Upper tract anatomy

Lumbodorsal fascia
Arises from spinous processes of lumbar vertebrae. Splits into 3 layers to enclose sacrospinous and quadrates lumbarum mm. Contiguous with transverses abdominis aponeurosis.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Origin</th>
<th>Insertion</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacrospinalis</td>
<td>Sactum and lumbar vertebrae</td>
<td>Lower ribs and thoracic vertebrae</td>
<td>Extension of the spine</td>
</tr>
<tr>
<td>Quadratus lumborum</td>
<td>5th lumbar vertebra</td>
<td>1st through 4th lumbar vertebrae, 12th rib</td>
<td>Depress and stabilize 12th rib, lateral bending of the trunk</td>
</tr>
<tr>
<td>External oblique</td>
<td>Lower eight ribs</td>
<td>Lateral lip of iliac crest, aponeurosis ending in midline raphae</td>
<td>Compress abdominal contents, flexion of the trunk</td>
</tr>
<tr>
<td>Internal oblique</td>
<td>Lumbarodorsal fascia, iliac crest</td>
<td>Lower four ribs, aponeurosis ending in linea alba</td>
<td>Compress abdominal contents, flexion of the trunk</td>
</tr>
<tr>
<td>Transversus abdominis</td>
<td>Lumbodorsal fascia, medial lip of iliac crest</td>
<td>Aponeurosis ending in linea alba</td>
<td>Compress abdominal contents</td>
</tr>
<tr>
<td>Psoas</td>
<td>12th thoracic through 5th lumbar vertebrae</td>
<td>Lesser trochanter of femur</td>
<td>Flexion of the hip</td>
</tr>
<tr>
<td>Iliacus</td>
<td>Inner aspect of iliac pelvic wing</td>
<td>Lesser trochanter of femur</td>
<td>Flexion of the hip</td>
</tr>
</tbody>
</table>
Aorta – 3 anterior, 3 lateral, 4 posterior (vertebral), one caudal (median sacral)  
3 branches of celiac a. – left gastric, common hepatic and splenic  
Aortic hiatus T12; bifurcation T4  
Multiple perforating adrenal arteries, single dominant adrenal vein  
Renal arteries at level of 2nd lumbar vertebrae
Lymphatic flow predominantly right to left. Right testis tumour landing site = interaortocaval nodes, then right and left. Left testis tumour landing site left paraaortic nodes – no spread to right nodes. See appendix notes Cysterna chyli = T12, retrocrural (thoracic), behind aorta slightly to right

Lumbosacral plexus T12, L1-5, S1-5, C1; motor and somatic sensory innervation of pelvis and lower limb. NB. Femoral nerve in body of psoas

Iliohypogastric and ilioinguinal run between transverses abdominis and internal oblique muscles – TAPP block
Kidneys
10-12 cm long, 5-7 cm wide and 3 cm thick
~150 g each
Typically 7-9 papillae/minor calyces – however wide variation
Remember orientation of kidney – upper pole more posterior and medial, medial surface more anterior. Important for PCNL etc.
Gerota’s fascia deficient inferiorly
Sympathetic nerve input typically travels through coeliac plexus (see above)
Kidney sectioned from behind – pelvis, vein, artery

<table>
<thead>
<tr>
<th>Branch</th>
<th>Origin</th>
<th>Spinal Segments</th>
<th>Function: Motor</th>
<th>Function: Sensory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iliohypogastric</td>
<td>Anterior ramus L1</td>
<td>L1</td>
<td>Internal oblique and transversus abdominis</td>
<td>Postolateral gluteal skin in pubic region</td>
</tr>
<tr>
<td>Ilioinguinal</td>
<td>Anterior ramus L1</td>
<td>L1</td>
<td>Internal oblique and transversus abdominis</td>
<td>Skin in the upper medial thigh, and either the skin over the root of the penis and anterior scrotum or the mons pubis and labium majus</td>
</tr>
<tr>
<td>Genitofemoral</td>
<td>Anterior rami L1 and L2</td>
<td>L1, L2</td>
<td>Genital branch—male cremasteric muscle</td>
<td>Genital branch—skin of anterior scrotum or skin of mons pubis and labium major femoral branch—skin of upper anterior thigh</td>
</tr>
<tr>
<td>Lateral cutaneous nerve of thigh</td>
<td>Anterior rami L2 and L3</td>
<td>L2, L3</td>
<td></td>
<td>Skin on anterior and lateral thigh to the knee</td>
</tr>
<tr>
<td>Obturator</td>
<td>Anterior rami L2 to L4</td>
<td>L2 to L4</td>
<td>Obturator externus, pectineus, and muscles in medial compartment of thigh</td>
<td>Skin on medial aspect of the thigh</td>
</tr>
<tr>
<td>Femoral</td>
<td>Anterior rami L2 to L4</td>
<td>L2 to L4</td>
<td>Iliacus, pectineus, and muscles in anterior compartment of thigh</td>
<td>Skin on anterior thigh and medial surface of leg</td>
</tr>
</tbody>
</table>

Arterial supply
20% cardiac output; 600 ml/min each
Arise body of L2: splits into segmental branches
First branch posterior; usually 4 anterior branches. End arteries – large ischaemic loss if ligated.
Free anastomoses of renal veins – no defect if ligated.
Progression: segmental – interlobar – arcuate – interlobular – afferent artery
Arterial anomalies in 25 – 40% patients. Most common abnormality supernumerary left renal artery
Upper tract anatomy

Adrenals

Embryologically distinct development from kidneys – seen in normal anatomical position with ectopia/agenesis
Medulla – zona reticularis – zona fasciculate – zona glomerularis
Right higher than left

Ureters

22 – 30cm long
Internal longitudinal and outer circular/oblique mm (opposite of tunica albuginea ‘trunk’)
Segmental arterial supply from renal, gonadal, aorta, common iliac, internal iliac and branches
Tight areas at PUJ, VUJ and over iliac artery
Autonomous pacemaker cells in renal pelvis
Arbitrary division into:
(i) Upper and lower halves (bifurcation of common iliac)
(ii) Upper, mid and lower thirds (mid ureter between upper and lower borders of sacrum)