Carcinoma Testis

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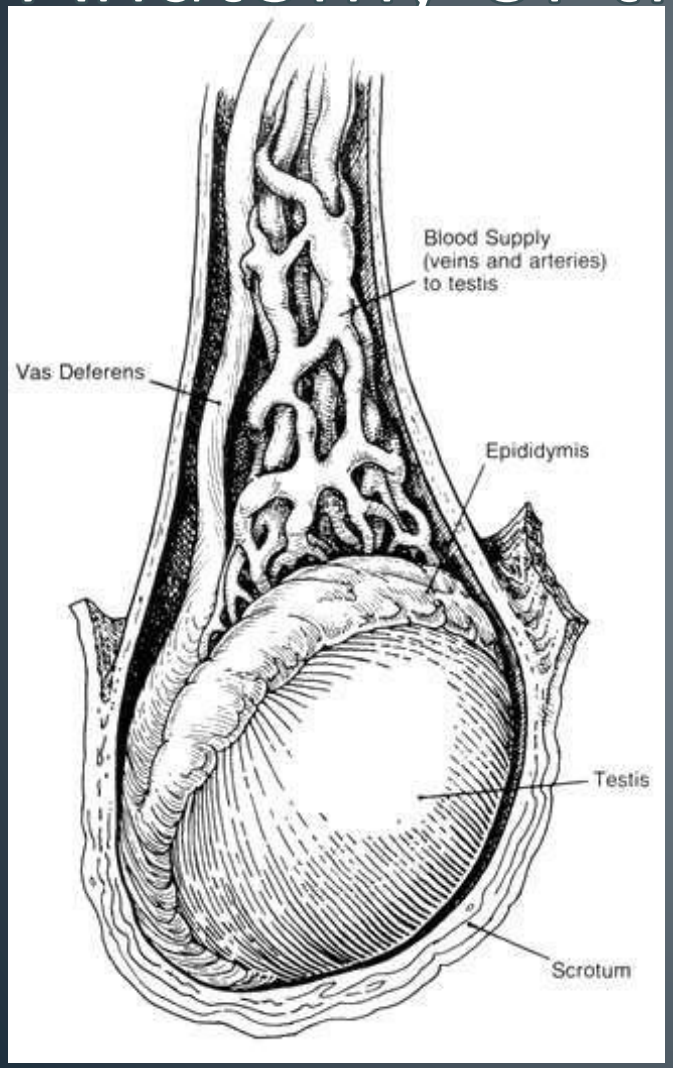
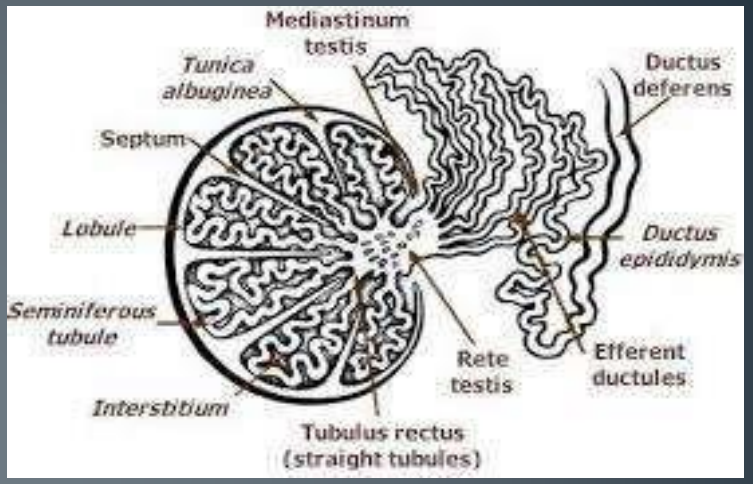
Anatomy of the Scrotum

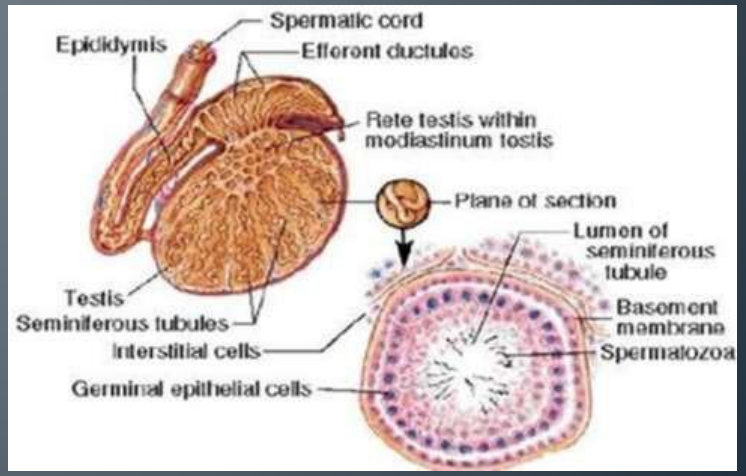


- Scrotum: muscular pouch containing testes
- Testis: a network of tightly coiled seminiferous tubules that converge and anastamose into efferent tubules
  - Encapsulated by tunica albuginea
- Epididymis: a structure formed from merged efferent tubules, which attaches along the posterior and upper border of the testis
  - Described as having head, body & tail
- Vas deferens: tube arising from tail of epididymis,
  - Passes through inguinal canal and joins seminal vesicle duct to form ejaculatory duct, which passes into prostate gland
- Spermatic cord: structure formed by vas deferens, testicular arteries, and veins

Structure of testis

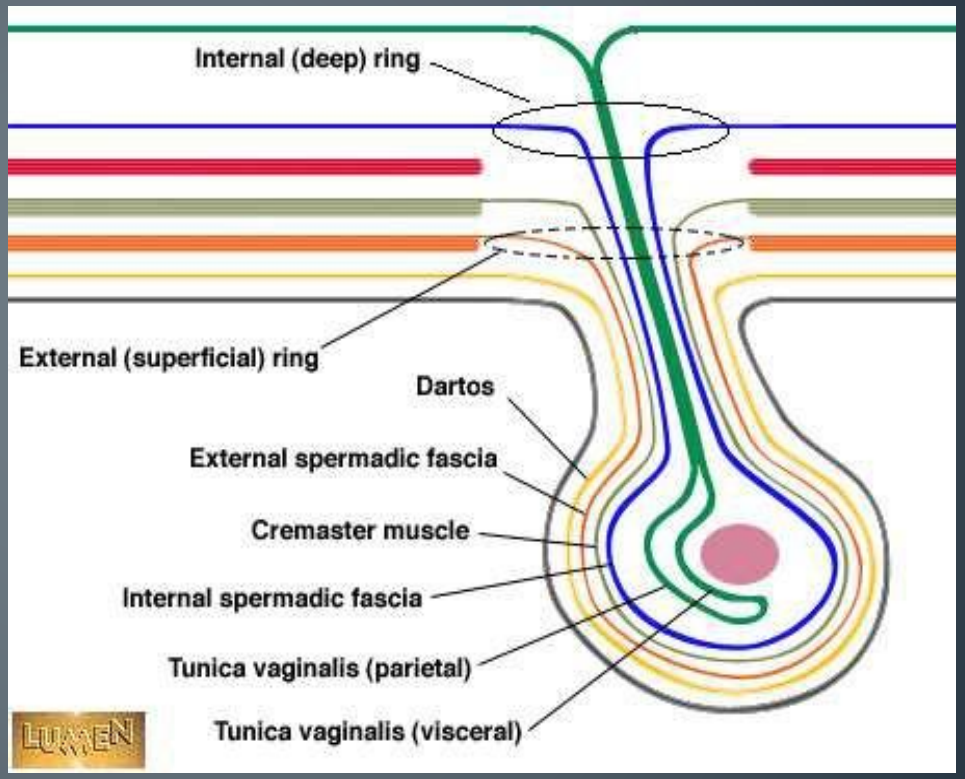
- 200-300 **lobules**
- Each lobule has 2-3 **seminiferous tubules**
- Each seminiferous tubules lined by **cell in different stages of spermatogenesis**
- Among the seminiferous tubules are **Sertoli cells**.
- Between the loops of the seminiferous tubules are **interstitial cells, produce testosterone**.



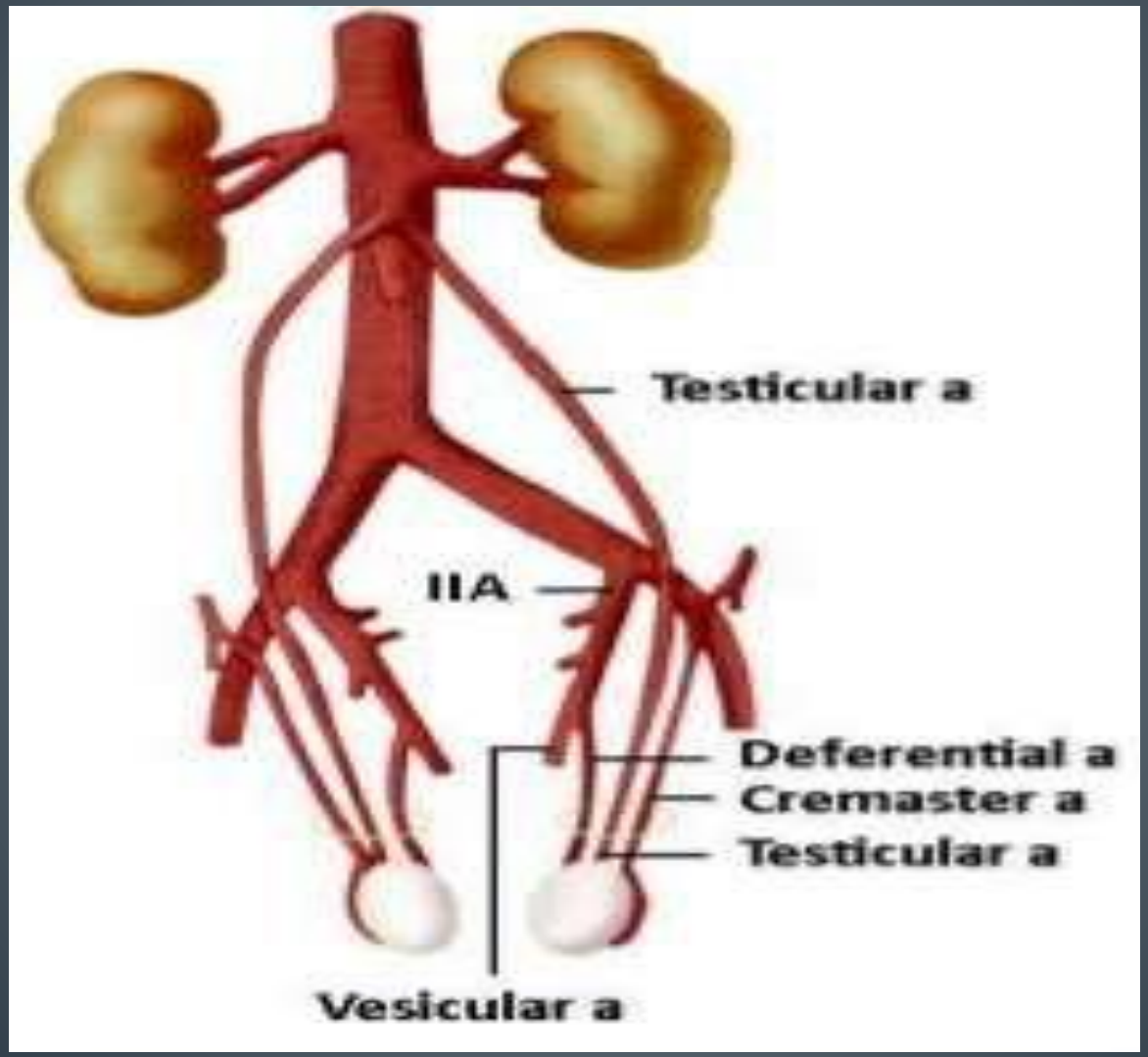


Coverings of testis

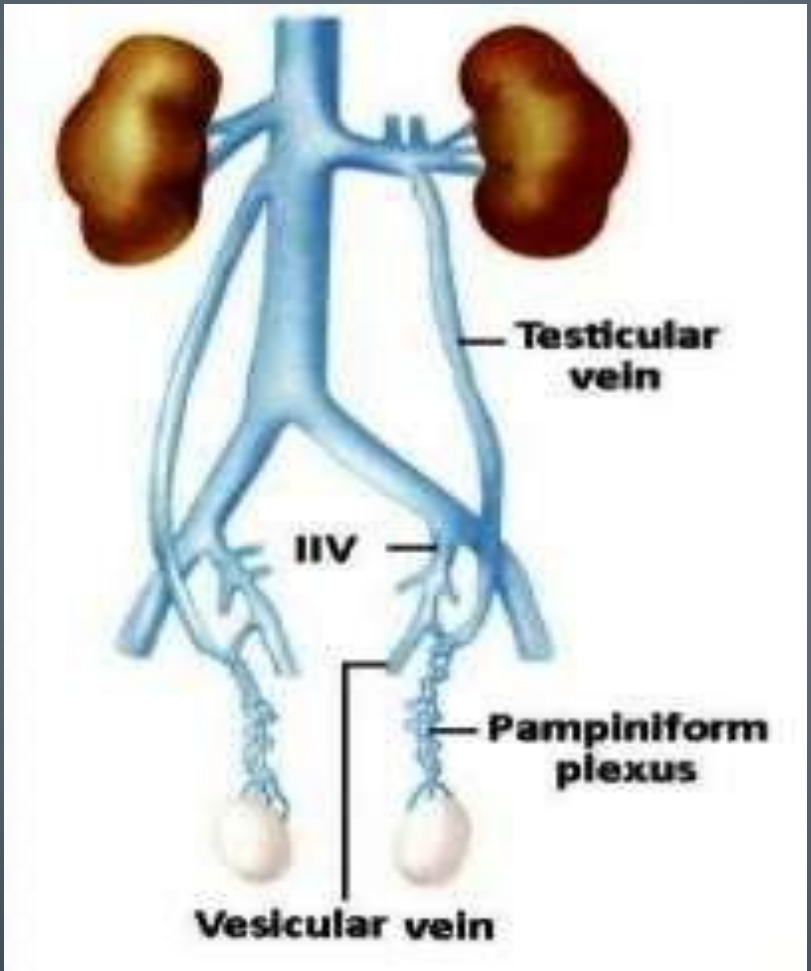
- Skin
- DARTOS Muscle
- External Spermatic Fascia
- Cremastric Muscle
- Internal Spermatic Fascia
- Tunica Vaginalis
- Tunica Albuginea



Arterial supply



Venous Drainage



Introduction

- Although rare, is the most common malignancy in men in 15-35 yr age group
- Has become one of the most curable solid tumour
  - Associated with accurate tumour markers
  - Origin in germ cells
  - Capacity to differentiate into histologically more benign forms
  - Predictable, systematic pattern of spread
  - Occurrence in young individuals

Predisposing Factors

1. **Cryptorchidism**
2. **Klinefelter syndrome**
3. **Positive family history**
4. **Contralateral germ cell tumor**
5. *Viral infection*
6. *Hormonal factors*
7. *Exposure to environmental oestrogen*

CRYPTORCHIDISM & TESTICULAR TUMOUR

Risk of Carcinoma developing in undescended testis is

⇓

4 to 6 times the normal expected incidence

CRYPTORCHIDISM & TESTICULAR TUMOUR

The cause for malignancy are as follows:

- Abnormal Germ Cell Morphology
- Elevated temperature in abdomen & Inguinal region as opposed to scrotum
- Endocrinal disturbances

ITGCN

- Most GCTs arise from a precursor lesion, ITGCN.
- ITGCN is present in adjacent testicular parenchyma in 80% to 90% of cases of invasive GCT and is associated with a 50% risk of GCT within 5 years and 70% within 7 years.
- Of patients with GCT, 5% to 9% have ITGCN within the unaffected contralateral testis.
- ITGCN develop from arrested primordial germ cells or gonocytes that failed to differentiate into prespermatogonia.
- These cells are thought to lay dormant until after puberty, when they are stimulated by increased testosterone levels.

CLASSIFICATION

I. Primary Neoplasma of Testis

A.Germ Cell Tumour (90-95%)

B.Non-Germ Cell Tumour

(5-10%)

II. Secondary Neoplasms.

III. Para testitucal tumors

TESTIS

Germinal Neoplasms : (90 - 95 %)

Seminomas - 40%

1. Classic Typical Seminoma
2. Anaplastic Seminoma
3. Spermatocytic Seminoma

Teratoma - 25 - 35%

1. Mature
2. Immature

EmbryonalCarcinoma - 20 - 25%

Choriocarcinoma - 1%

Yolk Sac Tumour

TESTIS

Nongerminal Neoplasms : (5 to 10%)

- Specialized gonadal stromal tumor
  - (a) Leydig cell tumor
  - (b) Sertoli's cell tumour
  - (c) Granulosa cell tumour
  - (b) Theca cell tumor
- Gonadoblastoma
- Miscellaneous Neoplasms
  - (a) Adenocarcinoma of the rete testis
  - (b) Mesenchymal neoplasms
  - (c) Carcinoid

SECONDARY NEOPLASMS OF TESTIS

A. Reticuloendothelial Neoplasms

B. Metastases(prostate,lung,colorectal, renal cell carcinoma,thyroid,breast)

PARATESTICULAR NEOPLASMS

A. Adenomatoid

B. Cystadenoma of Epididymis

C. Mesenchymal Neoplasms

D. Mesothelioma (Benign & malignant)

SEMINOMA

- Classical : 82-85%
  Thirties
  Slow growth

- Anaplastic: 5-10%
  More aggressive, potentially more lethal
  Greater metastatic potential

- Spermatocytic Seminoma: 2-12 %
  - No precursor lesion
  - Old age
  - No h/o cryptorchidism
  - Good prognosis

NON SEMINOMATOUS GERM CELL TUMOURS

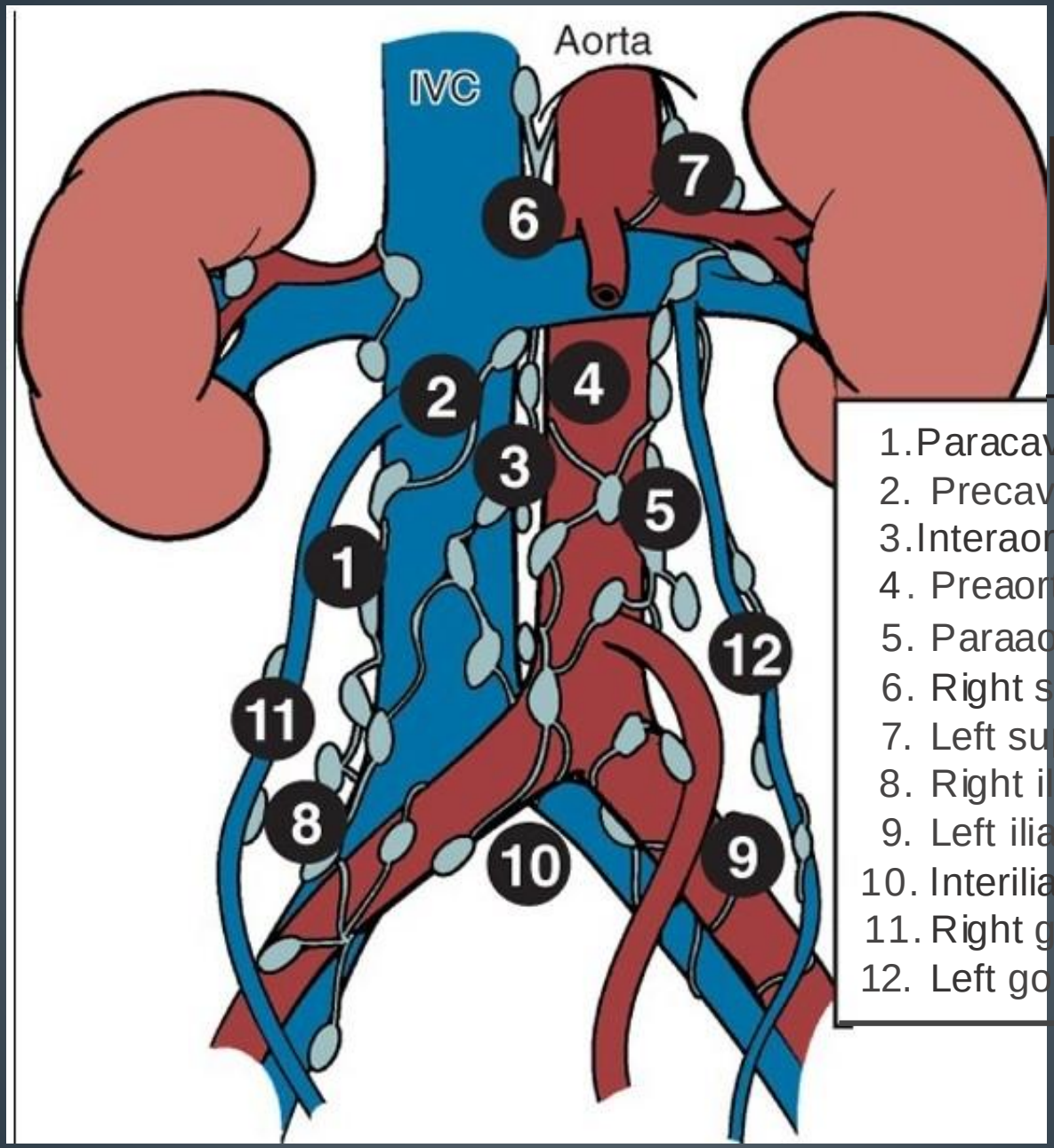
- Embryonal carcinoma
  - ❖ Most undifferentiated tumor
  - ❖ Capacity to differentiate to other nsgct
- Choriocarcinoma
  - ❖ Central hemorrhage
  - ❖ High metastatic potential (blood & lymphatic)
  - ❖ **Most malignant tumor**
  - ❖ Produces HCG
  - ❖ **Features of Hyperthyroidism, Hyperprolactinemia**

NON SEMINOMATOUS GERM CELL TUMOURS

- Teratoma
  - ❖ Contains more than one germ cell layers in various stages of maturation and differentiation
  - ❖ Microscopically, cystic & solid componenets
  - ❖ Normal serum markes
- Yolk cell tumours
  - ❖ Most common testicular tumour in infants & children
  - ❖ Schiller- duval bodies in histology
  - ❖ 80% confined to testis at time of diagnosis
  - ❖ Do not produce hcg

Pattern of Spread of Germ Cell Tumour

- Right sided tumours- intraaortocaval
- Left sided tumours – left paraaortic & preaortic nodes
- Then cephalad to cisterna chyli, thoracic duct and supraclavicular (usually left)
- Epidydimis- External iliac chain



1. Paracaval
2. Precaval
3. Interaortocaval
4. Preaortic
5. Paraaortic
6. Right suprahilar
7. Left suprahilar
8. Right iliac
9. Left iliac
10. Interiliac
11. Right gonadal vein
12. Left gonadal vein

CLINICAL FEATURES

- Nodule/Painless Swelling of One Gonad
- Dull Ache or Heaviness in Lower Abdomen
- 10% - Acute Scrotal Pain
- 10% - Present with Metatstasis

  - Neck Mass / Cough / Anorexia / Back Ache
- 5% - Gynecomastia
- Infertility

WAKE UP

All patients with a solid, Firm Intratesticular Mass that cannot be Transilluminated should be regarded as Malignant unless otherwise proved

Requirements for staging

- To properly Stage Testicular Tumours following are pre-requisites:

(a) Pathology of Tumour Specimen

(b) History

(c) Clinical Examination

(d) Radiological procedure - USG / CT / MRI / Bone Scan

(e) Tumour Markers - HCG, AFP, LDH

TNM Staging of Testicular Tumour

T_0	=	*No evidence of Tumour*
T_{1s}	=	*Intratubular, pre invasive*
T_1	=	*Confined to Testis*
T_2	=	*Limited to testis and epididymis with vascular/ lymphatic invasion or tumour extending through Tunica Albuginea with involvement of tunica vaginalis*
T_3	=	*Invades Spermatic Cord with/without vascular/ lymphatic invasion*
T_4	=	*Invades Scrotum with/without vascular/ lymphatic invasion*
N_1	=	*Single or multiple < 2 cm*
N_2	=	*Multiple < 5 cm / Single 2-5 cm*
N_3	=	*Any node > 5 cm*

Staging of Testicular Tumour

Staging I - Tumour confined to testis.

Staging II - Spread to Regional nodes.

IIA - Nodes <2 cm in size

IIB - 2 to 5 cm in size

IIC - Large, Bulky, abd.mass usually > 5 to 10 cm

Staging III- Spread beyond retroperitoneal Nodes or Above Diaphragm or visceral disease

Group	T	N	M	S (Serum Tumor Markers)
Stage 0	pTis	N0	M0	S0
Stage I	pT1-4	N0	M0	SX
Stage IA	pT1	N0	M0	S0
Stage IB	pT2	N0	M0	S0
	PT3	N0	M0	S0
	PT4	N0	M0	S0
Stage IS	Any pT/TX	N0	M0	S1-3
Stage II	Any pT/Tx	N1-3	M0	SX
Stage IIA	Any pT/TX	N1	M0	S0
	Any pT/TX	N1	M0	S1
Stage IIB	Any pT/TX	N2	M0	S0
	Any pT/TX	N2	M0	S1
Stage IIC	Any pT/TX	N3	M0	S0
	Any pT/TX	N3	M0	S1
Stage III	Any pT/TX	Any N	M1	SX
Stage IIIA	Any pT/TX	Any N	M1a	S0
	Any pT/TX	Any N	M1a	S1
Stage IIIB	Any pT/TX	N1-3	M0	S2
	Any pT/TX	Any N	M1a	S2
Stage IIIC	Any pT/TX	N1-3	M0	S3
	Any pT/TX	Any N	M1a	S3
	Any pT/Tx	Any N	M1b	Any S

Risk Status	Nonseminoma	Seminoma
Good Risk	Testicular or retroperitoneal primary tumor and No nonpulmonary visceral metastases and Post-orchiectomy markers- all of: AFP < 1,000 ng/mL hCG < 5,000 iu/L LDH < 1.5 x upper limit of normal	Any primary site and No nonpulmonary visceral metastases and Normal AFP Any hCG Any LDH
Intermediate Risk	Testicular or retroperitoneal primary tumor and No nonpulmonary visceral metastases and Post-orchiectomy markers- any of: AFP 1,000–10,000 ng/mL hCG 5,000–50,000 iu/L LDH 1.5–10 x upper limit of normal	Any primary site and Nonpulmonary visceral metastases and Normal AFP Any hCG Any LDH
Poor Risk	Mediastinal primary tumor or Nonpulmonary visceral metastases or Post-orchiectomy markers- any of: AFP > 10,000 ng/mL hCG > 50,000 iu/L LDH > 10 x upper limit of normal	No patients classified as poor prognosis

Investigation

1. Ultrasound - Hypoechoic area
2. Chest X-Ray - PA and lateral views
3. CT Scan
4. MRI
4. Tumour Markers
   - AFP
   - β HCG
   - LDH
   - PLAP(placental alkaline phosphatase)

Tumour Markers

TWO MAIN CLASSES

- **Onco-fetal Substances : AFP & HCG**
- **Cellular Enzymes : LDH & PLAP**

(AFP - Trophoblastic Cells

HCG - Syncytiotrophoblastic Cells)

AFP –(Alfafetoprotein)

NORMAL VALUE: Below 16 ngm / ml

HALF LIFE OF AFP – 5 and 7 days

Raised AFP :

- **Pure embryonal carcinoma**
- **Teratocarcinoma**
- **Yolk sac Tumour**
- **Combined Tumour**

REMEMBER: AFP Not raised is Pure Choriocarcinoma or Pure Seminoma

HCG – (Human Chorionic Gonadotropin)

Has α and β polypeptide chain

NORMAL VALUE: < 1 ng / ml
HALF LIFE of HCG: 24 to 36 hours

RAISED β HCG -
100 % - Choriocarcinoma
60% - Embryonal carcinoma
55% - Teratocarcinoma
25% - Yolk Cell Tumour
7% - Seminomas

Lactate Dehydrogenase (LDH)

- Nonspecific tumor marker but is a useful prognostic indicator
- Indicator of tumor burden
- 140-280 IU/L

ROLE OF TUMOUR MARKERS

- Helps in Diagnosis - 80 to 85% of Testicular Tumours have Positive Markers
- Most of Non-Seminomas have raised markers
- Only 10 to 15% Non-Seminomas have normal marker level
- After Orchidectomy if Markers Elevated means Residual Disease or Stage II or III Disease
- Elevation of Markers after Lymphadenectomy means a STAGE III Disease

ROLE OF TUMOUR MARKERS cont…

- Degree of Marker Elevation Appears to be Directly Proportional to Tumour Burden
- Markers indicate Histology of Tumour:

  If AFP elevated in Seminoma - Means Tumour has Non-Seminomatous elements
- Negative Tumour Markers becoming positive on follow up usually indicates -

  Recurrence of Tumour
- Markers become Positive earlier than X-Ray studies

Serum Tumor Markers (S)

SX	Marker studies not available or not performed
SO	Marker study levels within normal limits
S1	LDH < 1.5 x N* and hCG (mIu/mL) < 5,000 and AFP (ng/ml) < 1,000
S2	LDH 1.5-10 x N or hCG (mIu/mL) 5,000-50,000 or AFP (ng/ml) 1,000-10,000
S3	LDH > 10 x N or hCG (mIu/mL) > 50,000 or AFP (ng/ml) > 10,000

*N indicates the upper limit of normal for the LDH assay.

TREATMENT

- Treatment should be aimed at one stage above the clinical stage
- Seminomas- Radio-Sensitive. Treat with Radiotherapy.
- Non-Seminomas are Radio-Resistant and best treated by Surgery
- Advanced Disease or Metastasis - Responds well to Chemotherapy

PRINCIPLES OF TREATMENT

- Radical INGUINAL ORCHIDECTOMY is Standard first line of therapy
- Lymphatic spread initially goes to RETRO-PERITONEAL NODES
- Early hematogenous spread RARE
- Bulky Retroperitoneal Tumours or Metastatic Tumors Initially “DOWN-STAGED” with CHEMOTHERAPY

Seminomas

Stage I: pT1-T4 N0 M0

1. Radical Inguinal Orichidectomy
2. Adjuvant chemotherapy with single dose Carboplatin
3. Prophylactic radiotherapy at dose of 20 Gy

Stage IIA:

- Radiotherapy to retroperitoneum including ipsilateral iliac lymphnodes 30 Gy
- Primary chemotherapy with BEP 3cycles or EP 4 cycles

Stage IIB:

- BEP 3 cycles or EP 4 cycles

- radiotherapy to retroperitoneal and ipsilateral iliac lymphnodes with 36 Gy

- Stage IIC and Stage III:

  Good risk : BEP 4 cycles

  EP 4 cycles

  Intermediate risk: BEP 4 cycles

  VIP 4 cycles

Post chemotherapy

- < 3 cm residual mass: Surveillance
- > 3 cm with PET positive :resection or biopsy

biopsy positive should undergo second line chemotherapy

NSGCT

Stage I:

- Nerve sparing RPLND
- Primary chemotherapy with 1 cycle BEP

Stage IIA: Marker negative- Nerve sparing RPLND

Stage IIB: Marker negative- Primary chemotherapy with BEP 3 cycles or
EP 4 cycles

Nerve sparing RPLND

Marker positive disease

- Stage I to Stage IIIA : any T any N M1a Good risk

  BEP 3 or EP 4 cycles

- Stage IIIB: any T any N M1a Intermediate risk

  BEP 4 or VIP 4 cycles

- Stage IIIC: M1 b poor risk

  BEP 4 or VIP 4 cycles

Chemotherapy

EP
Etoposide 100 mg/m^2 IV on Days 1–5
Cisplatin 20 mg/m^2 IV on Days 1–5
Repeat every 21 days[1]

BEP
Etoposide 100 mg/m^2 IV on Days 1–5
Cisplatin 20 mg/m^2 IV on Days 1–5
Bleomycin 30 units IV weekly on Days 1, 8, and 15 or Days 2, 9, and 16
Repeat every 21 days[2]

VIP
Etoposide 75 mg/m^2 IV on Days 1–5
Mesna 120 mg/m^2 slow IV Push before ifosfamide on Day 1, then
Mesna 1200 mg/m^2 IV Continuous Infusion on Days 1–5
Ifosfamide 1200 mg/m^2 on Days 1–5
Cisplatin 20 mg/m^2 IV on Days 1–5
Repeat every 21 days[3]

Complications

- Pulmonary toxicity: Bleomycin keep total dose under 400 units.
- Nephrotoxicity: Cisplatin- decreased CrCl: Dosed based on CrCl
- Neurologic: Cisplatin- Ototoxicity
- Cardiovascular: HTN, MI, Angina
- Secondary Malignancies: Etoposide

Recommended Exams

- Every 2-3 months 1st yr.
- Every 3-6 month 2nd yr.
- Every 6 month remainder 5 yrs.
- CTscans: 3-6 months 1st yr. then annually

Prognosis

Seminoma (at 5 years)

- I: 98%
- IIA: 92-94%
- IIB-III: 33-75%

NSGCT (at 5 years)

- I: 96-100%
- IIA: >90%
- IIB-III: 55-80%

SURGICAL MANAGEMENT

ORCHIDECTOMY

- Radical
- Partial

RPLND

- PRIMARY RPLND
- PC-RPLND

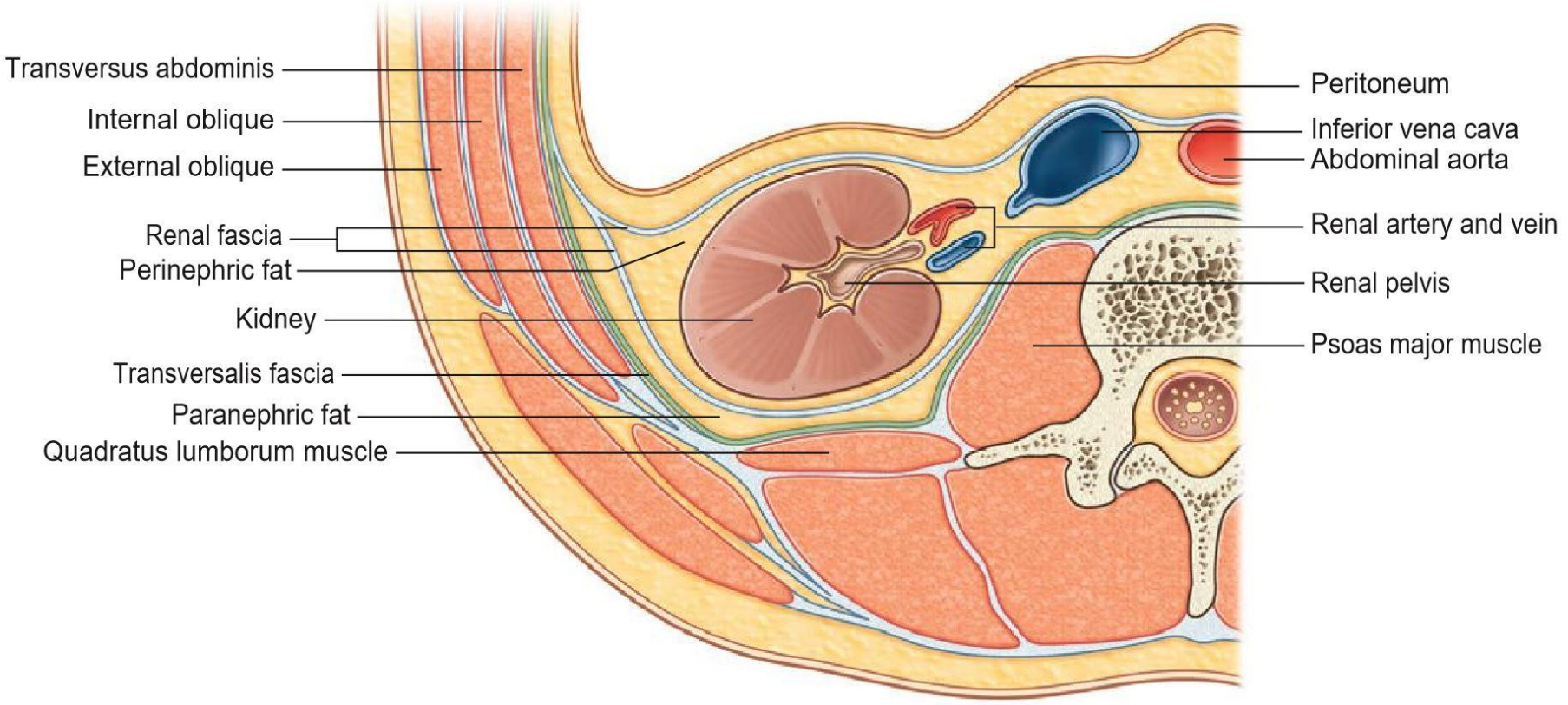
PC - RPLND

a) Salvage RPLND
b) Desperation RPLND
c) Reoperative RPLND
d) Resection of late relapse

Anatomy of Retroperitoneum

- The retroperitoneum lies between the posterior parietal peritoneum in front and the transversalis fascia behind.

- It is nominally divided into three spaces by the perirenal fascia:
  - anterior pararenal space,
  - perirenal space and the
  - posterior pararenal space.



Organization of fat and fascia surrounding the kidneys

Contents

- Duodenum and pancreas
- Ascending and descending colon
- Kidneys and ureters
- Bladder and uterus
- Great vessels
- Rectum

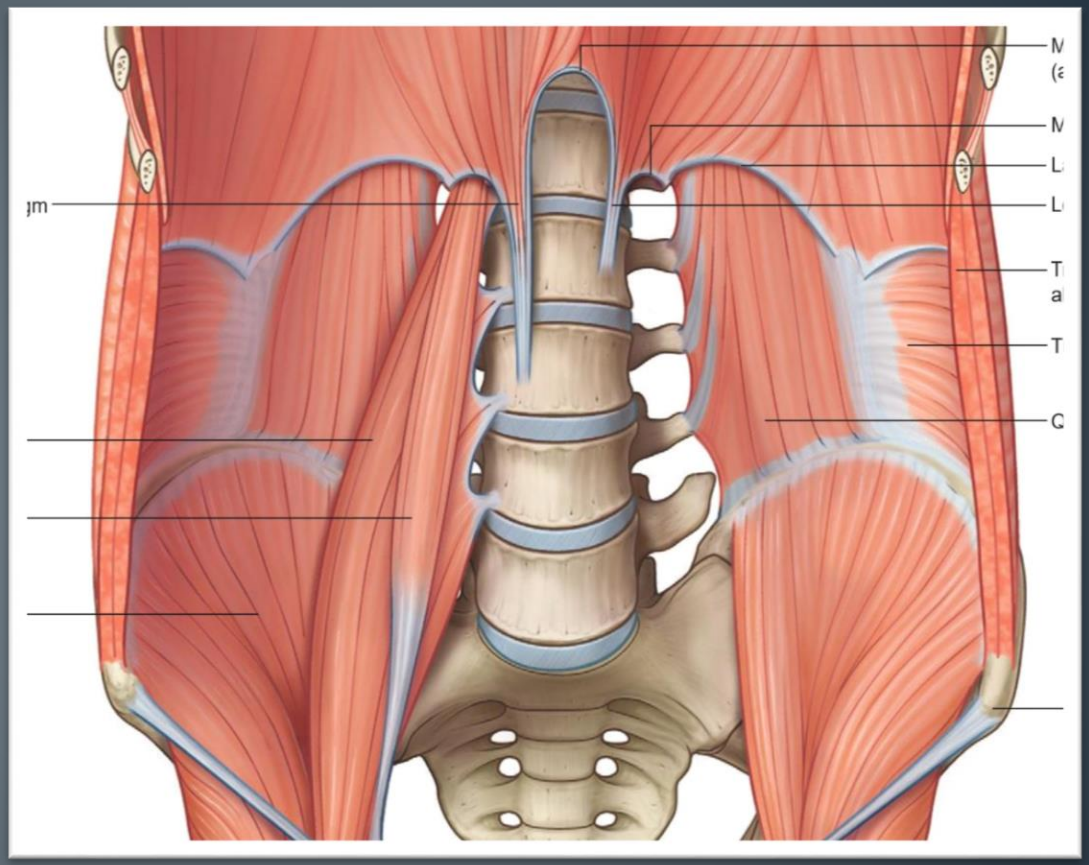
Muscles

Psoas Major

Psoas Minor

Quadratus Lumborum

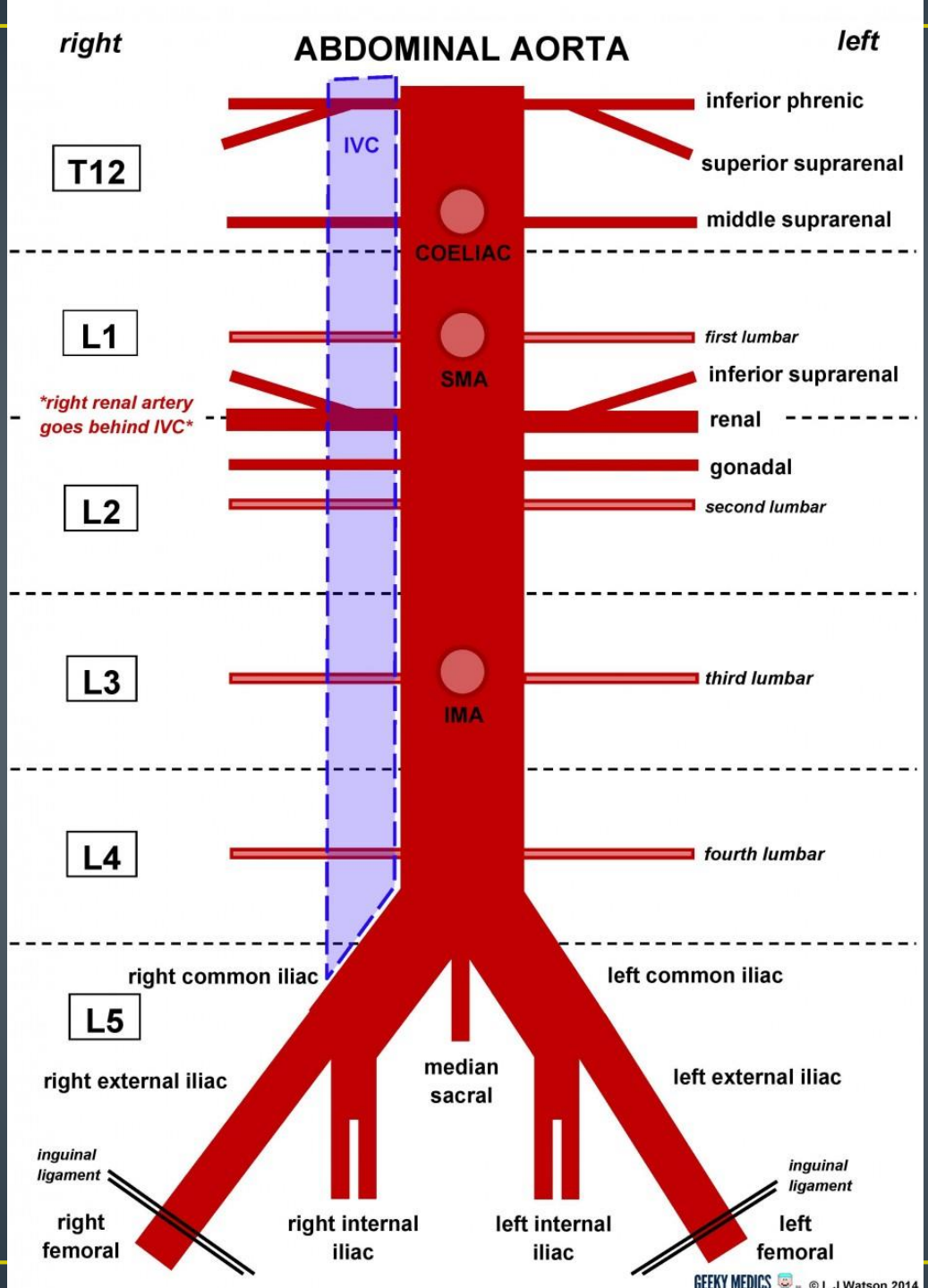
Iliacus



Arterial Supply

Abdominal Aorta has

- **3 single anterior visceral** branches (coeliac, SMA, IMA),
- **3 paired lateral visceral** branches (suprarenal, renal, gonadal),
- **5 paired lateral abdominal wall** branches (inferior phrenic and four lumbar)
- **3 terminal** branches (two common iliacs and the median sacral)


right
ABDOMINAL AORTA
left
IVC
T12
inferior phrenic
superior suprarenal
middle suprarenal
COELIAC
L1
first lumbar
SMA
inferior suprarenal
right renal artery goes behind IVC
renal
gonadal
L2
second lumbar
L3
third lumbar
IMA
L4
fourth lumbar
right common iliac
left common iliac
L5
right external iliac
median sacral
left external iliac
inguinal ligament
inguinal ligament
right femoral
right internal iliac
left internal iliac
left femoral
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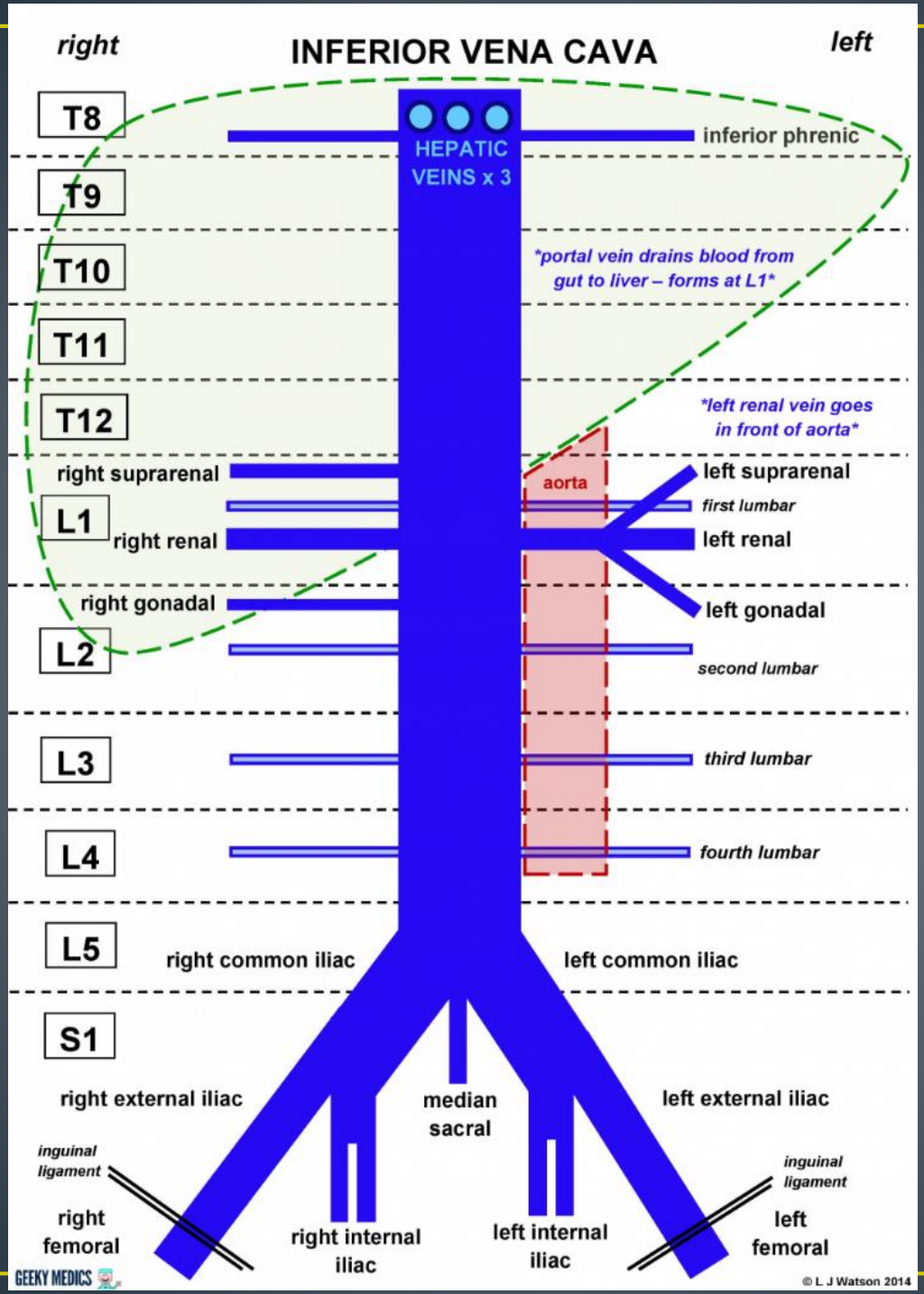
Venous Drainage

- IVC has
- **3 anterior visceral** tributaries (three hepatic)
- **3 lateral visceral** tributaries (suprarenal, renal, gonadal)
- **5 lateral abdominal wall** tributaries (inferior phrenic and four lumbar)
- **3 veins of origin** (two common iliac and the median sacral)


right
INFERIOR VENA CAVA
left
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
HEPATIC VEINS x 3
inferior phrenic
portal vein drains blood from gut to liver – forms at L1
left renal vein goes in front of aorta
aorta
right suprarenal
left suprarenal
first lumbar
right renal
left renal
right gonadal
left gonadal
second lumbar
third lumbar
fourth lumbar
right common iliac
left common iliac
right external iliac
median sacral
left external iliac
inguinal ligament
inguinal ligament
right femoral
left femoral
right internal iliac
left internal iliac
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LYMPHATIC DRAINAGE

Anatomic classification

- left lumbar (aortic),
- interaortocaval (interaorticovenous), and
- right lumbar (caval) nodal groups.

The left lumbar group includes

- preaortic,
- left para-aortic (periaortic), and
- retroaortic nodes.

The preaortic nodes are located anterior to the abdominal aorta, around the major anterior arterial branches that supply the gastrointestinal tract.

The left para-aortic region includes the nodes lateral to the midline of the aorta and medial to the left ureter.

The retroaortic nodes are variably present and located between the aorta and vertebrae.

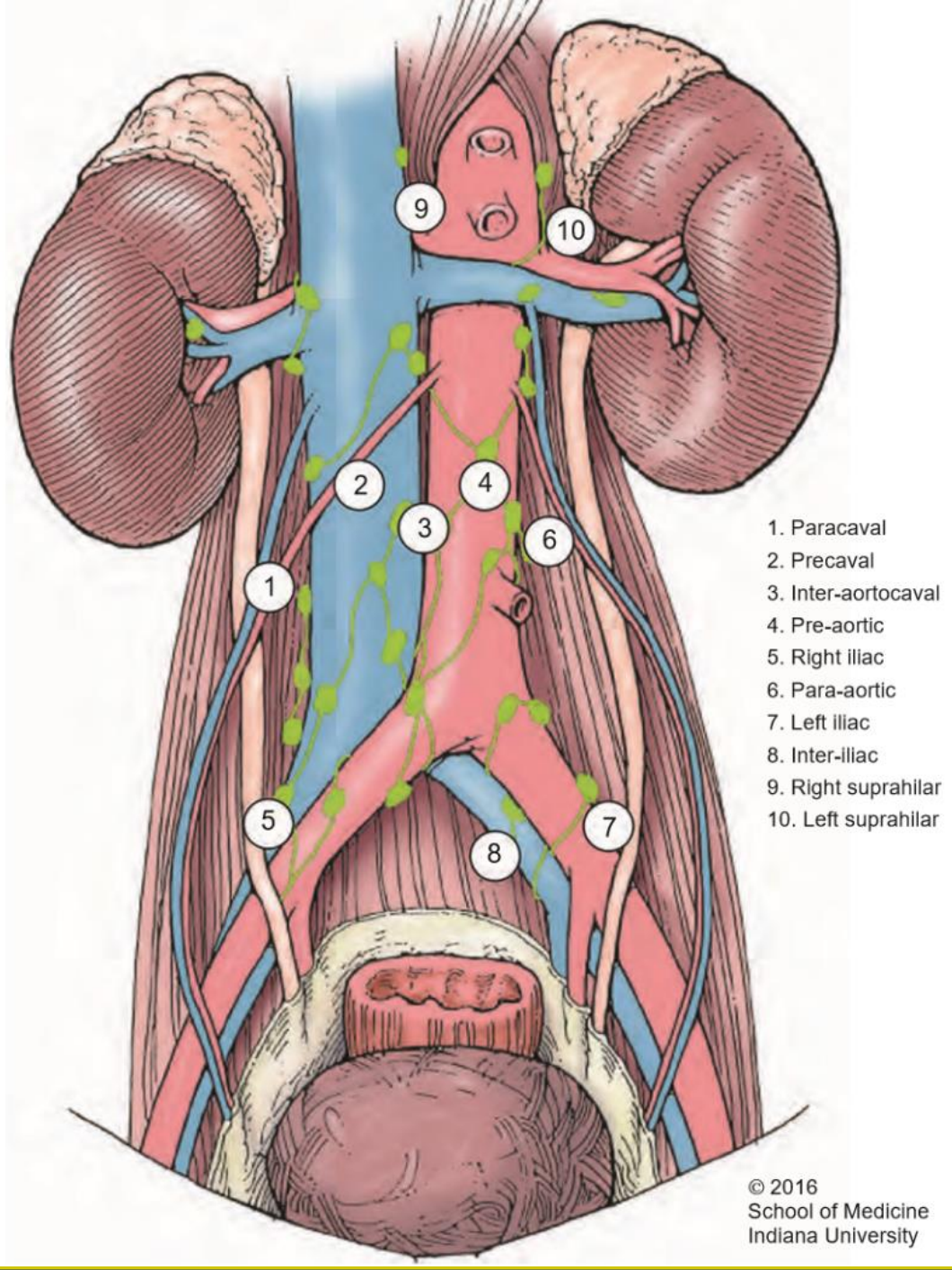
The right lumbar group

- precaval,
- right paracaval, and
- retrocaval nodes.

The precaval nodes are located on the anterior wall of the IVC. The right paracaval region includes the area lateral to the midline of the IVC, extending to the right ureter. The retrocaval nodes are present between the vena cava and the psoas muscle

The interaortocaval nodal group extends from the midline of the IVC to the midline of the aorta.

- Posterior to the right side of the abdominal aorta and anterior to the L1 and L2 vertebrae, these trunks come together at a saccular dilated structure known as the cisterna chyli.
- This marks the beginning of the thoracic duct, which runs cephalad posterior to the aorta and empties into the left innominate vein.



NERVOUS STRUCTURES

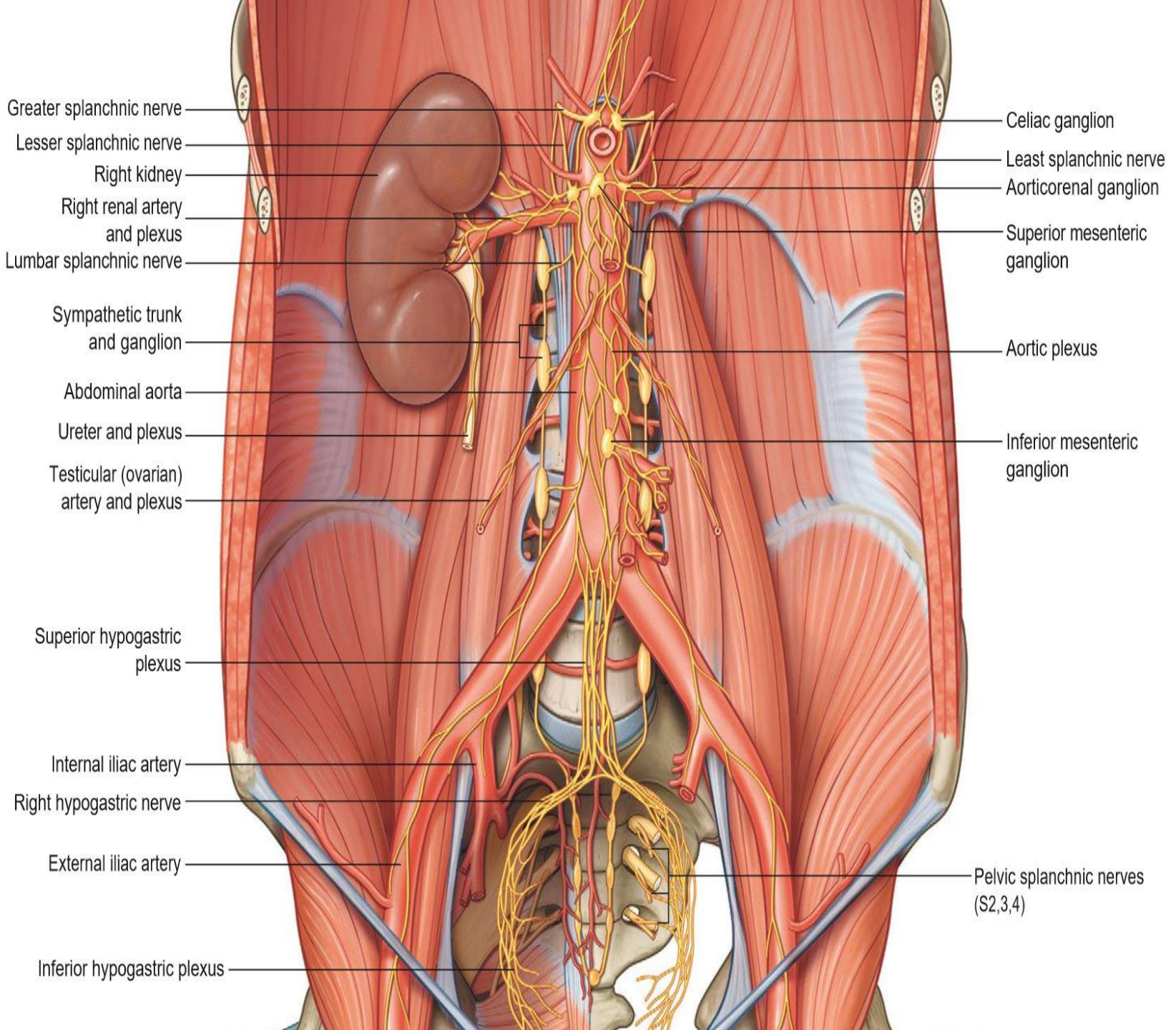
- The nervous structures of the retroperitoneum can be divided into the autonomic nervous system and the somatic nervous system
- Autonomic nervous system further divided to sympathetic and parasympathetic nervous system

- The parasympathetic nervous system originate from cranial nerves III, VII, IX, and X and from the ventral rami of the second, third, and fourth sacral nerves, which provide parasympathetic innervation to the pelvic and abdominal viscera.

- Sympathetic nervous system originate between the T1 to L2. The fibers then run medial to the psoas muscle along the anterolateral aspect of the spine.
- The paired sympathetic trunks are in close proximity to the lumbar arteries and veins, which cross them perpendicularly.
- Much of the sympathetic innervation to the pelvic viscera travels through the superior and inferior hypogastric plexuses, which are contiguous.

- The superior hypogastric plexus originates at the caudal extent of the abdominal aorta and extends to the anterior surface of the fifth lumbar vertebra.

- Extensive retroperitoneal dissection that causes disruption of these plexuses may result in loss of seminal vesicle emission or failure of bladder neck closure resulting in retrograde ejaculation.


Greater splanchnic nerve
Lesser splanchnic nerve
Right kidney
Right renal artery and plexus
Lumbar splanchnic nerve
Sympathetic trunk and ganglion
Abdominal aorta
Ureter and plexus
Testicular (ovarian) artery and plexus
Superior hypogastric plexus
Internal iliac artery
Right hypogastric nerve
External iliac artery
Inferior hypogastric plexus
Celiac ganglion
Least splanchnic nerve
Aorticorenal ganglion
Superior mesenteric ganglion
Aortic plexus
Inferior mesenteric ganglion
Pelvic splanchnic nerves (S2,3,4)

RPLND(Bland and Sutton)

- Extended (Supra Hilar) RPLND
- Infra Hilar bilateral standard RPLND
- Nerve Sparing RPLND
- Modified Template RPLND

INDICATIONS

NSGCT

1. High risk patients with LVI
2. Single focus of retroperitoneal disease >1 cm at primary landing zone
3. Normal post orchidectomy markers
4. Patients with risk of teratoma

Seminoma

1. Advanced stage residual masses greater than 3 cm which are PET positive.

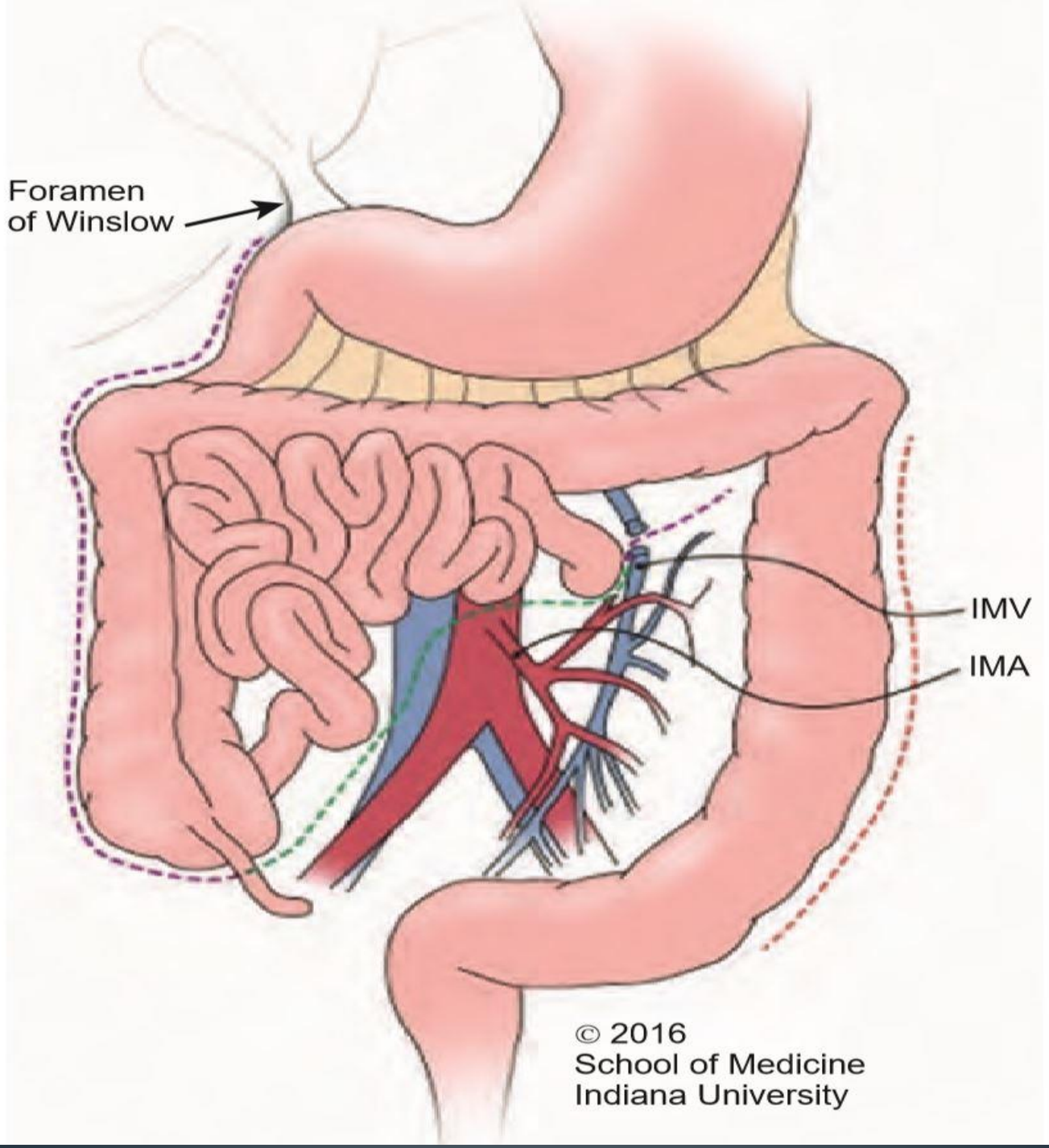
RPLND

Pre Operative Planning

- Serum tumor markers
- Sperm banking
- Pre operative radiological investigations

Surgical Technique

- Position: Supine
- Incision : vertical midline
- Falciform ligament is ligated and divided
- Abdomen inspected
- EXPOSURE OF RETROPERITONEUM
- Split and Roll Technique
- Nerve Sparing Technique
- Closure and Post operative care


Foramen
of Winslow
IMV
IMA
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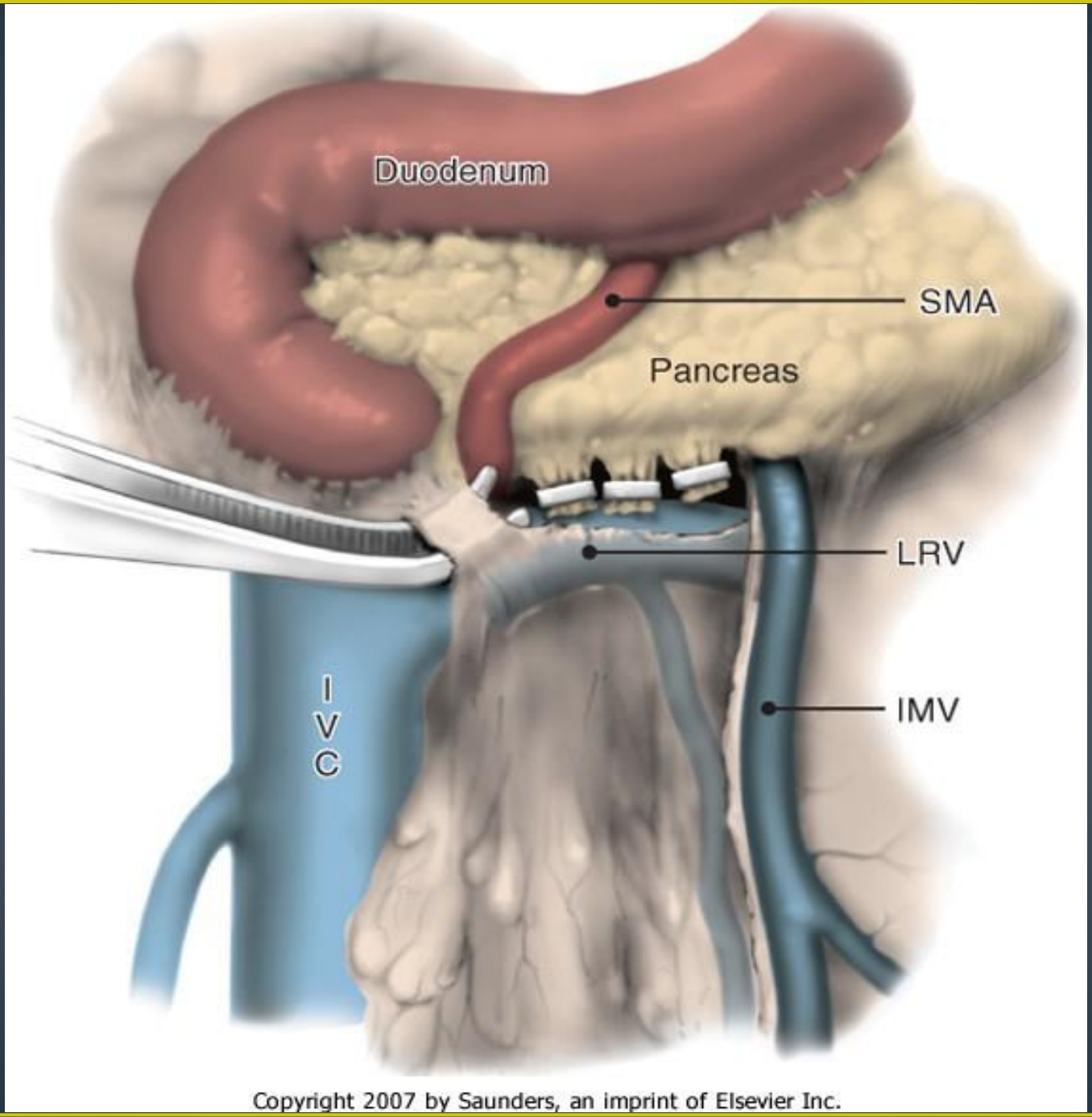
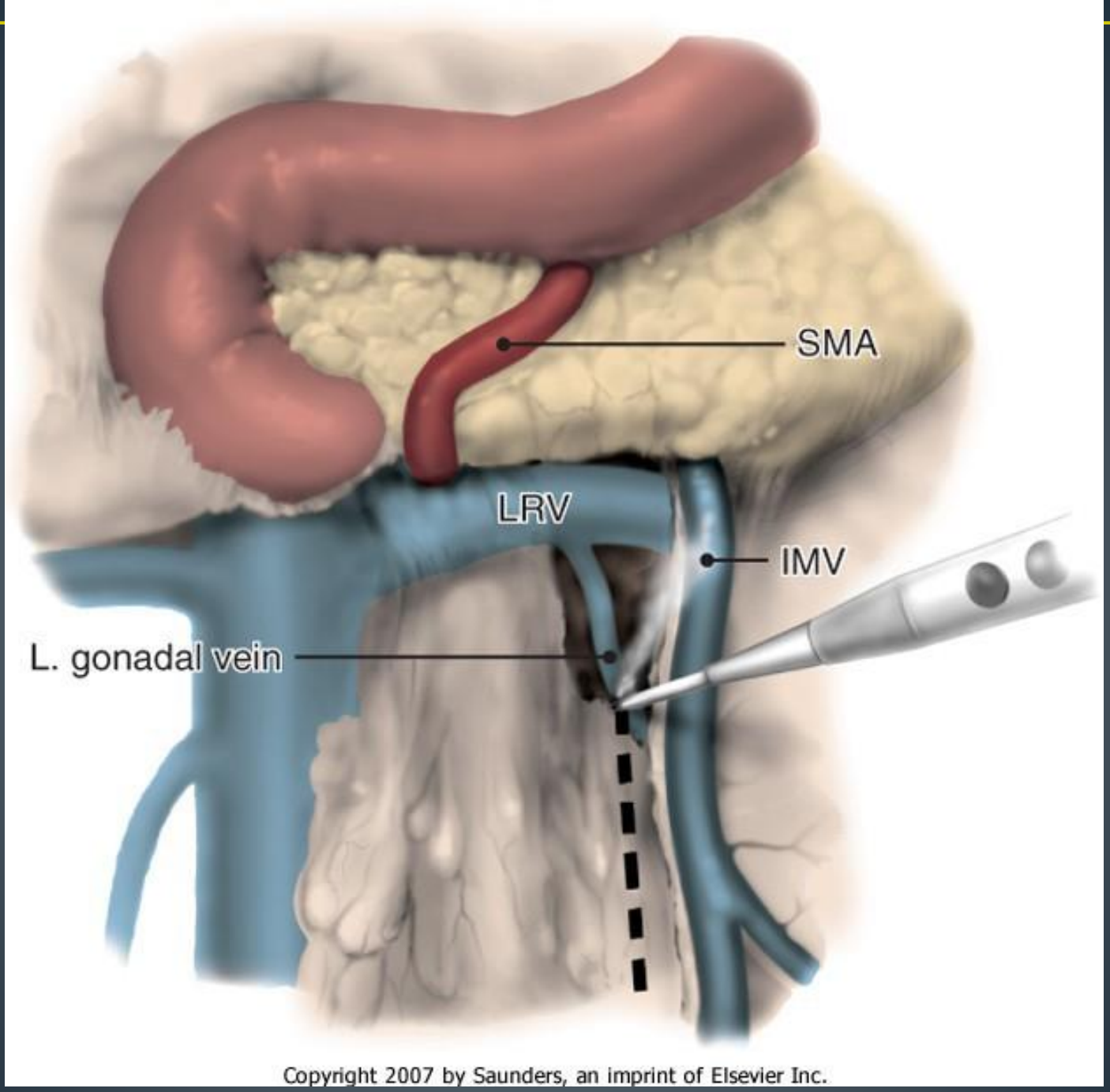
Exposure of retroperitoneum

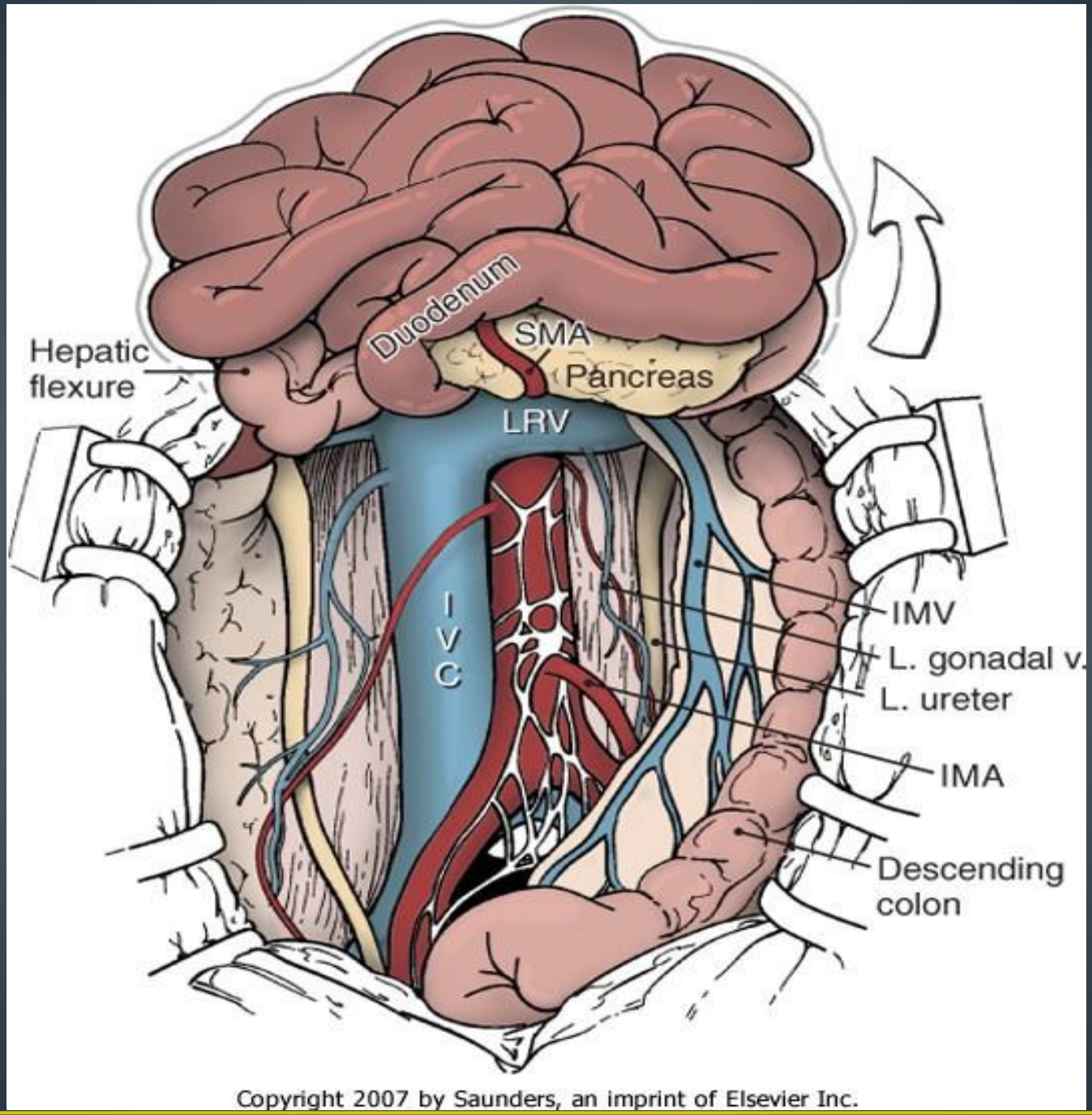
- For smaller paracaval and interaortocaval masses, the root of the mesentery is opened from the inferior tip of the cecum to the medial aspect of the inferior mesenteric vein.
- In the case of large interaortocaval and/or paracaval masses, the mesenteric incision can be continued around the inferior portion of the cecum to the right white line of Toldt and up to the foramen of Winslow to permit placement of the bowels on the chest.

- In the case of larger left paraaortic masses, the inferior mesenteric vein is often ligated and divided to improve exposure of the left retroperitoneum.
- Alternatively, in the case of a modified left template dissection for CS I disease, the para-aortic packet can be approached through the left white line of Toldt.

- The plane between the mesentery and the retroperitoneal fat is developed by identifying the gonadal vein and developing the plane along its anterior surface.
- The duodenum is dissected off of the IVC and left renal vein. Before placing retractors in this region, the superior mesenteric artery must be identified.





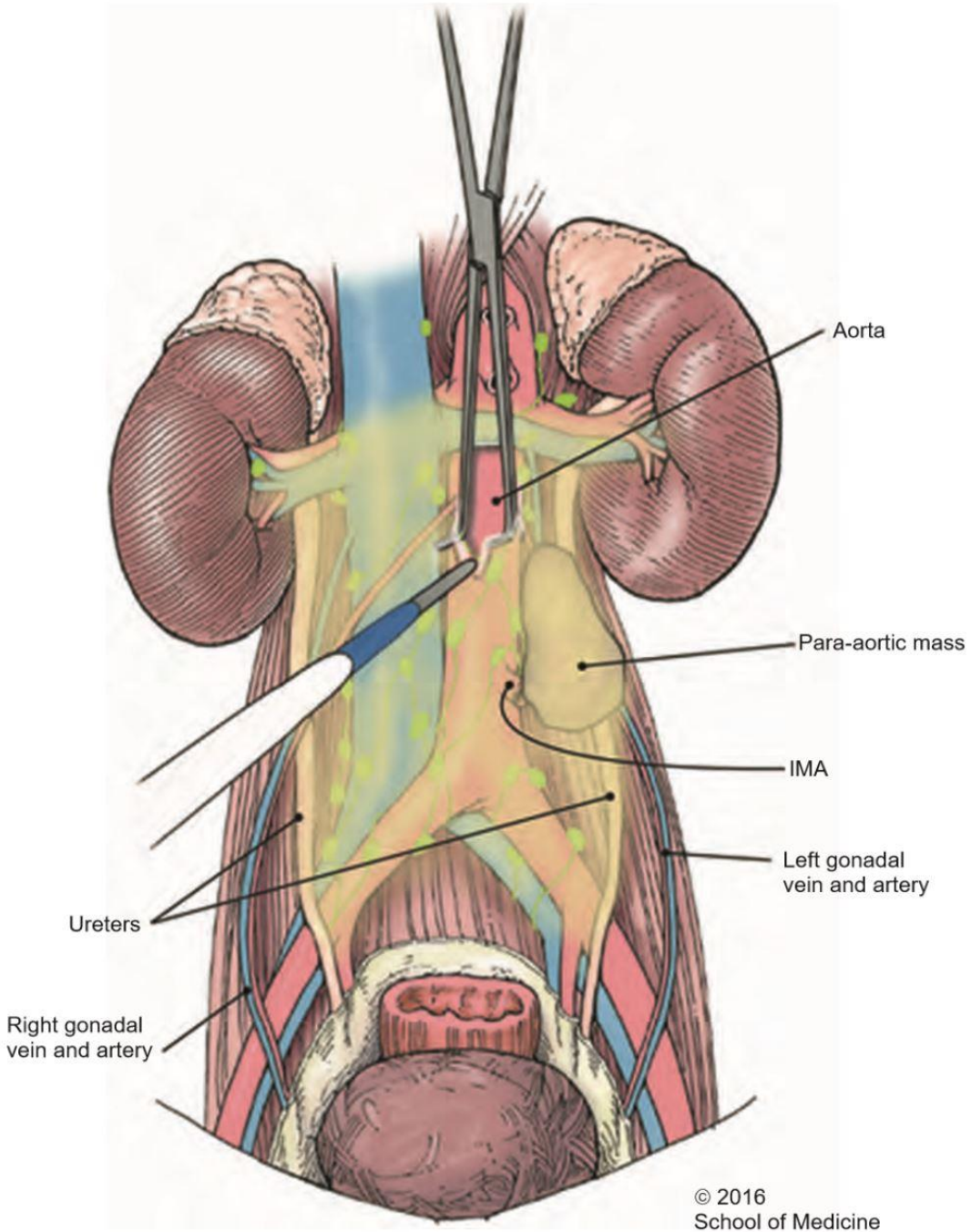


Split and Roll Technique

1. IVC Split
2. Aortic Split

The advantage of performing the IVC split first is that the right-sided postganglionic sympathetic nerve fibers can be identified and traced to the superior hypogastric plexus minimizing risk of injury during the aortic split.

Split on the aorta first rather than the IVC to avoid precaval right-sided accessory lower pole renal arteries.


Aorta
Para-aortic mass
IMA
Left gonadal vein and artery
Ureters
Right gonadal vein and artery
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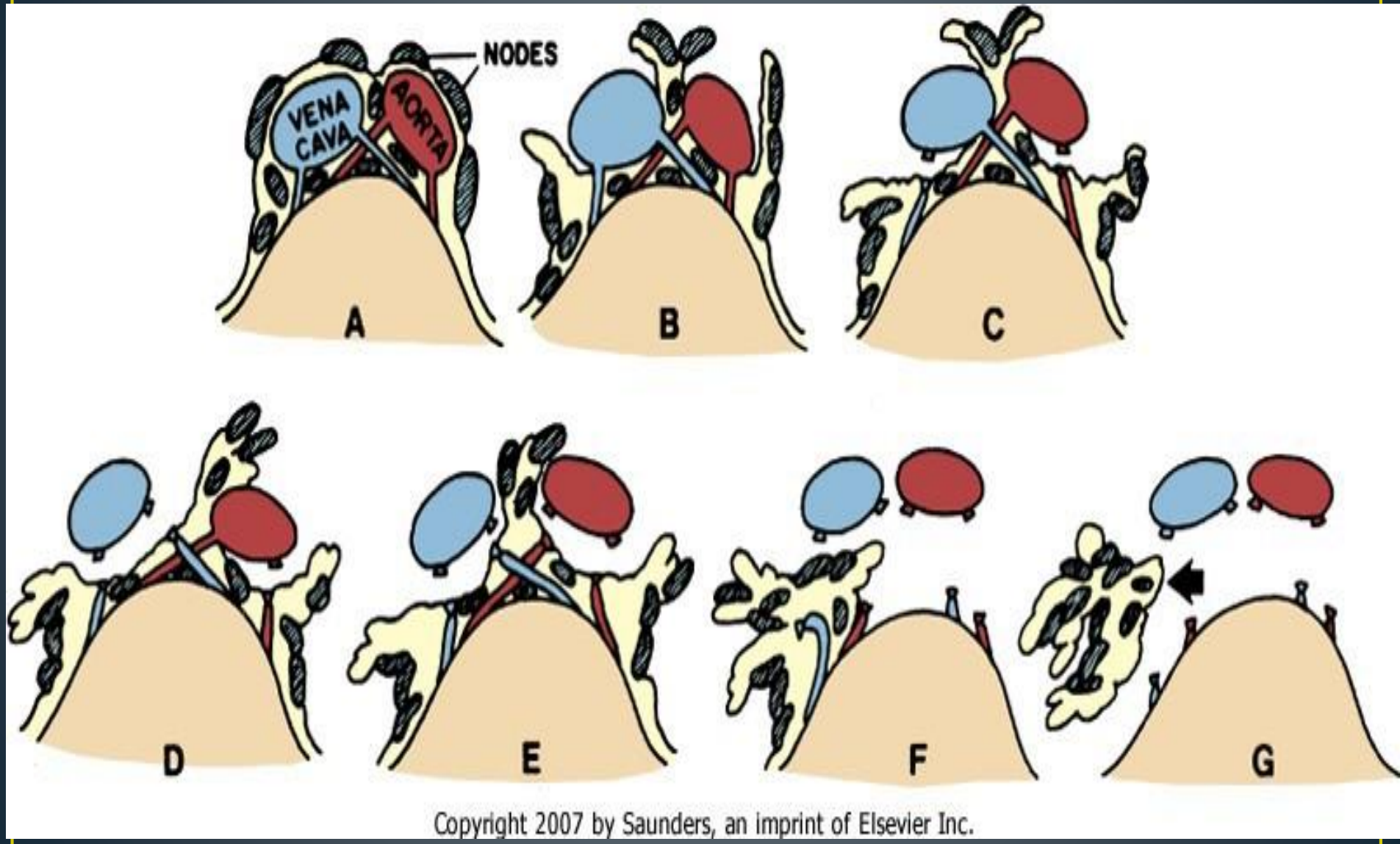


The split is started at the 12 o'clock position of the aorta, immediately inferior to the left renal vein and continued caudally taking care to identify prospectively the inferior mesenteric artery and preserve it in cases of right modified template RPLND or doubly ligate and divide this structure to expose the left paraaortic region in cases of full bilateral dissection.

If a nerve-sparing technique is to be performed, the split should be stopped at the IMA, and postganglionic sympathetic fibers should be identified before proceeding caudally.

Lymph Node Disscetion

- Left Para aortic Packet
- Inter aortocaval Packet
- Right Paracaval Packet

Gonadal Vein

- The peritoneal lining is opened immediately over the gonadal vein. The ureter should be swept posteriorly off of the vein.
- The gonadal vein is placed on gentle traction and bluntly dissected down to the internal ring.
- If the orchiectomy was performed properly, the distal cut end of the gonadal vein and suture ligature should be easily retrievable and is resected down to the internal inguinal ring.

Nerve Sparing RPLND (Jewett)

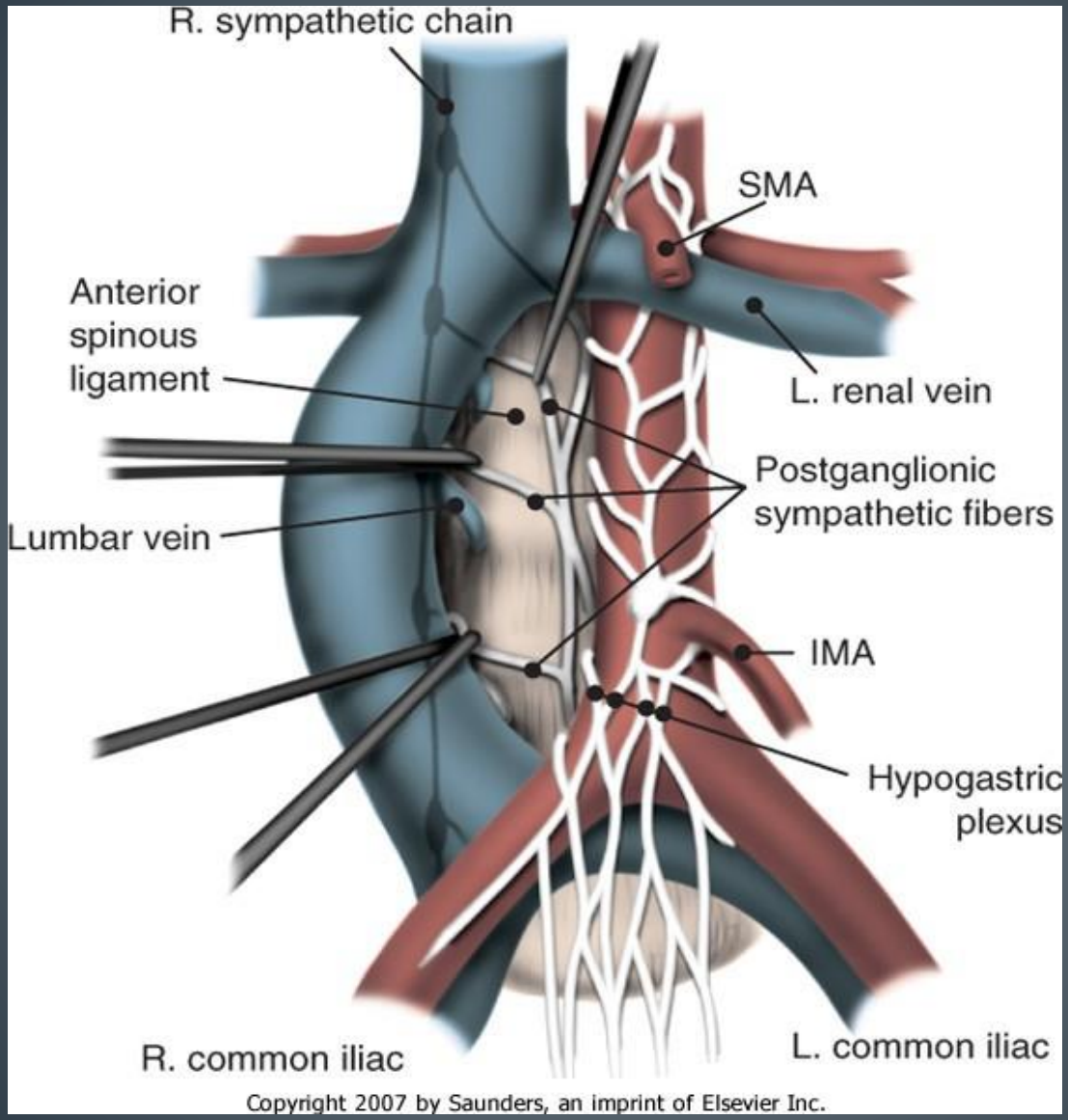
For successful antegrade ejaculation

- smooth muscle contraction in the vasa deferentia, seminal vesicles, and prostate resulting in seminal emission.
- closure of the bladder neck to prevent retrograde ejaculation
- rhythmic contractions of the ischiocavernosus, bulbospongiosus, and levator ani muscles expelling semen from the urethra.

This process requires efferent neurologic input from the L1 through L4 postganglionic sympathetic fibers, which coalesce with their contralateral counterparts in the superior hypogastric plexus.

- Changing the boundaries of dissection
- Prospectively identifying postganglionic sympathetic fibers and the superior hypogastric plexus

Beck and colleagues (2010) reported preservation of antegrade ejaculation in 97% of men undergoing modified unilateral template dissection without ipsilateral nervesparing technique


R. sympathetic chain
SMA
Anterior spinous ligament
L. renal vein
Postganglionic sympathetic fibers
Lumbar vein
IMA
Hypogastric plexus
R. common iliac
L. common iliac
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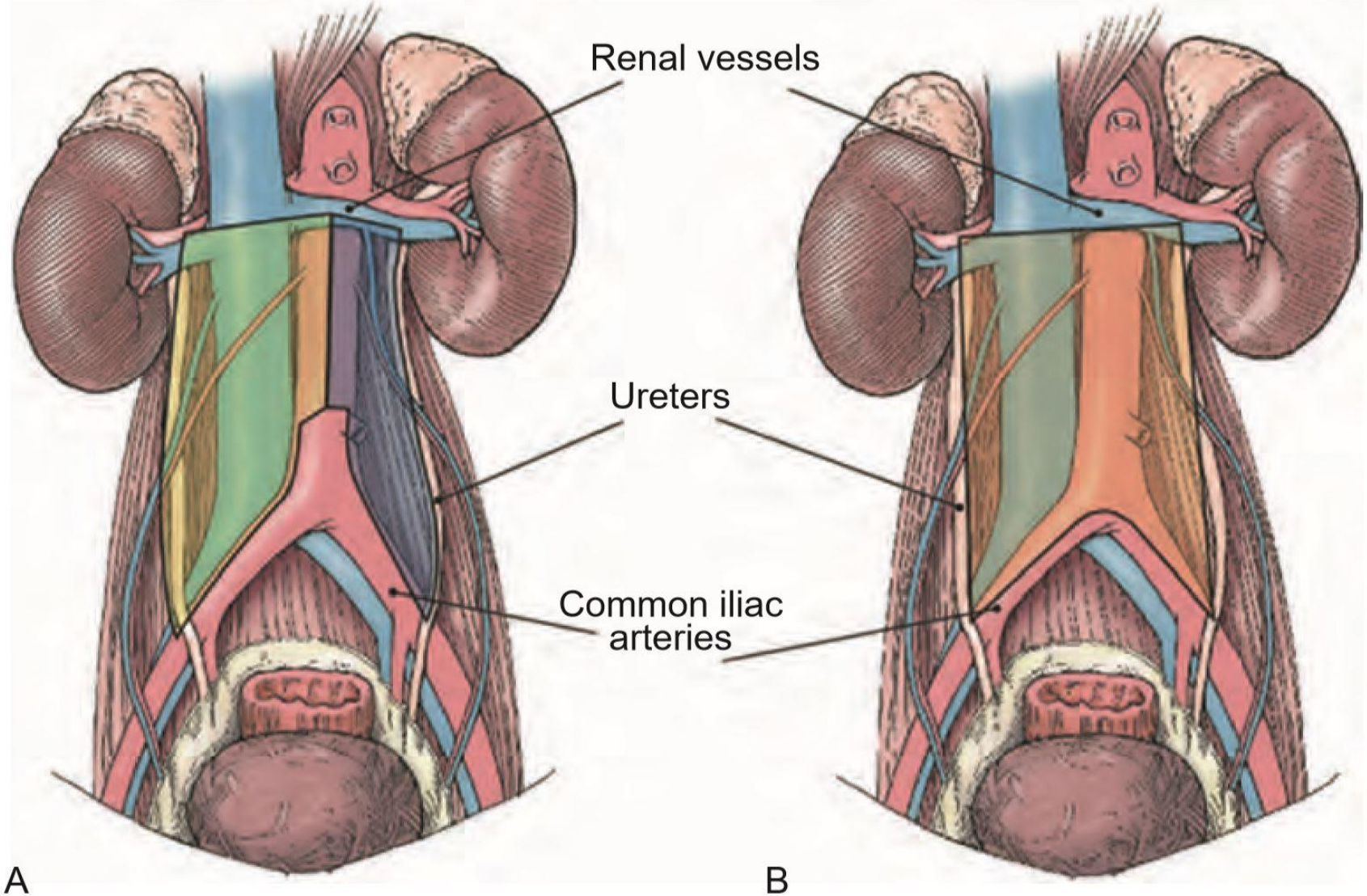
MODIFIED BILATERAL TEMPLATES

- Donohue and colleagues (1982) published a pathologic lymph node mapping study on 104 patients found to have pathologically positive nodes (pN+) at primary RPLND.
- Full **bilateral** dissections to include bilateral **suprahilar** dissections were performed on every patient.
- Investigators found that left-sided tumors were most likely to metastasize to the left para-aortic lymph nodes, whereas right-sided tumors were most likely to metastasize to interaortocaval and precaval regions.
- Spread to contralateral retroperitoneum and suprahilar regions was rare but increased with tumor bulk.
- Metastasis to the interiliac region was rare.

- This study confirmed the relatively predictable pattern of the lymphatic spread of testicular GCTs and provided strong pathologic evidence for the use of “modified bilateral” templates proposed by *Ray and colleagues* (1974) in patients with low-stage retroperitoneal disease.
- Omission of the contralateral retroperitoneum and interiliac regions resulted in the preservation of antegrade ejaculation in most patients.
- Omission of suprahilar regions decreased the risk of postoperative chylous ascites, renovascular injuries, and pancreatic complications.

- Crossover occurs more commonly from right to left than from left to right. This may be due to the fact that lymph nodes on the right are situated lower in the retroperitoneum and that lymphatic flow is generally in a cranial direction



- Patients meeting the following criteria may be considered for modified unilateral template PC-RPLND

1. Well-defined lesion measuring 5 cm or less confined to the primary landing zone of the primary tumor on imaging before and after chemotherapy
2. Normal postchemotherapy STMs
3. good/intermediate risk group

COMPLICATIONS

- Fertility Dysfunction
- Pulmonary Complications 3-5%
- Ileus 18-21%
- Lymphocele 1.7%
- Chylous Ascites
- Venous Thromboembolism
- Neurological complications
- Mortalty

AUXILLARY PROCEDURES

- Nephrectomy 5-30%
- IVC Resection 5-10%
- Aortic Resection and Reconstruction
- Hepatic resection
- Pelvic Resections

THANK YOU

THANKS