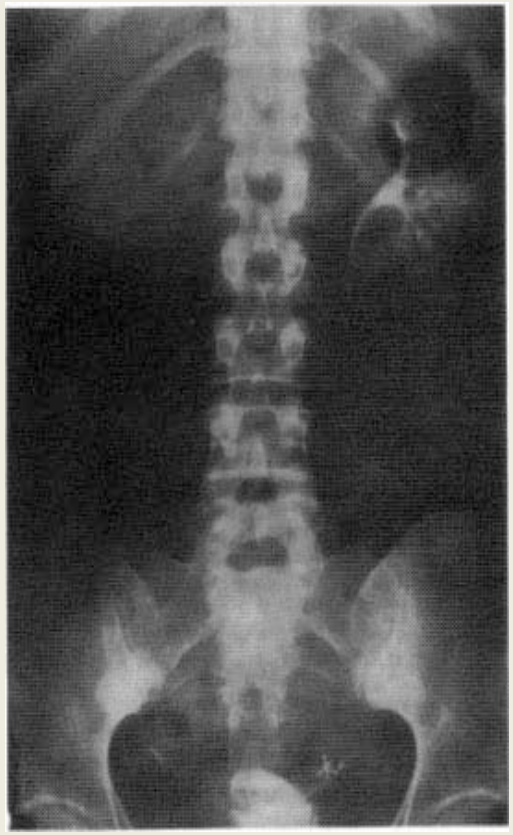


# Prevention of ureter injuries

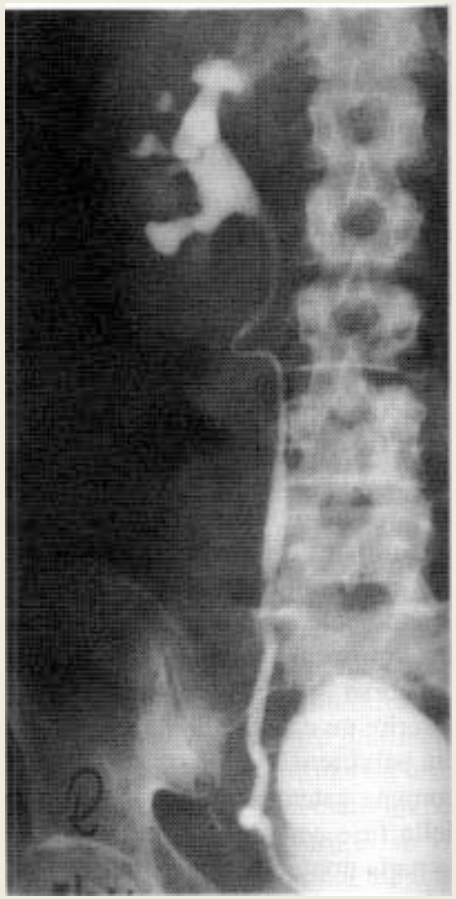
- Ureter must be localized in all moments during the laparoscopy
- by identification under the peritoneum
- by dissection
- pre-operative catherization (stenting), IVP, cystoscopy

- Ureteral catheter: systematic placement is abandoned because it does not prevent all lesions and has its own morbidity
- at the end of the surgery see ureter peristalsis and absence of dilatation

# Postoperative Ureter injury - Symptoms



- Clinical
  abdominal pain side
  (flank) pain distended
  abdomen
  ileus
  fever
- IV Ureterogram (IVP)
- Retrograde Ureterogram



# Mechanical trauma to Bladder occurs

- During
  - Adhesiolysis
  - Resection of endometriosis implants
- The history of previous laparotomy increase the risk:
  - Myomectomy
  - Cesarian section

# Bladder trauma

- 1 to 2,3% in the advanced laparoscopy
- mechanical or electro-thermal  trauma

## Prevention

- Bladder catheterization
- Secondary trocars under vision
- Blunt dissection better than electrosurgery

# Symptoms after Bladder injury

- Pneumo sac – swollen bladder – entrapped CO2
- Hematuria
- presence of urine in the abdominal pelvic cavity
- post-operative Anuria

# Risk reduction General guidelines

- Folley catheter insertion
- Bowel preparation
- Avoid Nitrous oxide in anaesthesia
- Use nasogastric sound
- Lysis of adhesions between bowel and anterior or lateral abdominal wall
- Lysis of sigmoid adhesions
- Continuous observation to the operating field
- Reduce risk of port-site metastases by closure in layers (Tjalma 2003) and the risk of vaginal spread by avoiding uterine manipulation

# Suggested guidelines to minimize risks and complications

- Check instruments insulation
- Usage of lowest possible power
- Use low voltage (cut) waveform
- Interrupted and not continuous activation
- Do not activate when open circuit
- Do not activate when the diathermy touches another instrument

# Minimizing the risks and electrosurgery complications

- Use bipolar when is indicated
- Use iron or plastic trocars and not those with mixed materials (iron + plastic)
- New technology electrogenerators that control electrical current and protect from capacitative currents
- The use of equipment with active electrodes that protect from insulation problems and from capacitative currents

# Surgery for DIE: Technique and rationale

Kondo et al. Jan 2013 Front Biosc - Clermont-Ferrand

- Preoperative assessment
- DIE is an indication for Surgery. Assess the radicality of surgery needed. Discuss with the patient.
- Several surgical approaches

  Absence of bowel infiltration: shaving technique

  Presence of bowel infiltration: segmental colorectal resection, discoid resection, stapled resection

- Postoperative results are defined according to:
- Quality of life (less pain)
- Fertility degree of treatment (facilitate OPU, ET other)
- Pain recurrence
- Complications (fistula, nerve injury, unstable bladder, urination problems etc)

# Management of DIE

- Mandatory Preoperative assessment
- Strategy of type of surgical treatment
- Aim and target is the excision of the nodule

- Without bowel resection: shaving technique
- Uterosacral ligaments infiltration
- Vaginal infiltration
- Bowel resection
- Discoid or segmental bowel resection
- Laparoscopy, laparotomy, laparoscopically assisted technique

# DIE Excision and Recurrence

| Recurrence | Pain | Reoperation |
|---|---|---|
| Fedele et al (2004) | 28% | 27% |
| Jatan et al (2006) | 5.3% | |
| Panel et al (2006) | 4.8% | |
| Darai et al (2007) | 16.4% | |
| Vignali et al (2005) | 24% | 10% |
| Brouwers –Woods (2007) | 4.6% | |
| Rectal dissection | 22% | |
| Anterior excision | 5.17% | |
| Segmental rectal | 2.19% | |

# Conclusion (1)

Most of the complications during laparoscopic surgery for mild and moderate endometriosis can be avoided by

- gaining knowledge
- improving surgical skills and
- increasing experience by operating more in number and severity cases of endometriosis.

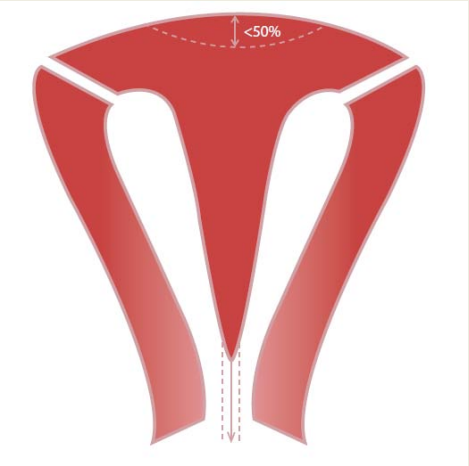
# Conclusion (2)

- Severe forms of endometriosis and DIE demand complex surgery and radical approach is mandatory in order to achieve better patients quality of life.

- Scrutinized preoperative workup is mandatory
- Sometimes complications can not be avoided

- “Benefits versus Risks” must be evaluated in detail, weighted and judged appropriately and discussed with the patient prior to surgery

# Female genital tract congenital malformations: new insights in an old problem

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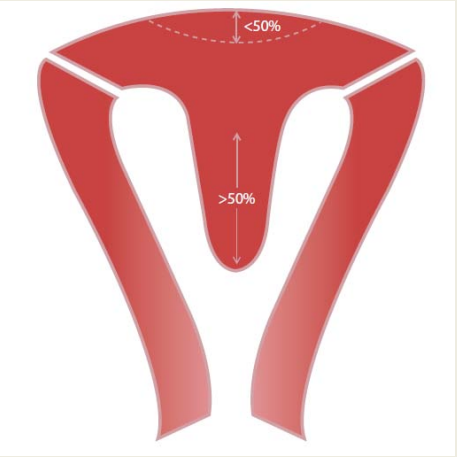


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