

Differential diagnosis of childhood abdominal mass

Renal masses

- Wilm's tumour
- Multicystic dysplastic kidney
- Large hydronephrosis
- Polycystic kidney
- Congenital mesoblastic nephroma (< 1 yr)

Non-renal masses

- Mesenteric and choledochal cysts
- Intestinal duplication cysts
- Splenomegaly
- Neuroblastoma
- Rhabdomyosarcoma
- Lymphoma
- Hepatoblastoma

Wilm's tumour (nephroblastoma)

First described by Max Wilms in 1889

Abnormal proliferation of metanephric blastema without differentiation into glomeruli or tubules

Incidence 1:150,000 (7 per million children per year)

6-7% of all childhood cancers

Commonest renal malignancy

Commonest cause of solid abdominal malignancy

Peak age 3-4 yrs

Blacks > whites

Equal sex ratio

90% sporadic; 10% a/w 'predisposition syndromes' (see below):

Denys-Drash WT, glomerulosclerosis and ambiguous genitals

WAGR WT, aniridia, GU malformation, retardation

Beckwith-Weidemann

WT, macroglossia, visceromegaly, omphalocele

Horseshoe kidney 7-fold increased risk

95% unilateral; 5% bilateral (more common in above syndromes)

Overall 90% 5YS with combination of surgery, chemotherapy and occasionally radiotherapy

Presentation

Painless abdominal mass

Haematuria in 10%

Occasionally left varicocele

Rarely rupture and acute abdomen

Pathology

Molecular

WT1 gene on 11p13 (DDS, WAGR)

WT2 gene on 11p15 (BWS)

Loss of 1p and 16q associated with increased likelihood of relapse and death

Macroscopic

Unicentric with pseudocapsule of compressed normal parenchyma
Friable, with tendency to rupture

Microscopic

Classic good prognosis Wilm's has 'triphasic' appearance: blastema, tubular cells and stroma
Poor prognosis WT associated with anaplastic, rhabdoid, or clear-cell sarcoma (10% tumours; 60% deaths). NB. some authors do not believe that rhabdoid and clear-cell sarcoma subtypes true Wilm's.
30-40% of WT kidneys contain nephrogenic rests – islands of abnormally persistent nephrogenic (blastema) cells thought to be the precursor lesions from which WT develops

Investigation

| | |
|------------------|---|
| USS with Doppler | mass and renal vein/IVC invasion |
| CT C/A/P | standard cancer staging |
| Urinalysis | proteinuria = ?DDS VMA = ? neuroblastoma |
| CT head | Rhabdoid and clear cell sarcoma only |
| Bone scan | Rhabdoid and clear cell only |
| Clotting screen | TEG vs. APTT and bleeding time Anti-vWF agents from tumour |

Staging (Children's Oncology Group)

| Stage | |
|-------|--|
| I | Tumor limited to the kidney and completely excised. The renal capsule is intact and the tumor was not ruptured prior to removal. There is no residual tumor. |
| II | Tumor beyond the kidney, but is completely resected. Extrarenal vessels may contain tumor thrombus or be infiltrated by tumor. |
| III | Residual nonhematogenous tumor confined to the abdomen: lymph node involvement, any tumor spillage, rupture or biopsy, peritoneal implants, tumor beyond surgical margin either grossly or microscopically, or tumor not completely removed. |
| IV | Hematogenous metastases to lung, liver, bone, brain, etc. |
| V | Bilateral renal involvement at diagnosis. |

Management

Trimodal therapy with surgery, chemo and RT
Chemotherapy = VAD (vincristine, actinomycin D, doxorubicin)
General strategy is to identify high risk patients for maximal treatment while sparing low-risk patients highly toxic anthracyclines (doxorubicin) and radiotherapy
Differing treatment philosophies across Atlantic: US surgery first.
UK = Pre-operative chemotherapy (4 weeks) designed to downstage tumour and reduce risk of rupture; then surgery followed by adjuvant chemotherapy [Stage 1 = V; Stage 2 = V + A; Stage 3 = V + A + D]
Abdominal radiotherapy reserved for gross abdominal disease, anaplastic subtype, and chemotherapy failures

Prognosis

Poor prognostic factors
Anaplastic features

Advanced stage
 Tumour spillage
 Lymph node metastases

Survival

Good prognosis

| | | |
|-----------|-----|-----|
| Stage 1/2 | 90% | 5YS |
| Stage 3 | 80% | 5YS |
| Stage 4 | 70% | 5YS |
| Stage 5 | 70% | 5YS |

Poor prognosis

| | | |
|------------|-----|-----|
| Clear cell | 75% | 5YS |
| Anaplastic | 60% | 5YS |
| Rhabdoid | 20% | 5YS |

Rhabdomyosarcoma

Rare tumour of mesenchyme, resembling skeletal muscle

10-15% solid childhood malignancies

One third involve GU tract, typically bladder base, prostate, paratesticular, uterus & vagina

Paratesticular rhabdomyosarcoma accounts for 10% solid scrotal mass lesions in childhood

Incidence 1 in 2 million

Males > females

Blacks > whites

Increased risk in Li Fraumeni syndrome (p53 mutation)

Embryonal, alveolar and pleomorphic forms: embryonic good prognosis; almost all bladder tumours embryonal

GU rhabdomyosarcoma

Irritative bladder symptoms

Protruding vaginal mass

Combination of surgery, chemotherapy and RT

Surgery often first line, but debulking preferred to radical excision if continence mechanisms likely to be involved

70-80% 5YS

Neuroblastoma

Most common extracranial childhood tumour

Arise from neuroectoderm – 50% adrenal medulla, remainder along sympathetic chain

Incidence 1:100,000

Median age at diagnosis 2 yrs

Unlike Wilm's, patients present with abdominal pain and systemic features

Occasionally proptosis and periorbital ecchymosis 2' retro-orbital mets

Urinary homovanillic acid (HVA) and vanillylmandelic (VMA) elevated in 90%

Metaiodobenzylguanidine (MIBG) scans highly sensitive. Diagnosis a combination of MIBG and standard staging investigations

Survival generally poor except for a subset with favourable features (low stage, +/- mets limited to skin, liver and bone marrow (stage 4S))

Poor prognostic features:

High VMA:HVA ratio
Elevated serum ferritin and neuron-specific enolase
Amplification of N-myc oncogene
Deletion of short-arm of chromosome one
Adrenal location