Pelvic Exenteration (PE) and LEER in Recurrent Cervical Cancer

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No conflict of interest

Pelvic Exenteration & LEER

1. Introduction of PE
2. Outcomes of PE
3. Surgical issues of PE
4. Concept of LEER
5. KCCH experience and cases

“They that live by the sword shall perish by the sword.”

“칼로 흥한 자는 칼로 망한다”

Pelvic Exenteration

- **No RCT**
  - Retrospective
  - Wide span of study
    - 20-30 year experience
  - Single institutional experience

Pelvic Exenteration (PE)

- **Alexander Brunschwig (1948)**
  - Palliative
  - En bloc removal
    - Rectosigmoid colon, genital tract, bladder, urethra, anus, vulva
  - Ureter; ureterosigmoidostomy
    - "Wet colostomy"; Urine+feces
  - Gauze packing
- 22 case
  - 5 die (23% mortality)

Alexander Brunschwig (1901–1969)

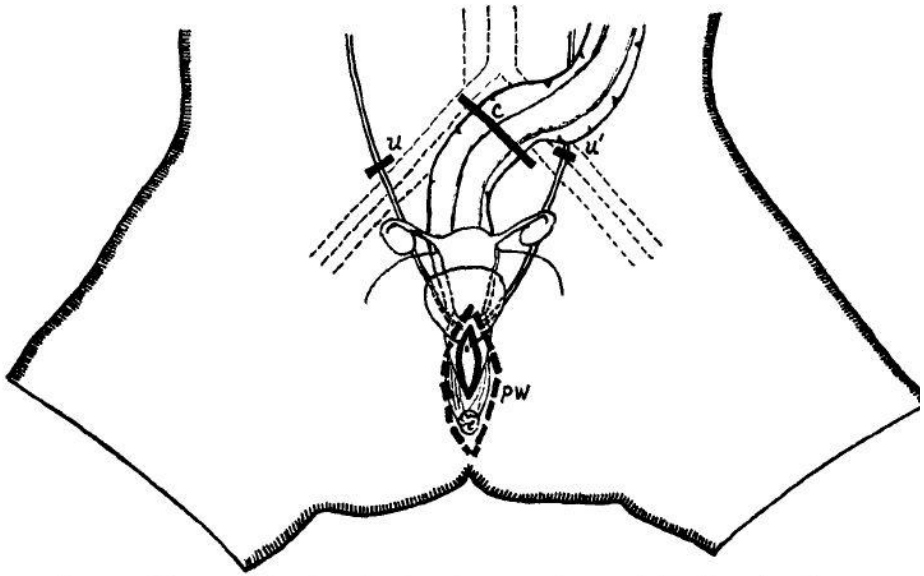


FIG. 1. *Diagram showing levels of transection and incision in the performance of total resection of pelvic viscera.* U, U′, *Levels of transection of right and left ureters respectively near the external iliac vessels. Sometimes the ureters are transected lower.* C, *Level of transection in region of upper pelvic colon.* PW, *Elliptical incision performed at second stage which encompasses the vulva and anus. In younger women the clitoris and labia minora are left in situ.*

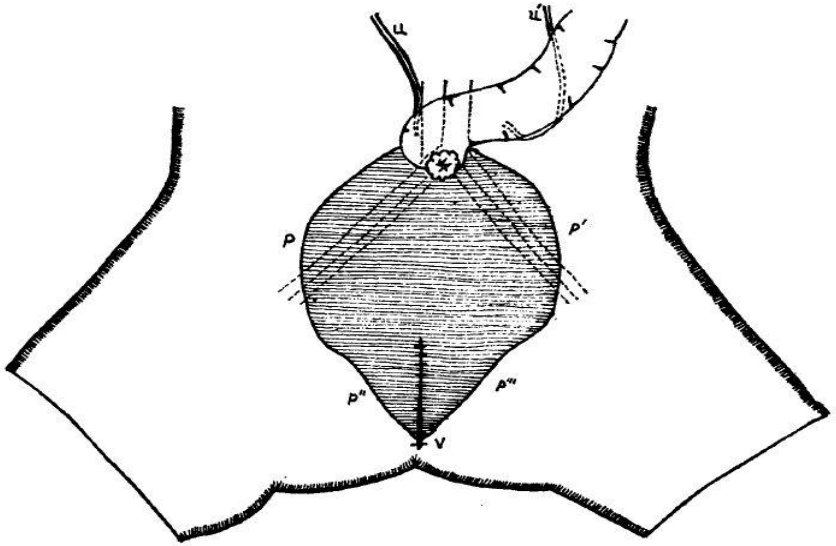


FIG. 2. *Diagram showing conditions at end of operation for complete excision of pelvic viscera. The shaded area,* P, P′, P″, P‴, *indicates area of pelvis from which peritoneum has been stripped as well as pelvic viscera removed. The peritoneal stripping has extended above the level of the common and external iliac vessels. The midline colostomy is shown with* U, U′, *both ureters implanted into the colon a short distance above colostomy.*

Brunschwig et al., 1948

"Not a single patient refused the operation!"

Brunschwig et al., 1948

TABLE I.

SUMMARY OF PATIENTS WHO UNDERWENT TOTAL EXCISION OF PELVIC VISCERA (AS OF APRIL 10, 1948).

	Patient	*Survived operation*	*Subsequent course*
1.	N. C. (f.) 60 yrs. Ca. vagina	36 days	Died suddenly. Necropsy: cardiac (auricular) thrombosis; abdomen neg.
2.	M. S. (f.) 46 yrs. Ca. cervix	5 days	Operative death; necropsy: peritonitis, pyelonephritis.
3.	Grab. (f.) 45 yrs. Ca. cervix	8 months	Very good palliation. Returned to almost normal existence for 4 mos. Died of carcinomatosis.
4.	Baret. (f.) 32 yrs. Ca. cervix	6 months	Living, well. Gained 30 lbs. Returned to full normal activities.
5.	M. Sylv. (f.) 58 yrs. Recur. ca. corpus.	6 months	Living, well. Colostomy stenosed, but functioning well.
6.	F. H. (f.) 47 yrs. Ca. cervix	7 months	Living, well. Returned to gainful occupation.

"Is it the Gene?"

Table 1. Survival outcome of pelvic exenteration

Treatment period	n*	Mortality	Morbidity		5YSR
			Early	Late	All
1947	430	**18%**	NR	NR	**22%**
1950	207	8%	**44%**	39%	35%
1957	100	37%	NR	NR	16%
1955	296 (255)	14%	63%	27%	**42%**
1962	252	17%	45%	NR	39%
1972	65	**9%**	NR	NR	23%
1970	69 (63)	7%		NR	48%
1964	100	4%	**49%**	NR	61%
1969	143	6%	NR	NR	50%
1977	133 (NR)	7%	36%	22%	41%
1987	103 (98)	2%	NR	NR	**47%**
1996	74	**3%**	**49%**	19%	56%

Improved Mortality of PE

- **Improved mortality** (Westin et al., 2014)
  - 25%-> less than 5%
    - Antibiotics
    - Thromboembolic prophylaxis
    - Improved technology such as vessel sealing devices,
    - Modifications in surgical technique
      - urinary diversion
      - vaginal reconstruction
    - Post op intensive care

High Morbidity of PE

- **Complication rate**
  - 51-82% overall
  - 22-32% major complication
    - Infection, abscess
    - Uro/GI reconstructive problem
    - Thromboembolism
  - Risk factors
    - Prior RT

Improved Survival?

- Reduced mortality, but…..
  - No improvement of survival (Westin 2014)
  - Improve patients selection?
    - Pre-op imaging, FDG-PET
    - Intra-op exam, LN sampling

LN involvement

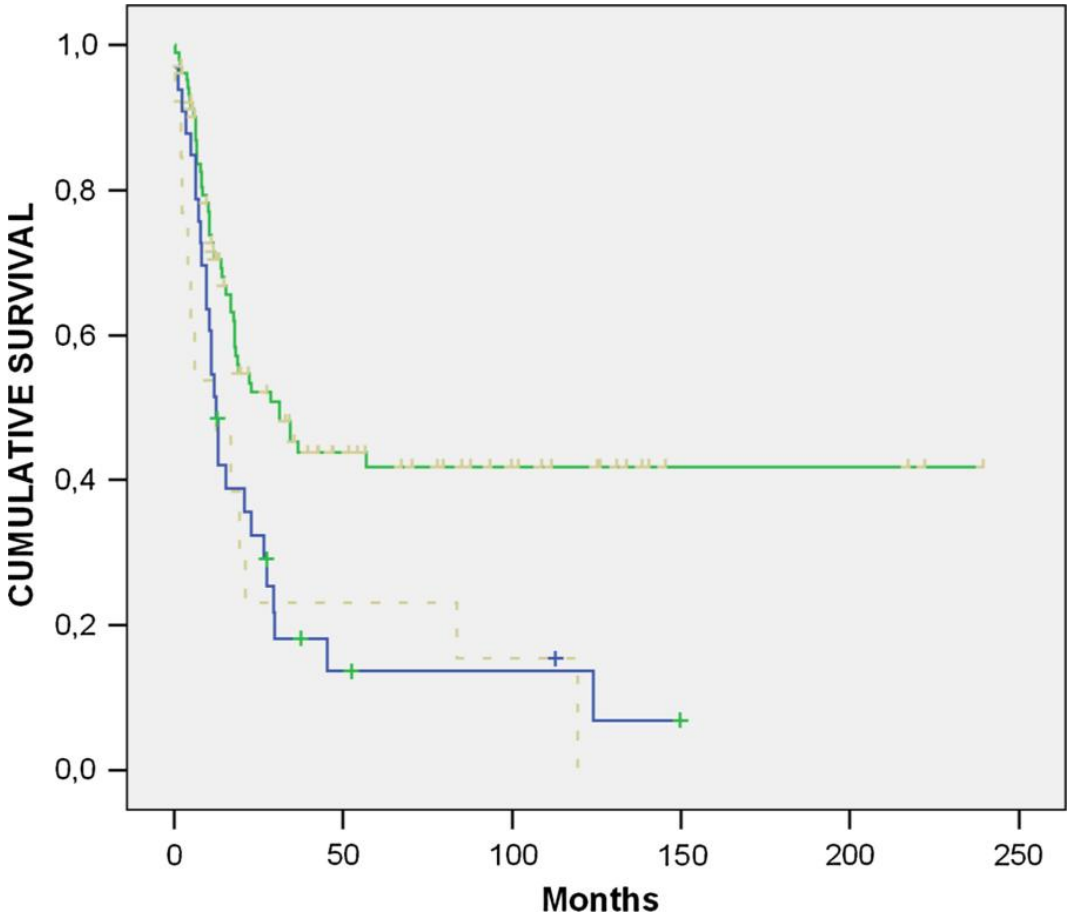
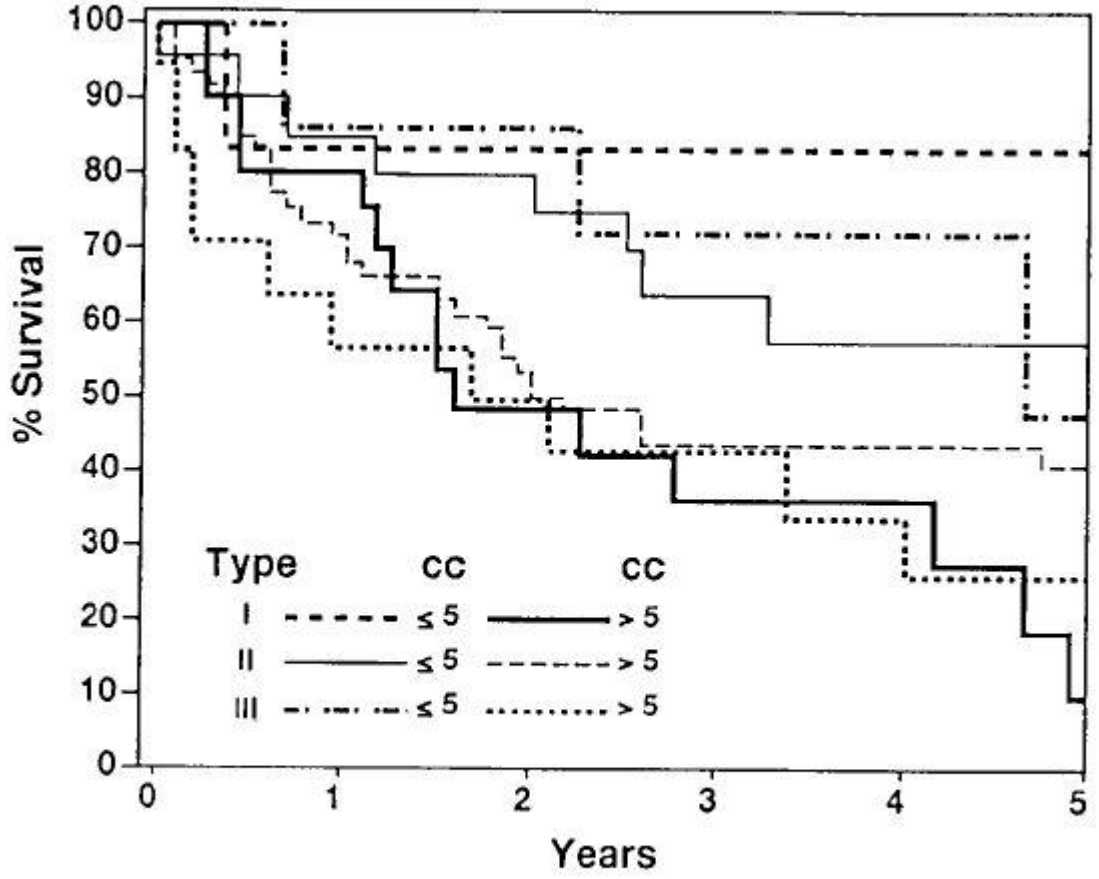


Fig 1. Kaplan-Meier curve (OS) depending on pelvic lymph node state: negative (green) versus positive (blue). The yellow line indicates missing values. (Chiantera et al., 2014)

Tumor size 5cm



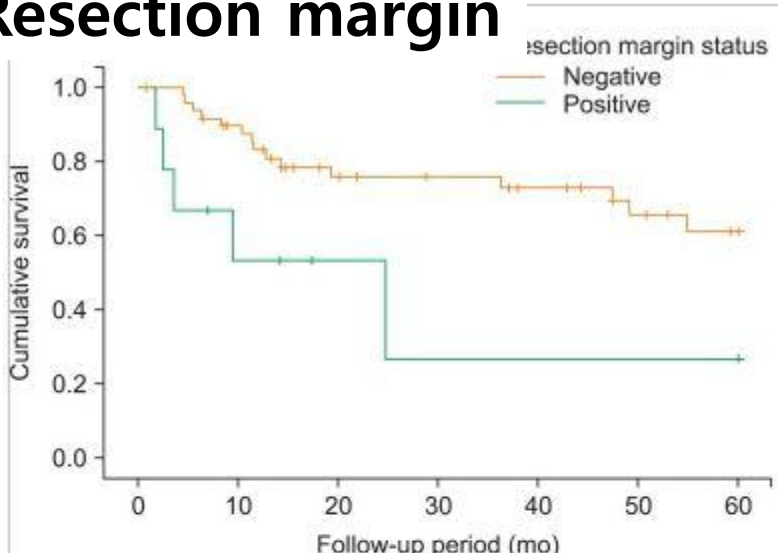
< 5cm

> 5cm

FIG. 4. Survival rates of patients who had types I, II, and III pelvic exenteration, by tumor volume (5 ml or less or more than 5 ml).

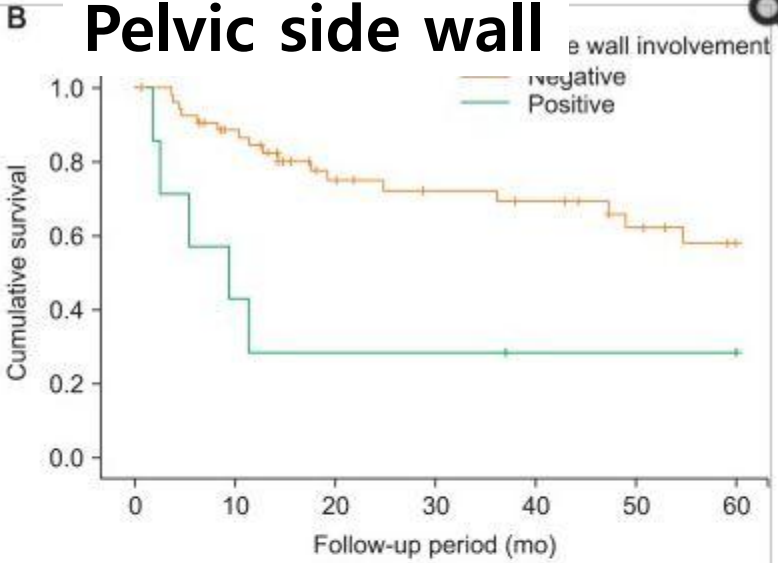
Hockel et al., 2006

Resection margin

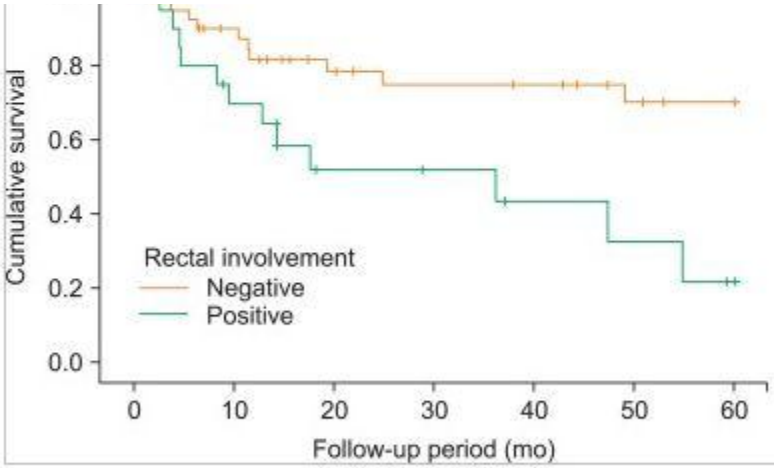


B

Pelvic side wall



Rectal involvement



Yoo et al., 2012

Overall survival by resection margin status (negative margin, n=52 vs. positive margin, n=9) (A); pelvic side wall involvement (negative, n=54 vs. positive, n=7) (B); and rectal involvement (negative, n=41 vs. positive, n=20) (C) after adjustment for resection margin status, pelvic side wall involvement and rectal involvement (Cox regression model, p=0.043, p=0.037, and p=0.044, respectively). In 2007, 33 out of 61 present cases were analyzed and reported.

Resection margin, Lymph node

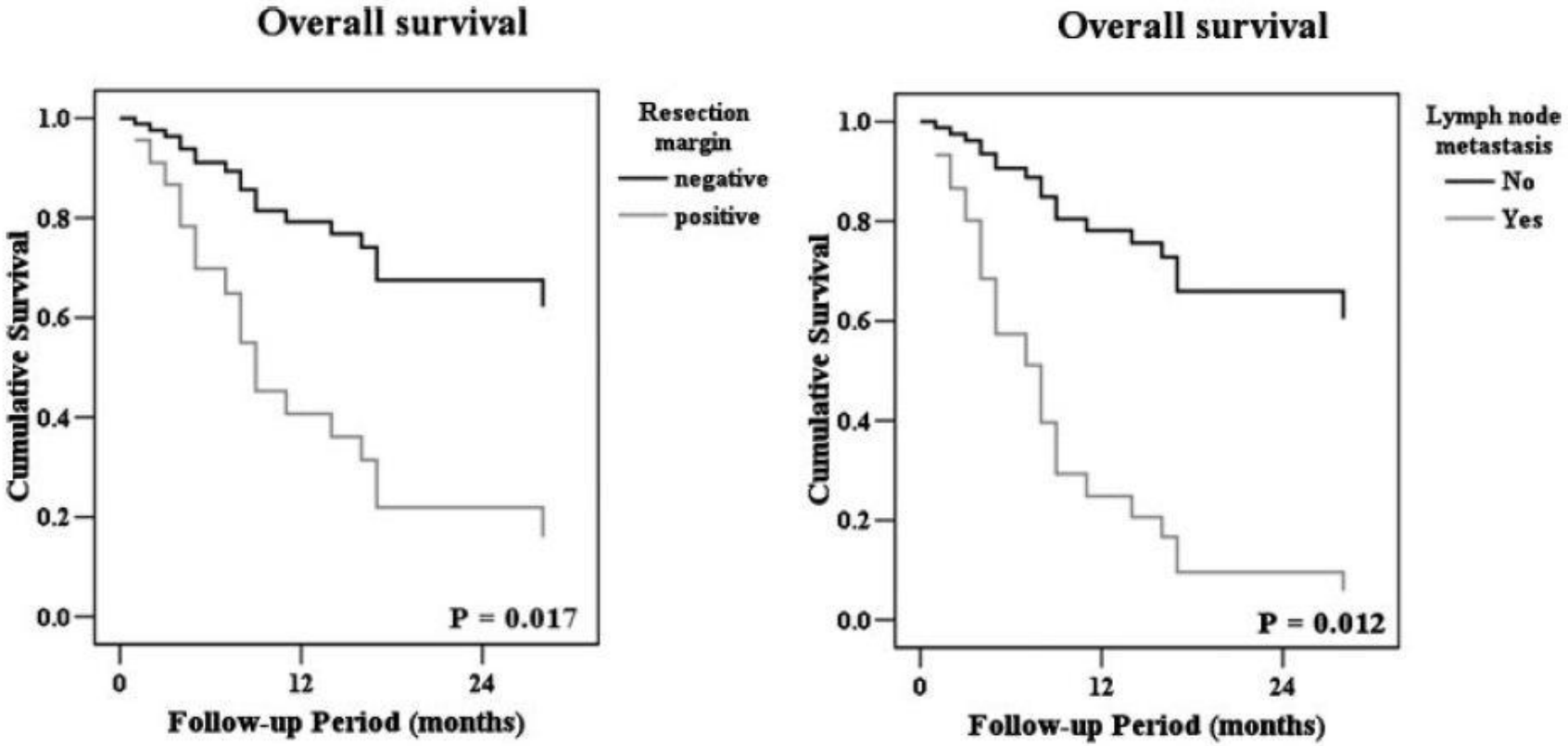


Fig. 2. Overall survival by the resection margin status (left) (negative margin, n = 37 vs. positive margin, n = 7) and lymph node metastasis (right) (negative, n = 40 vs. positive, n = 4) after adjustment for tumor size, bladder wall invasion, status of resection margin, and lymph node metastasis (Cox regression model, $P = 0.017$ and 0.012, respectively).

JY Park et al., 2007

Selection of Patient for PE

- **Ix of pelvic exenteration**
  - Centrally persistent or recurrent cervical cancer
    - Endomet ca, vulvar ca, rectal ca, ov ca
    - Curative vs Palliative
  - R0 resection
    - R1; micro residual
    - R2; macro residual

Limiting Factor against R0

- **Intra-abdominal disease**
  - Peritoneal meta, PALN (+)
- **Pelvic side wall infiltration sign (+)**
  - Rigidly fixed pelvic side wall
    - Palpation under anesthesia

    ->LEER?
  - Hydronephrosis proximal of the uretero-vesical junction

    ->LEER?
  - Leg edema
  - Sciatic pain

Selection of Patient for PE

- **KCCH guideline**
  - Persistent or recurrent after RT or CRT
    - No distant meta
      - PET (-)
    - Tumor size $\leq$ 5cm
    - No pelvic, paraortic LN

Surgical Issues of PE/LEER

Surgical Technique of PE

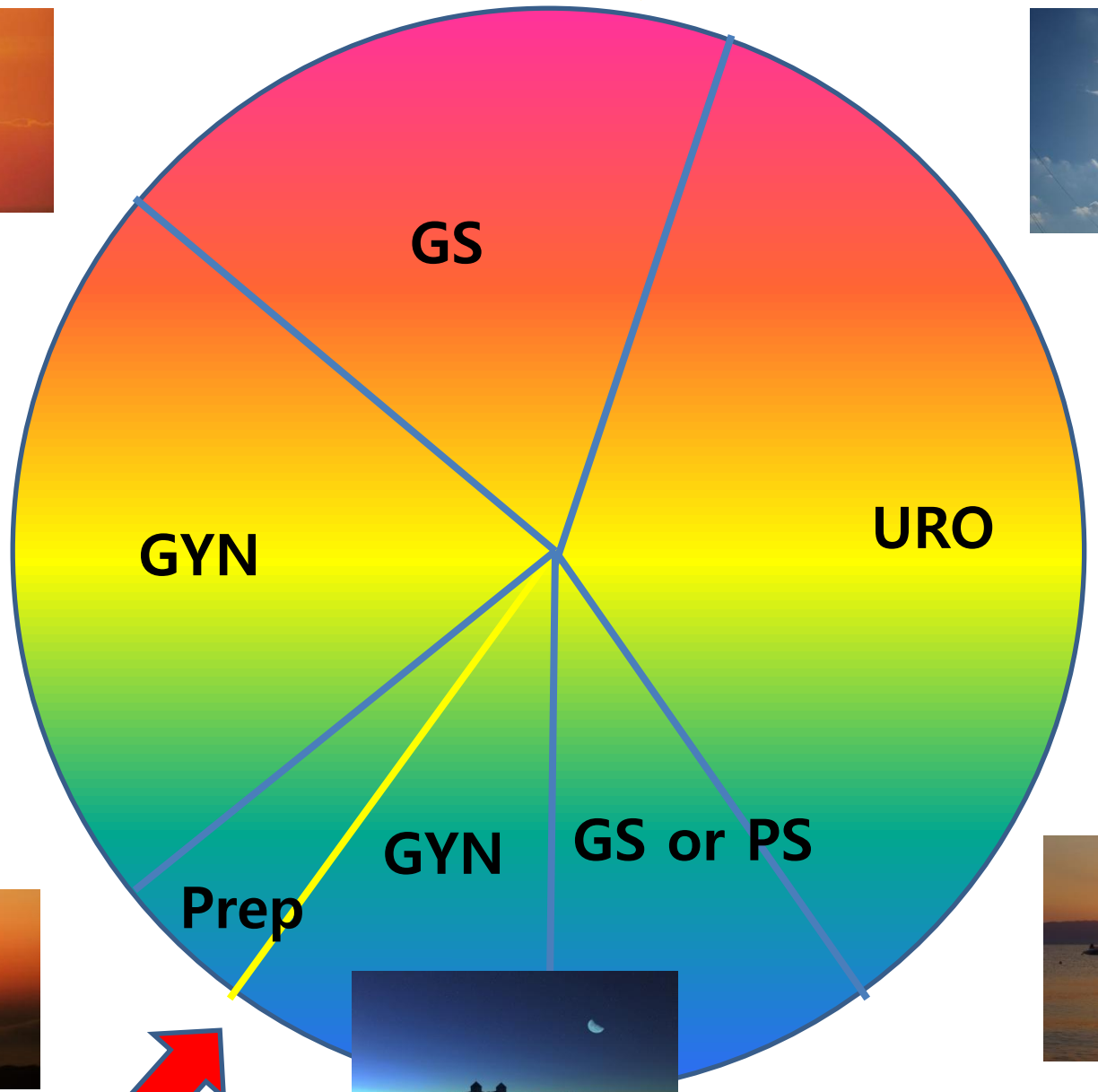
- **En bloc removal of pelvic viscera**
  - **Explorative phase**
    - Midline incision
    - Peritoneal seeding, systemic dissection of PALN
    - Explore lateral resectability
  - **Ablative phase**
    - Abdomino-perineal resection of the rectum
    - Hystero-colpectomy
    - Cystectomy
  - **Reconstructive phase**

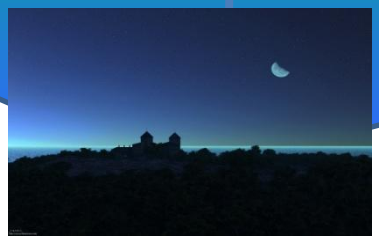
Pre-op Evaluation of PE

- **Pre-op evaluation**
  - USG, Cystoscopy, Colonoscopy
  - MRI, CT
  - PET(?)
    - PET/MRI
  - Laparoscopy

Ablative phase of PE

- **Original description (Brunschwig 1948)**
  - **Abdominal phase**
    - Low midline incision
    - Ovarian ligament ligation, Pelvic LND
    - Hypogastric a. v. ligation near common iliac bifurcation
    - Mesosigmoid dissection over common iliac
    - Bladder/ureter dissection, implant
    - Low colon dissection
  - **Perineal phase**
    - Vaginal and anal incision/ dissection
    - Pelvic tissue removal
    - Perineal closure, Drainage
  - **After Care**


GS
URO
GYN
GS or PS
GYN
Prep



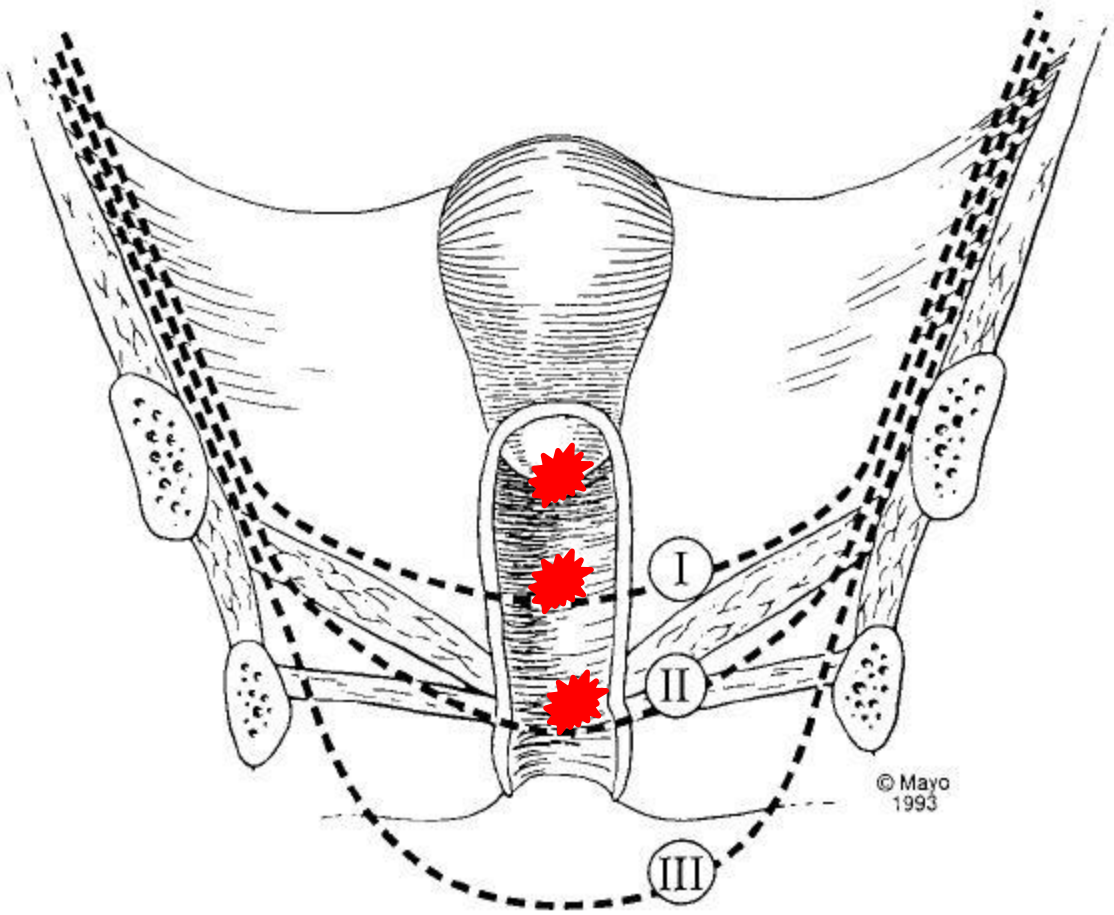


FIG. 1. Extent and level of resection of pelvic tissues of the three different types of pelvic exenterations: (I) supralevator, (II) infralevator, and (III) infralevator with vulvectomy (by permission of Mayo Foundation).

FIG. 3. *Photograph of surgical specimen consisting of all pelvic viscera (Case 3) removed* en masse *for recurrent squamous-cell carcinoma of cervix,* C, *that has produced* V, *vesicovaginal fistula, and has invaded the wall of the pelvic colon with* P, *production of papillomatous growth into the lumen of the bowel.* A, *Anus;* I, *vaginal introitus;* U, *urethra;* C, *clitoris;* B, *urinary bladder;* M, M', M'', *entire anal, pelvic, and most of sigmoid colon.*

Reconstruction of PE

- **Reconstructive phase**

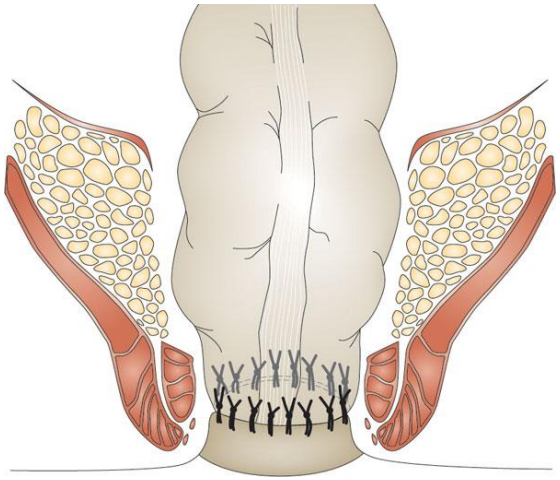
    1. Bowel reconstruction

    2. Urinary reconstruction

    3. Pelvic floor reconstruction

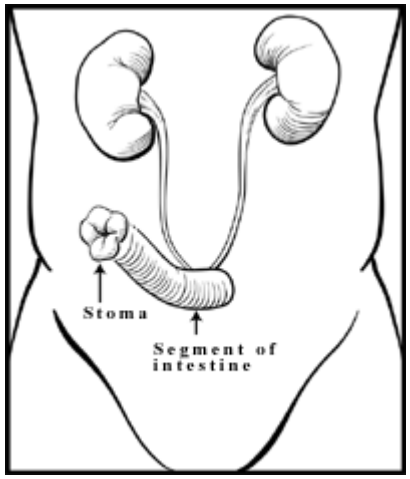
1. Bowel Reconstruction

- **Permanent end colostomy**
- **Colo-anal anastomosis (CAA)**
  - Colonic J-pouch CAA

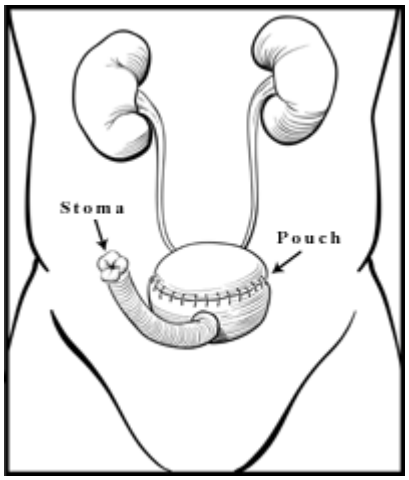


2. Urinary Reconstruction

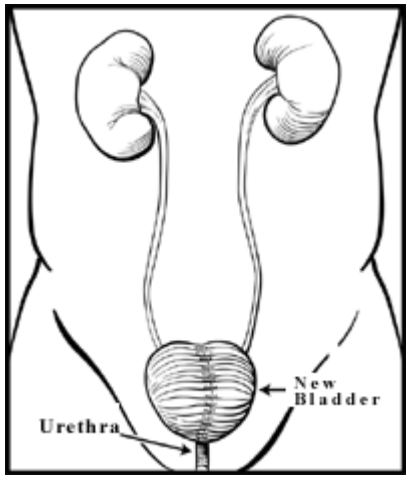
- **Wet colostomy** Brunschwig (1948)
- **Ileal loop conduit** Briker (1950)
  - Less demanding technically
- **Continent urinary reservoirs**
    - Higher complication, less acceptable to pts
  - Miami pouch (Bejany and Politano 1988)
    - Distal ileum and ascending colon
  - Ilieal orthotopic neobladder
    - Intact urethra, pudendal nerve



Ileal Conduit Urinary Diversion: A segment of the intestine directs urine through a stoma into an external collecting bag.

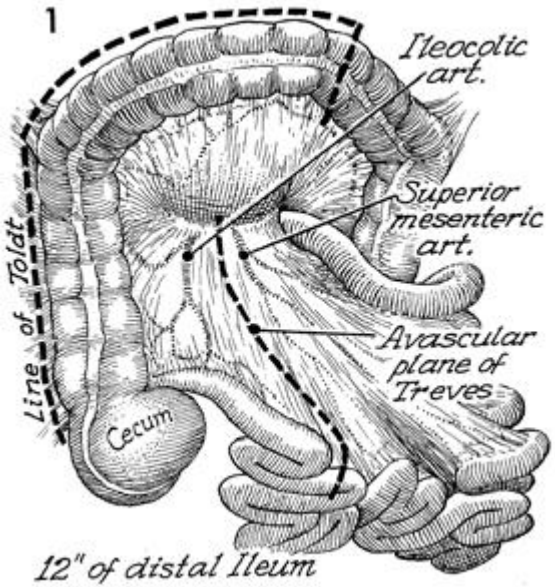


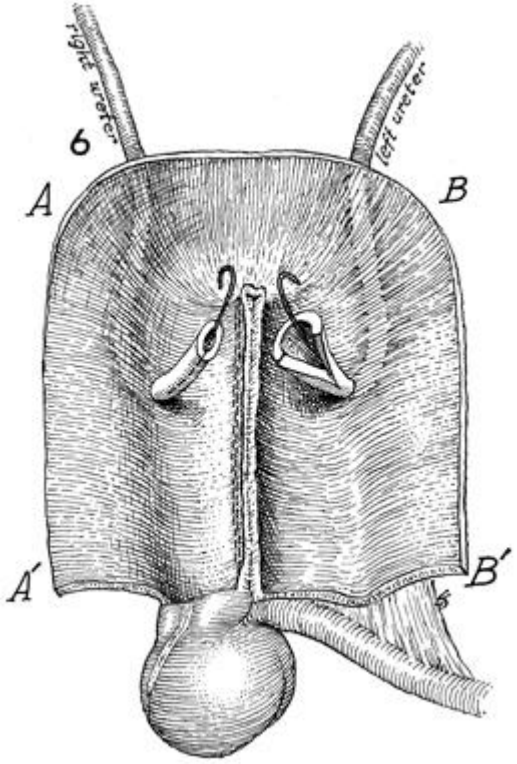
Indiana Pouch Reservoir: A pouch made out of portions of intestines stores urine until it is drained via a catheter inserted through the stoma.

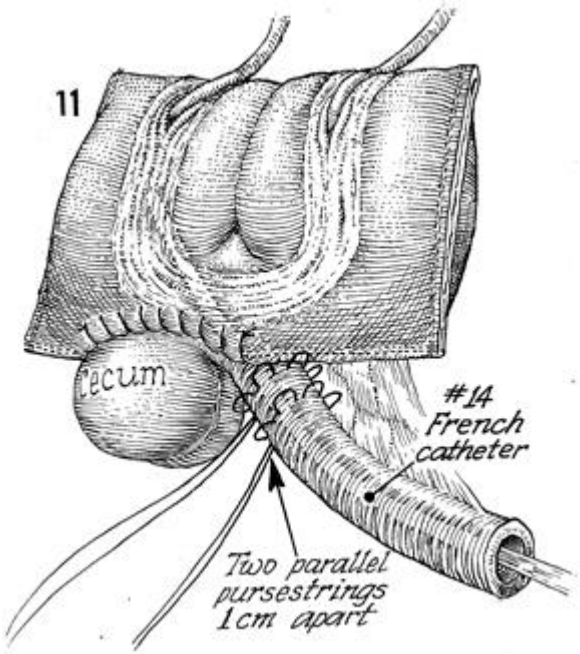


Neobladder to Urethra Diversion: Intestine is made into a reservoir and connected to the urethra

Miami Pouch


1
Ileocolic art.
Superior mesenteric art.
Avascular plane of Treves
Line of Toldt
Cecum
12" of distal Ileum


6
right ureter
left ureter
A
B
A'
B'


11
Cecum
#14 French catheter
Two parallel pursestrings 1cm apart

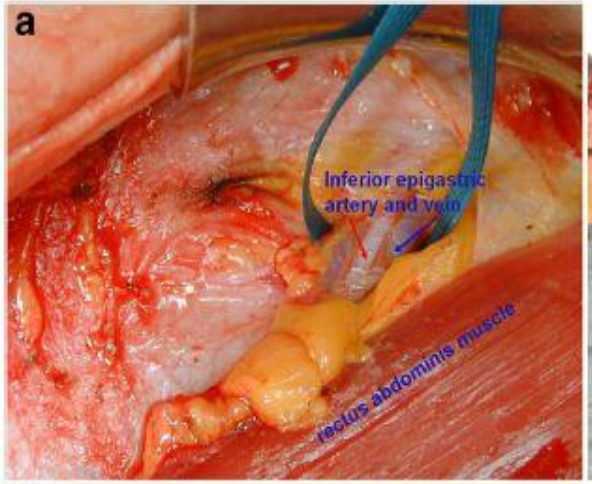
3. Pelvic Reconstruction

- **Why Flaps?**
  - Prevent abscess and fistula formation
    - Rectus abdominis, Gluteus maximus, gracilis, omentum

1. Vertical rectus abdominis myocutaneous (VRAM)

- Greater bulk, vascularity on a long pedicle
- Noninterference with colostomy or urinary diversion
- Same midline incision

2. Omentoplasty



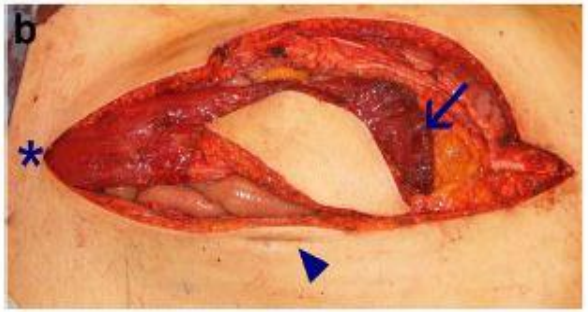
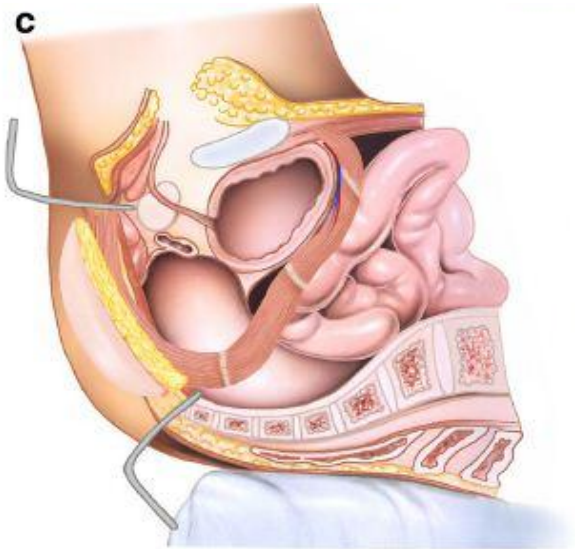
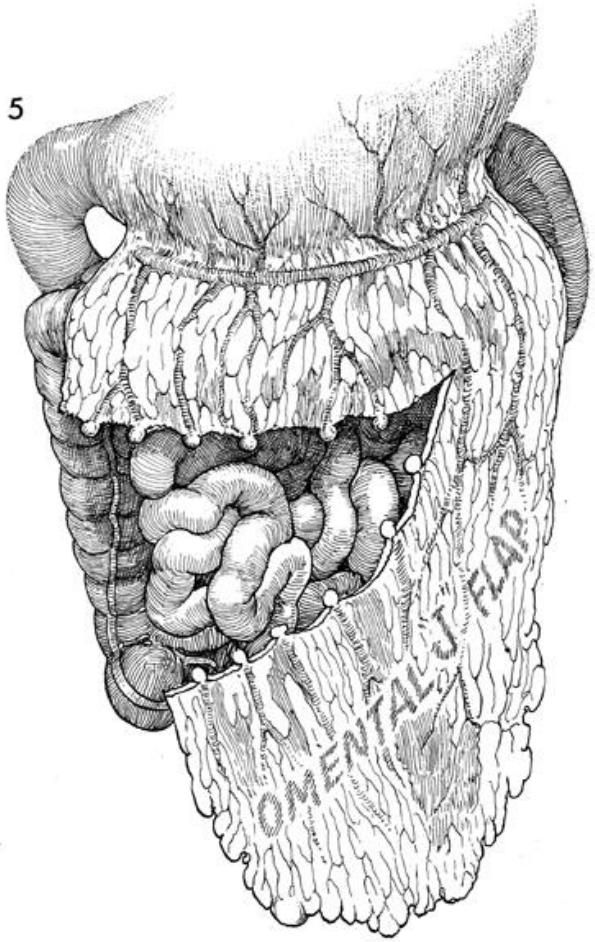


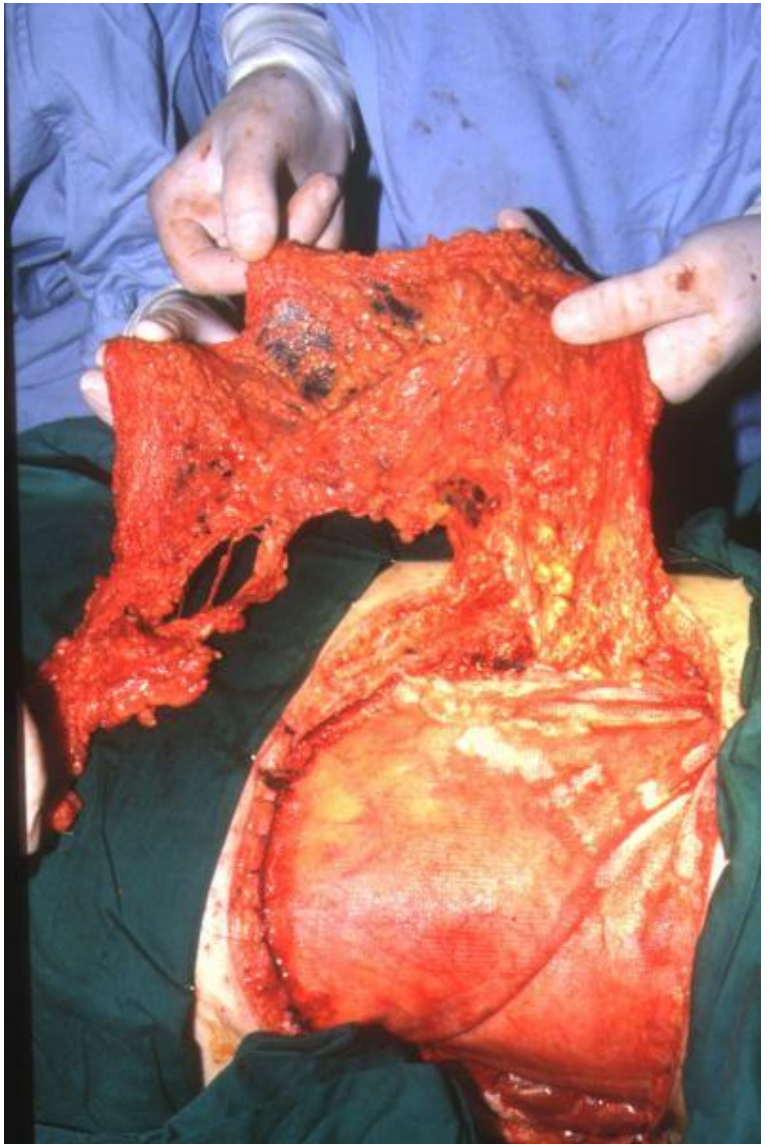
Fig. 1 **a** Dissection of the deep inferior epigastric vessels is carried out first to ensure vessel integrity before harvesting of the VRAM flap. **b** Typical situs after harvested of VRAM flap from right side with cranially desinserted rectus muscle (*arrow*), umbilicus (*arrowhead*) and caudal muscle insertion still in situ (*asterisk*). **c** Harvest of VRAM flap completed with visualisation of epigastric vessels (*arrow*) and pyramidal muscle insertion part at symphysis still left intact (*arrowhead*)

edge to the lowest point in perineum (**c**). **d** Intra-operative view of pulled through a VRAM flap with visible lower surface of rectus muscle



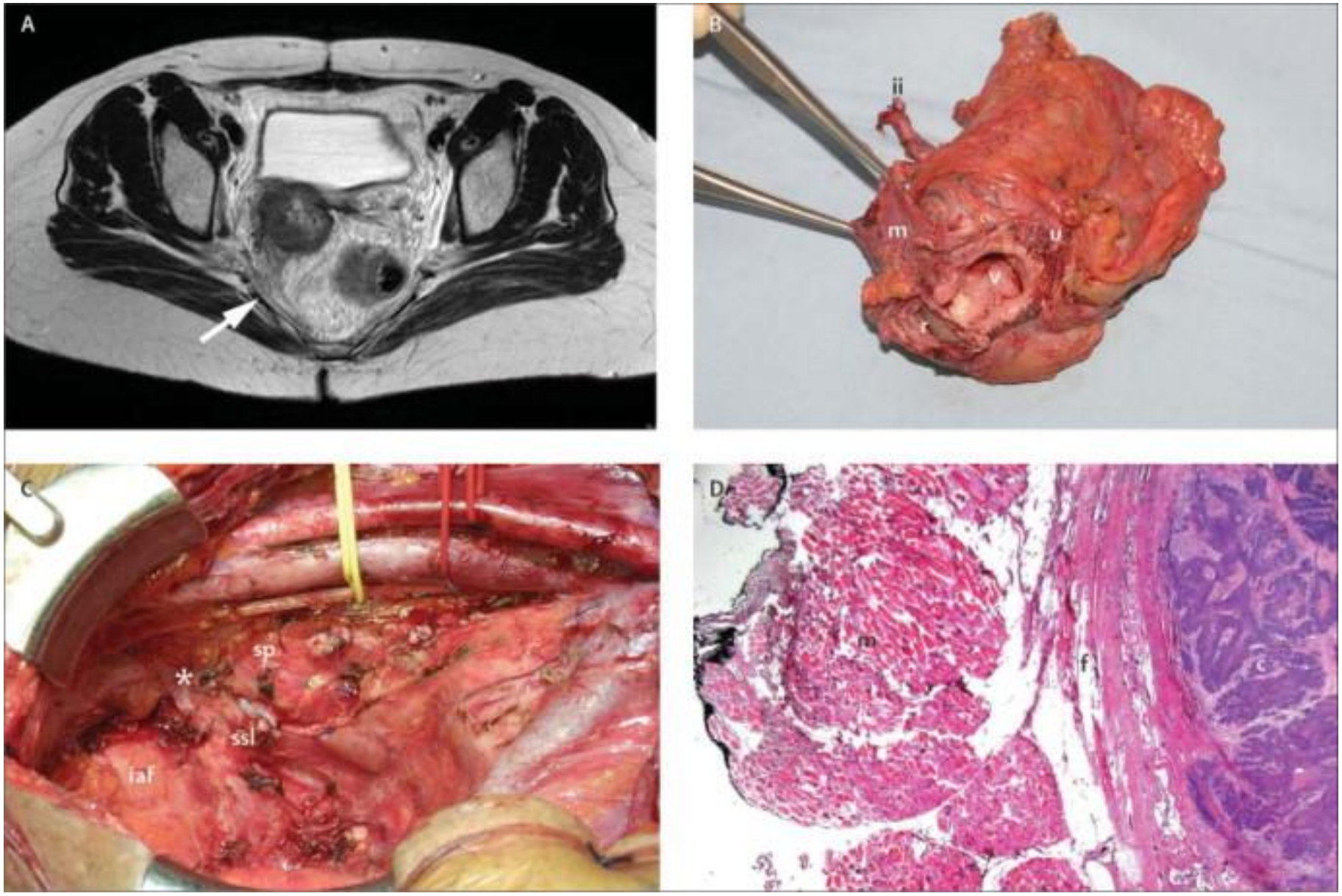
Omental Flap





Laterally Extended Endopelvic Resection (LEER)

- **R0 excision**
  - Lower pelvic side wall infiltration
    - Up to the level of obturator nerve~ischial spine
  - Resection any of endopelvic parietal structures
    - Paravisceral fat pad, internal illiac vessels, obturator internus muscle, pubococcygeus, iliococcygeus, coccygeus muscles
  - 97% (72/74) of R0 resection rate (Hockel, 2003)



Hockel, 2003

Laterally Extended Parametrectomy (LEP)

Groups	5-Year Overall Survival, %
Surgery, no adjuvant treatment (n = 492)	94.0
Stage IB1 (n = 324)	96.0
Stage IB2 (n = 168)	87.0
Two of 3 GOG 92/RTOG 87-06 intermediate risk criteria*† (n = 62)	88.0
SWOG 8797/GOG 109/RTOG 9112 high-risk criteria (n = 128)	
Lymph node positive (n = 70)	91.0
pIB1 (n = 26)	96.0
pIB2 (n = 16)	88.0
pIIA (n = 12)	100.0
pIIB (n = 16)	81.0
Upstaging, lymph node negative (n = 58)	88.0
Intermediate risk + high risk (n = 190)	90.0

*GOG 92/RTOG 87-06 intermediate risk criteria[10]: tumor diameter greater than 4 cm, invasion greater than 1/3 of the cervical stroma, lymphovascular space involvement.

†These patients did not meet SWOG 8797/GOG 109/RTOG 9112 high-risk criteria[8]: stage pIB, lymph node negative, R0.

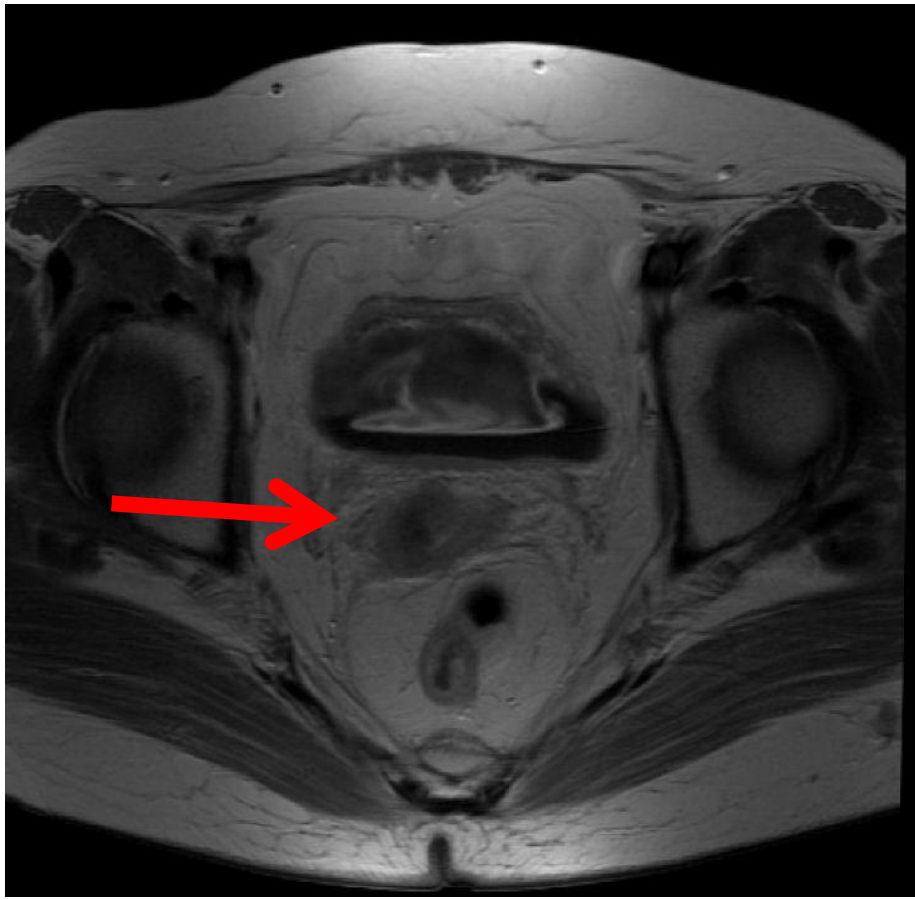
Ungar et al. 2012

KCCH Experience of PE

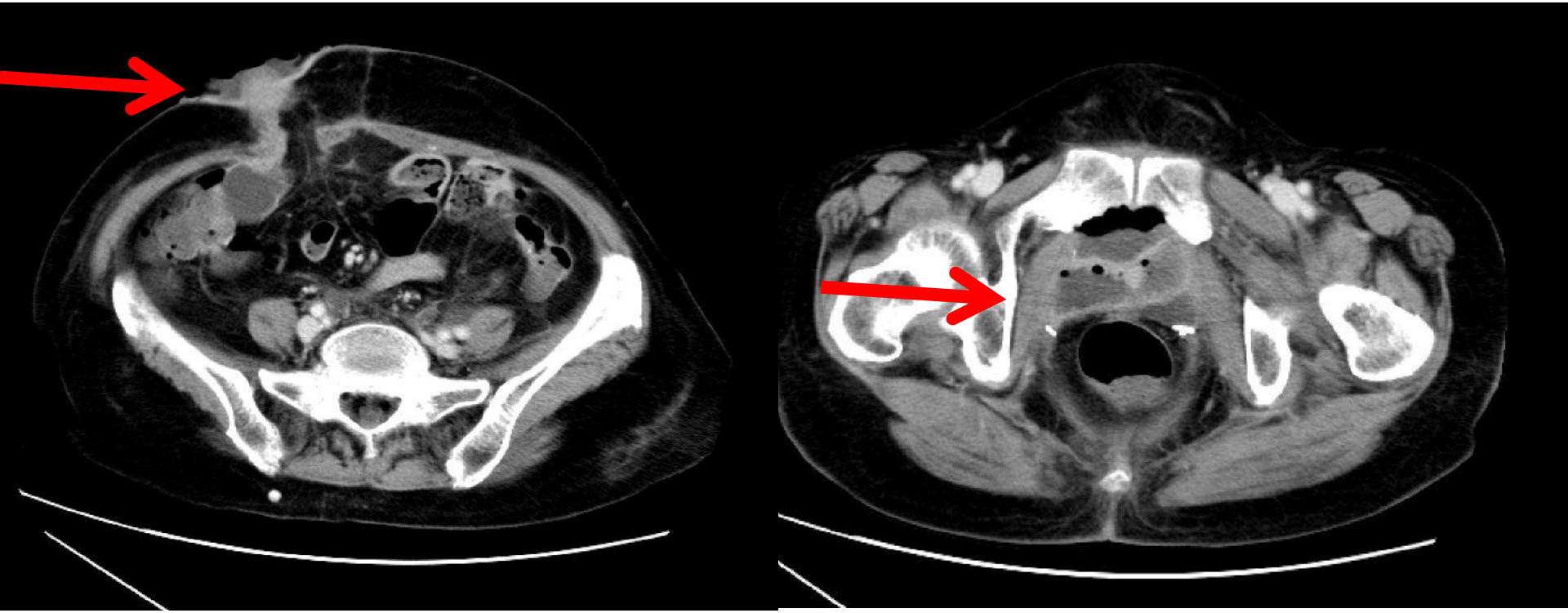
- All recurrent or persistent cervical cancer
  - 1-2 cases/year
- Ant PE: Total PE=1:1
  - Mostly ileal conduit
  - Omental flap/VRAM flap/Gracilis flap
- 5 YSR 50%
  - 1 mortality case (my 1st patient)

KCCH Case 1

- 2004 Cx ca IIB CRT
- 2006 Recurr
  - >Ant extenteration



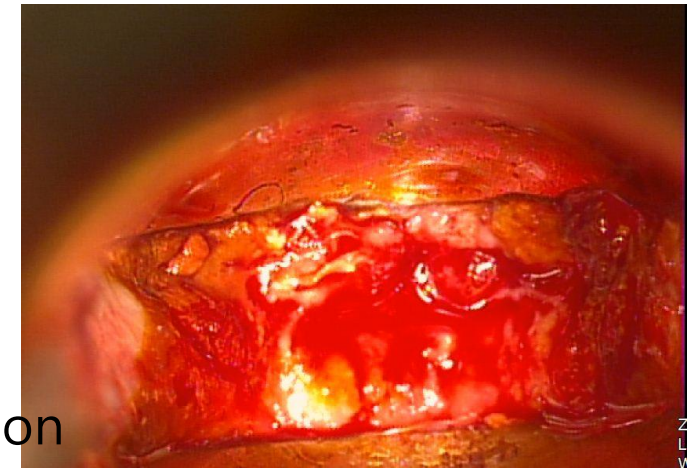
KCCH Case 1; post-op status

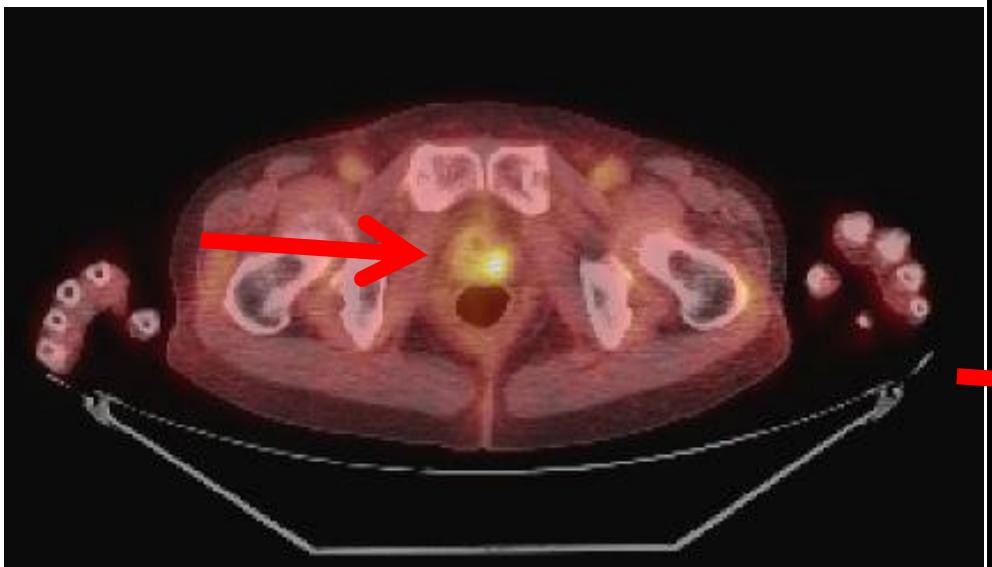


KCCH Case 1 F/U; NED 7 years later

KCCH Case 2

- 2006.7 Cx ca IIA1
  - >RH, CRT
- 2007. 7 stump recur
  - > HDRx 4
- 2008.2 stump bx; SCC
  - > HDRx4
- 2009.2 Total exenteration



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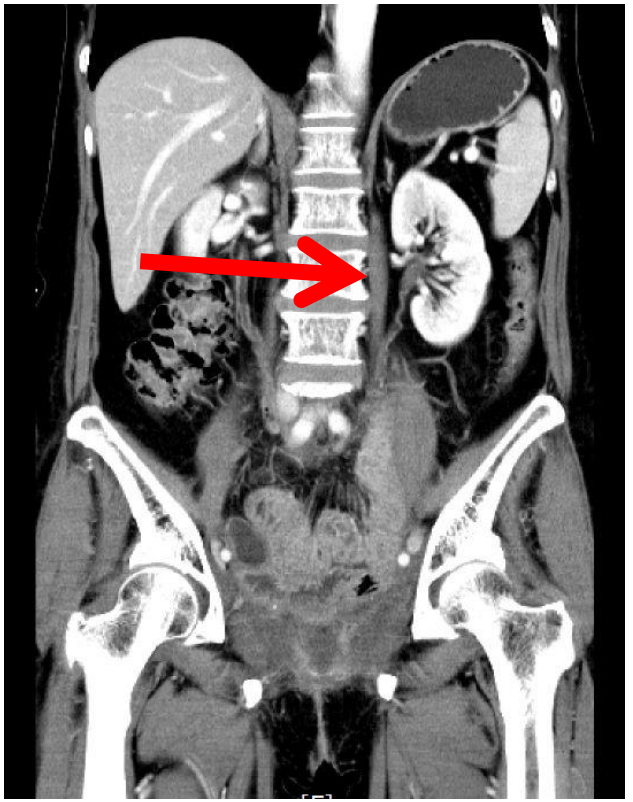
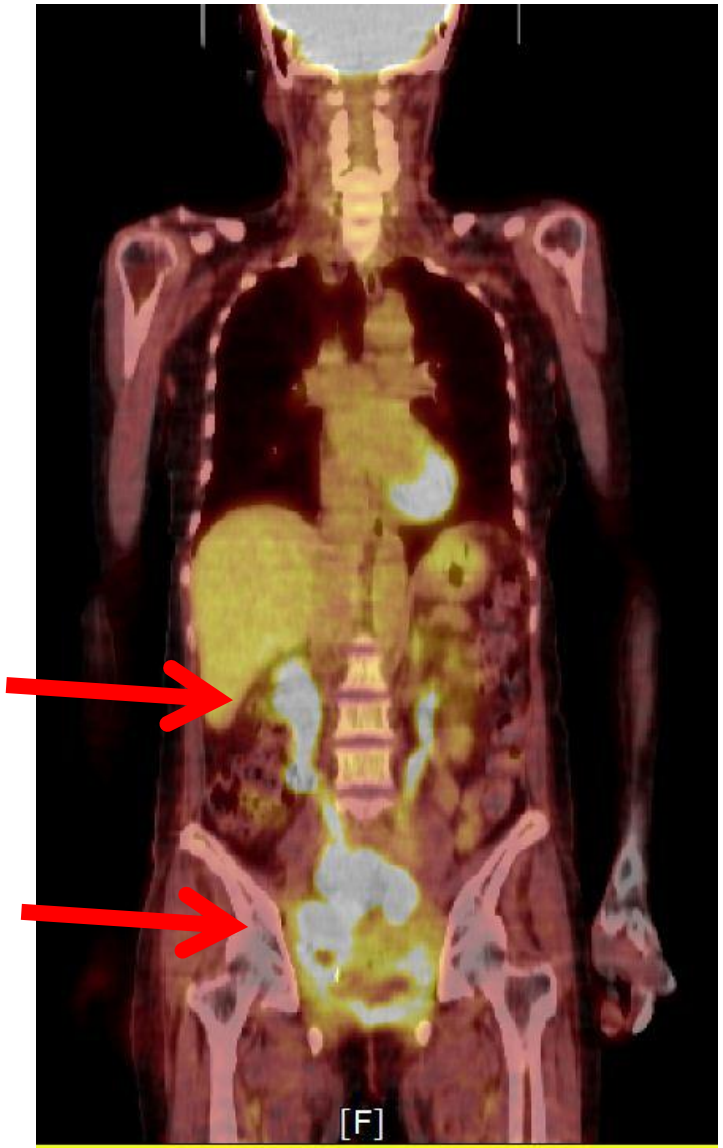


KCCH Case 2 f/u

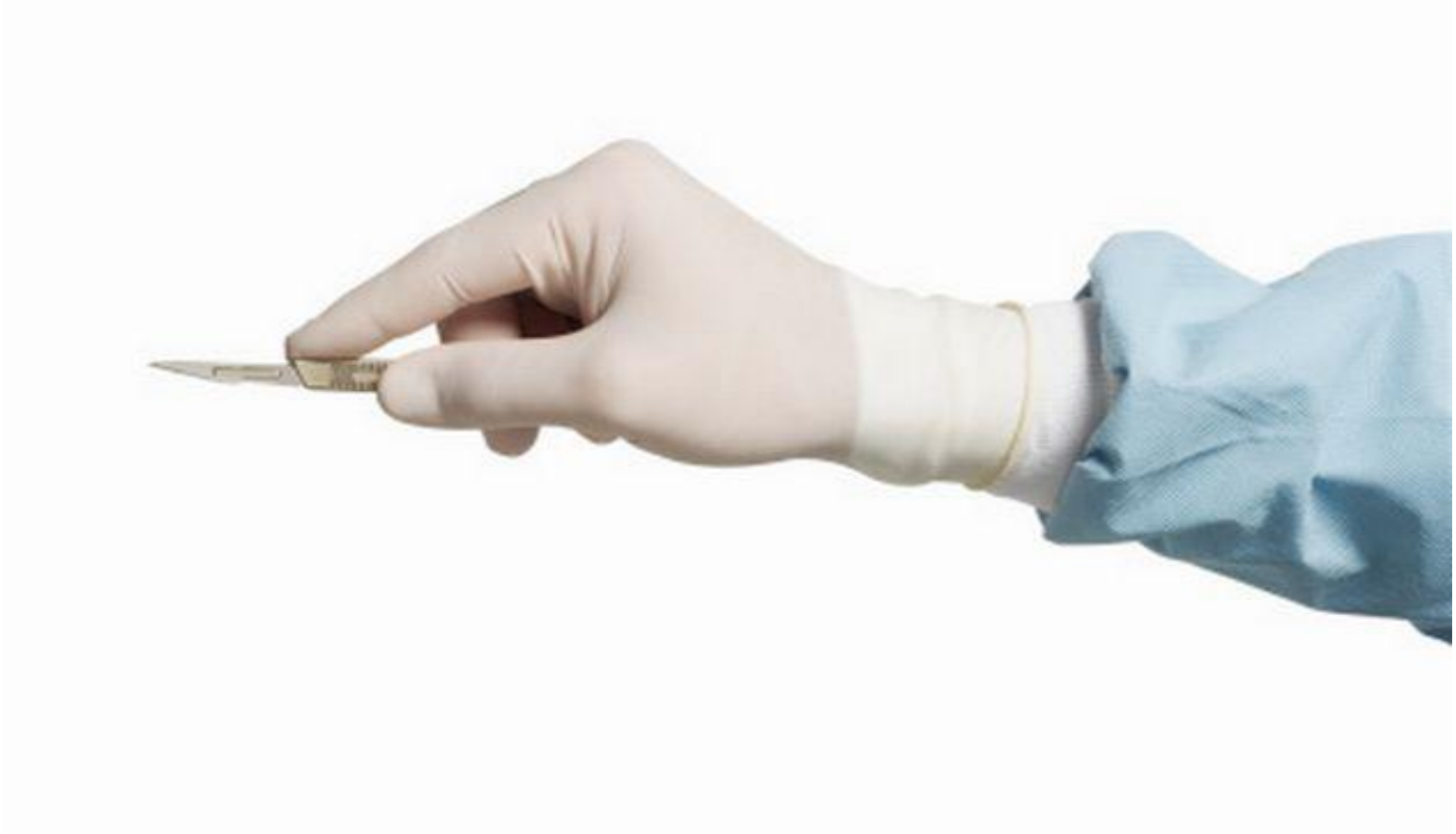
- 2009. 12 Taxol-Carbo #6
- 2010.9 pelvic recur
  - >Rapid Arc
  - >Topo-CDDP#6
- 2012. 11 expired



Summary

- **Pelvic extenteration/LEER**
  - Improved mortality but not morbidity
    - < 5% mortality, 50% morbidity,
  - Progress of surgical technique
    - Urinary diversion
    - Anterior exenteration
  - Last chance for cure
    - 20-73% (50%)
  - Careful patient selection
    - Balance btw QOL and survival gain
    - Worse body image and function
    - Experienced team approach

Not by hand, but by mind.



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  - 김태훈, 김문홍, 김법종, 최석철
  - Intern, Residents and Fellows
  - CRCs and PAs
- KCCH GS Staffs
  - 신의섭, 문선미, 진성호, 조응호
  - Residents and Fellows
- KCCH Urology team
  - 조문기, 박종욱, 송강현, 김종원
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  - 이용석, 이지희, 이수남, 이은주,이소영, 이지연
- KCCH Radiology team
  - 김기환
- KCCH ICU team