Comprehensive pelvic and high aortic lymphadenectomy

- IM and IR aortics.
- Total hysterectomy, BSO
- Incidental appendectomy
- Pelvic lymphadenectomy
- Omentectomy if UPSC

In Vivo Studies on the Lymphatic Drainage of the Human Ovary

EDUARD EICHLER, M.D., and EDWARD R. BOVE, M.D.
**InfraRenal IR** nodes: uterus, ovarian vessels drain to these nodes.

**InfraMesenteric:** uterine, ovarian vessels down to ureter.

**Pelvic:** Uterine and cervical drainage. From ureter and sacrum to the circumflex iliac vein crossing Ext Iliac.

**Aortic nodes:** renal vein down to ureter crossing Iliac. **IM+IR**
Lymphatic mapping of ovaries

- Carbon particles, 20 nm, 1 ml, injected into ovarian cortex with 23g needle, nodes resected 10 minutes later.
- 91% nodes + from IMA to RV, around IMA 36%, below IMA in 36%, CI in 26%, and EI in 9%.
- Left: exclusively above IMA, bilateral 33%.
- Right: right common iliac artery, bilateral 60%.

Lymph node metastasis in apparent early-stage epithelial ovarian cancer

![Diagram showing lymph node metastasis]

Powless et al, 2011 Gyn Onc

<table>
<thead>
<tr>
<th>Subtype</th>
<th>Total +PA</th>
<th>% of PA + IR</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-IV Ov Ca(^1)(n=276)</td>
<td>40%</td>
<td>63% (bil, contra, L&gt;R)</td>
</tr>
<tr>
<td>III, IV Ov Ca(^2)(n=110)</td>
<td>43%</td>
<td>79%</td>
</tr>
<tr>
<td>III-IV PPSC(^4)(n=19)</td>
<td>58%</td>
<td>72% (esp. left)</td>
</tr>
<tr>
<td>I-III Ov Ca(^5)(n=69)</td>
<td>12%</td>
<td>50%</td>
</tr>
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4. Dubernard et al Gynecol Oncol, 2005
5. Chang et al, J Gynecol Oncol, 2013
50% of the responding gynecologic oncologists stop the aortic LND at the IMA, potentially limiting the effectiveness of detecting positive para-aortic nodes.

Soliman et al Gyn Onc 2010

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Lymphadenectomy during endometrial cancer staging: Practice patterns among gynecologic oncologists

Pamela T. Soliman, Michael Frumovitz, Whitney Spannuth, Marilyn J. Greer, Sheena Sharma, Kathleen M. Schmeler, Pedro T. Ramirez, Charles F. Levenback, Lois M. Ramondetta

Defining the upper border of a para-aortic lymph node dissection based on year of fellowship completion ($p = 0.02$).

<table>
<thead>
<tr>
<th>Year of fellowship completion</th>
<th>IMA</th>
<th>Between the IMA and the renal vein</th>
<th>Renal vein</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1979</td>
<td>7 (27%)</td>
<td>11 (42%)</td>
<td>4 (15%)</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>1980–1989</td>
<td>31 (43%)</td>
<td>27 (37%)</td>
<td>12 (16%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>1990–1999</td>
<td>46 (43%)</td>
<td>46 (43%)</td>
<td>9 (8%)</td>
<td>6 (6%)</td>
</tr>
<tr>
<td>2000 or later</td>
<td>87 (63%)</td>
<td>36 (25%)</td>
<td>12 (9%)</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Total</td>
<td>171 (50%)</td>
<td>120 (35%)</td>
<td>37 (11%)</td>
<td>17 (5%)</td>
</tr>
</tbody>
</table>

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ABSTRACT

The fate of ink and viable lymphoid cells placed in the wall and the lumen of the cycling rat uterus was determined. India ink injected into the myometrium rapidly filled major lymphatic trunks, going to the ipsilateral renal and/or iliac lymph nodes, depending on the site of inoculation along the uterus' length. No other abdominal or thoracic nodes seem to be involved. However, ink injected into the uterine lumen penetrated the endometrial stroma very slowly and only scattered dye-containing phagocytic cells could be seen in draining nodes. Ink-laden macrophages were retained for at least several days in the endometrium. Lymphoid cells similarly injected were
Lymphatic mapping of uterus - 3 regions:

**Fundus:** through ovarian channels to aortic nodes, some along External Ileac, near round ligament, to lumbar pelvic lymph nodes

**Body:** through broad ligament to external iliac nodes

**Cervix:** through internal iliac and sacral lymph nodes

Head & Lande, Biol. Reproduction, 1983

Intraabdominal Lymphatic Mapping to Direct Selective Pelvic and Paraaortic Lymphadenectomy in Women with High-Risk Endometrial Cancer: Results of a Pilot Study

THOMAS W. BURKE, M.D., CHARLES LEYENDECKER, M.D., CARMEN TORGOS, M.D., J. TAYLOR WHARTON, M.D., AND DAVID M. GREENBERG, M.D.

Department of Gynecologic Oncology and *Division of Pathology, The University of Texas M.D. Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, Texas 77030

All dye-containing paraaortic nodes were clustered just below the level of the renal vessels. Once obvious nodal metastases are established, the involved nodes may no longer filter lymph, thereby altering the usual lymphatic drainage routes. Lymphatic mapping may not be applicable in such situations.
Of 72 cases of Stage I-II carcinoma, with dissection of all six nodal packages:

- 15 positive PEL nodes, 10 had positive IM and 8 had positive IR
- 57 negative PEL nodes, 4 had positive IM and 2 had positive IR
- Among all 14 with positive IM nodes, 10 had positive IR nodes.
- 24% stage I or II endometrial, 12% with ovarian/tubal were upstaged from lymphadenectomy alone (O'Hanlan et al, SGO poster, 2013)

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Overall rate of aortic mets: (11%)
Among 49 with +PA any:
IR+ only: 36%
IR+ any: 82%

- Lymphadenectomy to IMA misses 88% of +nodes.
Infrarenal lymphadenectomy for gynecological malignancies: Two laparoscopic approaches

Katherine A. O'Hanlan *, Margaret S. Sten, Michael S. O'Holleran, Niesha N. Ford, Danielle M. Struck, Stacey P. McCutcheon

Infrarenal lymphadenectomy yields more nodes in the aortic bifurcation.

- Lymphadenectomy to the renal veins revealed occult metastases in 33% of patients.
- High aortic node dissection may improve survival by signaling enhanced therapy.

Endometrial and Ovarian Cancer

Overall rate of aortic mets: 24/72 (33%)

When IM nodes +, 63% of endometrial and 80% of ovarian cancer patients had IR metastases.

5% had +IR despite 6–16 negative IM nodes and no other metastatic foci.

O’Hanlan et al, Gyn Onc 2015
Aortic nodes yields and metastasis rates above / below the IMA in clinically low stage carcinoma

- n=71 had LND from DCIV to RV’s.
- All clinically early by exam and radiology.
  - Median #nodes: Pel 24, IM 11, IR 14.
  - Among 29 +Pel, 45%+IM, 38%+IR.
  - Among -Pel, 5%+IM, 2%+IR.
- Among 17 +IM nodes, 59% +IR nodes.
- 2 had +IR nodes, and -IM nodes.

O’Hanlan et al SGO abstract 2013

Staging aortics in endometrial ca

- N=671. 325 had PEL only and 346 PEL+PA LND to renal veins, chemo to high risk:

<table>
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<tr>
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<th>PelLND only</th>
<th>Pel+PALND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recur aortic retroperitoneum</td>
<td>10.5%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Given chemo, recur aortics</td>
<td>9.5%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Given chemo, DFS at 5 yrs</td>
<td>64%</td>
<td>84%</td>
</tr>
</tbody>
</table>

- 20% higher survival at 8yrs when PA nodes dissected from intermediate or high risk patients.
- Chemotherapy also independently significantly improved survival, but not radiation.

We still need to be able to perform comprehensive laparoscopic lymphadenectomy

- Sentinel applies only to stage I.
- Sentinel applies only for normal nodes.
- Sentinel does not light aortics.
- Must dissect aortics when sentinel + (40%+).
- Aortic dissection should extend to renals, as IR nodes are + 50-80% when +PA.

- Staging early ovarian/tubal carcinoma.
Cervical Cancer

- Inframesenteric aortic and presacral node debulking improves survival.
  Cosin et al, Cancer 1998
- GOG: Transperitoneal more bowel adhesions.
- Extraperitoneal lymphadenectomy effective.
  Lowe et al, Gyn Onc 2008

Infrarenal Aortic Lymphadenectomy

- **My Indications, for now:**
  - Endometrial: any G3, deep G2, at least.
  - Ovarian malignancy: any.
  - Cervical Ca: when pelvic nodes are positive.
  - Isolated recurrence of cancer.
  - Whenever pelvic nodes are involved and thorough debulking would confer a survival advantage.
Debulking a left aortic node
• Left kidney higher than right—slightly more space.
• Accessibility:
  – Aorta not easily compressible--can’t get to the left nodes from the right.
  – Vena Cava lifts nodes anteriorly for accessibility from left.
Are the nodes attached???
Left Infrarenal Aortic Node Dissection: Why from the Left????

- Left kidney higher than right--more space.
- Accessibility:
  - Aorta not easily compressible--can’t get to the left nodes from the right.
  - Vena Cava lifts nodes anteriorly for accessibility from left.
- In early Ca Cervix: left more often involved.
- I’m always on the left!!! (joke)

Start intraperitoneal

- Diagnostic laparoscopy. Explore.
- Observe LLQ through intraperitoneal scope.
- Left McBurney’s Incision, 3cm long:
  - 2 cm medial and 2 cm up from ASIC
  - Open two layers of fascia with open-spread technique using Kelly. Palpate both layers firmly attached to ASIC. Once in retroperitoneum, no attachment to ASIC. Sweep psoas fossa – confirms plane.
  - DO NOT PERFORATE PERITONEUM.
Start intraperitoneal

- Finger sweep-dissect peritoneum widely off abdominal wall, under direct observation (can insert next trocar onto finger)---to feel L common ileac.
- Insert 5mm trocar onto finger. Insert hernia trocar.
- Inflate. Sweep superiorly, inferiorly, and feel for Common Ileac.
- Insert 5mm trocar onto finger. Insert hernia trocar.
- Inflate.
Debulking pelvic nodes

Start of right retroperitoneal lymphadenectomy

Debulking a right obturator node
Completion of right pelvic lymphadenectomy

Return to intraperitoneum

- Fenestrate retroperitoneum to prevent lymphoceles by opening the hernia trocar into peritoneal cavity and stretching opening widely.
- Prevent lymphatic fluid leak:
  - Abdominal binder post-operatively to compress incisions for 5 days.
  - Close vagina running, bladder flap.
- Pre-op counseling: warn patient that she might drain copious wine-colored fluid out from any incision for 2-3 days.
- If leaks, she can insert paper towels under binder to absorb fluid and maintain compression until dry.
The challenges

- **Peritoneal perforation** -
  - Don't do it!!!!
  - Lift off Common ileacs gently. Follow Aorta.
- **Patient obesity** - up to 47 for me.
- **Bulky nodes** - maintain hemostasis
- **Patient vascular anatomy**
- **Equipment** - articulation is useful
- **Bleeding** - Ligasure, clips, FloSeal, open
For Aortic injuries

- FLOSEAL is indicated in surgical procedures (other than ophthalmic) as an adjunct to hemostasis when control of active blood flow by ligature or conventional procedures is ineffective or impractical.

Floseal Matrix should not be used for controlling post-partum bleeding or menorrhagia. The safety and effectiveness of Floseal Matrix has not been established in children and pregnant women.

How thrombin coated desiccated cartilage works

- FLOSEAL is applied to the tissue surface at the base of the lesion; its granules fill the wound and conform to its shape.

- FLOSEAL granules expand approximately 20% within about 10 minutes and physically restrict the flow of blood. Blood percolates through the spaces and is exposed to thrombin.

- A clot forms around the mechanically stable matrix provided by the granules. The structural integrity of the gelatin fibrin matrix enables it to remain in place at the tissue surface.

- Once hemostasis is achieved, FLOSEAL should always be removed by gentle irrigation.

- FLOSEAL is resorbed by the body within 6-8 weeks, consistent with the time frame of normal wound healing.

Venous tributaries
Aka: Fellow’s Veins

- .4%
- 17%
- 83%

- 237 vein tributaries in 112 patients undergoing lymphadenectomy.

Tachosil for vena caval bleed

- Horse collagen, covered with thrombin and fibrinogen, and riboflavin (yellow side down!)
- 5x5cm, 9.5x6cm.
- Indicated for hemostasis in vascular surgery
Major venous bleeding

Yellow side down

combination of human fibrinogen and human thrombin on a solid equine collagen patch.

Fig. 2. Anatomical distribution of lumbar arteries (A.) and veins (V.) in retroperitoneum. Numbers denote frequency (percent) of finding certain branch among 102 consecutive retroperitoneal lymph node dissections. IVC, inferior vena cava. Ao, aorta. Lt., left. Rt., right.
FIG. 4. Anatomical relationship between lumbar vessels, aorta and inferior vena cava, and course in retroperitoneum. In case of bleeding from lacerated lumbar vessel, distal portion can be controlled by pressure exerted on vessel between overlying psoas muscle and spinal column (inset).
If you perforate peritoneum

- Use intraperitoneal laparoscopy to close it:
  - Clip.
  - Suture.
  - Endoloop.
  - Anything!!!!!
- Endopaddle (12mm).
- Liver Retractor. (5mm)
- Open the umbilical trocar
to allow an exit for the
intraabdominal air.

“Liver retractors”
Suture McBurney at fascia, and all incisions at skin to prevent leakage of peritoneal fluid accumulation.
Abdominal binder to compress incisions to prevent leakage of peritoneal fluid accumulation.
### Laparoscopic extraperitoneal aortic lymphadenectomy to renal vessels

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Mean OR time, min (range)</th>
<th>Mean no. nodes (range)</th>
<th>Conversion due to peritoneal tears, N (%)</th>
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<td>Mehra et al., 2004 [4]</td>
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### Scope IM and IR aortics

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O’Hanlan et al, SGO poster, 2013
Inframesenteric nodes:
n=113 cases, (1-38, mean 12)

InfraRenal nodes:
n=82 cases, (1-37, mean 13)
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Magrina, Gyn Onc, 2009

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**Duration TLH - no nodes**

![Duration TLH - no nodes graph](image-url)
Thank you!!!