PedsCases Podcast Scripts

This is a text version of a podcast from Pedscases.com on "**Approach to Abdominal Mass Part 1.**" These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedcases.com/podcasts.

Approach to Abdominal Mass Part 1

Developed by Kieran Purich and Dr. Ioana Bratu for PedsCases.com.
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Introduction:

Hi, my name is Kieran Purich, and I am a medical student at the University of Alberta. This is the first of a two part series on an approach to the pediatric abdominal mass, and was developed with the help of Dr. Ioana Bratu, a pediatric surgeon and Associate Professor at Stollery Children's Hospital and the University of Alberta, in Edmonton, Canada.

Objectives

The objective of the first episode is to help you:

1. Formulate a differential diagnosis for the common causes of abdominal masses in children
2. Review an organized approach to a child presenting with an abdominal mass
3. List the pertinent points in history
4. Review the key physical exam maneuvers
5. Select the appropriate initial investigations

In the second episode we focus on two malignant causes of a pediatric abdominal mass: Wilms' Tumor and neuroblastoma.

Case presentation

Let's start with a clinical case. You are a medical student completing your pediatric rotation in a community clinic. A mother comes in to clinic with her son Tyler – a previously well 9-month-old baby boy. The mom is worried because she felt a large abdominal mass yesterday while bathing him. The child has otherwise been feeding and stooling well, is afebrile and has no infectious symptoms.

When you examine the child, you appreciate a distinct, 5-6cm, smooth, non-tender, firm, fixed abdominal mass in the right upper quadrant. No other masses are present. There is no lymphadenopathy. What is on your differential diagnosis for a pediatric abdominal mass? What are the next steps?

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Differential diagnosis

Before we talk about an approach to an abdominal mass, let's review the differential diagnosis, as this will guide your history and physical exam. For this podcast, we have broken down the differential diagnoses into several main categories organized by anatomy. These categories being: renal, hepatobilliary, adrenal, gastrointestinal, pancreatic, spleen and genitourinary. It is always important to have a high level of suspicion for malignancy.

In newborns, renal causes make up around half of all cases of abdominal masses. These renal etiologies can be broken down into malignant, and non-malignant categories. The most common causes of renal abdominal mass in infants are nonmalignant – specifically hydronephrosis followed by polycystic kidney disease. The most common renal malignancy seen in children is Wilms' tumor or nephroblastoma, but there are other rare types of tumors such as renal cell carcinoma, which is more common in adults.

Hepatobilliary causes make up 5-6% of pediatric intra abdominal masses. The most common pediatric malignancy involving the liver is hepatoblastoma, which generally presents between 1 and 3 years of age. Benign hepatobilliary causes include: hemangiomas, liver cysts and congenital bile duct anomalies.

The adrenal gland is a key category often missed on student's differentials. It is critical not to overlook adrenal causes as they host a subset of tumours known as neuroblastomas, which are the most common extracranial solid organ malignancy in childhood. We will discuss neuroblastomas in more detail during the second episode of this podcast series.

Gastrointestinal causes are seen frequently and include constipation, which can cause a palpable mass and is the most common cause of abdominal pain in preschool aged children. Fortunately it is often easily treated with dietary modifications as well as laxatives when necessary. Other gastrointestinal causes such as: pyloric stenosis, intussusception, bezoars and duplication cysts may require surgical intervention.

Pediatric patients rarely present with abdominal masses arising from the pancreas. However, pancreatic pseudocysts can occur following trauma, and a primary tumor known as pancreatoblastoma is occasionally seen in the first 10 years of life. Splenomegaly is occasionally due to malignant causes such as lymphoma, infectious causes including EBV (mononucleosis), TB and other viral hepatitis, but is also seen to be enlarged in benign vascular tumors of the spleen as well as occasionally in cell storage diseases such as gaucher's disease and sarcoid disease.

Genitourinary causes which must be considered include a full bladder secondary to retention as well as congenital abnormalities such as urachal cysts. For female patients pregnancy must be ruled out in all children of childbearing age. There are also various

pediatric ovarian causes of abdominal mass. Benign examples include ovarian cysts, congenital vaginal obstruction and benign tumors like ovarian teratomas. There are numerous malignant ovarian tumors, which will not be touched on in this podcast.

Finally, Enlargement of any abdominal organ should be considered, including the liver, spleen, kidney and bladder. Some other causes that do not fit into the above categories are: abdominal hernias, lymphoma, sarcomas, intra-abdominal infection/abscess and hematomas.

Approach to a child with an abdominal mass.

Next, let's review an approach to an abdominal mass in children. We will focus on the history immediately pertinent to the abdominal mass, but ensure to also complete a routine pediatric history to look for hints regarding the etiology of the mass.

History:

1. Start your history with general introductions and asking for the patient's age. This is extremely important for narrowing the differential as likely etiologies vary significantly based on whether the child is a newborn, child or adolescent.

2. Characterize how the mass has evolved over time. How big is it? Where is it located? How long has it been present? Is it fixed in one location? Does it appear to be growing? Is it pulsatile? Is there any associated pain?

3. Ask around associated symptoms or signs. In some cases the mass will have no associated symptoms but it is important to ask about:

A) Abdominal pain – is the mass painful? What is the quality of this pain? Does anything make the pain worse or improved?

B) Fever, fatigue, pallor, weight loss & enlarged lymph nodes- these are associated with metastases, lymphoma as well as infection.

C) GI symptoms such as nausea, vomiting, bloating and constipation suggest that the GI system may be involved. If the patient does experience constipation make sure to obtain details regarding their regular bowel routine, consistency and size of stools and any recent changes in bowel habits. Chronic constipation may require a different approach and investigations, which are not covered in this podcast.

D) Urinary symptoms like hematuria may suggest a renal origin

E) History of trauma – trauma could result in a hematoma or a pancreatic pseudocyst.

F) Ensure to ask about past medical history including a birth history. Antenatal ultrasounds can identify some causes of abdominal mass such as hydronephrosis. If the

patient has previously diagnosed chronic medical conditions they may be predisposed to certain malignancies or complications.

G) Take a family history, ensure to ask about genetic syndromes and childhood malignancies. Family history of polycystic kidney disease is a relatively common hereditary issue.

H) In a female who is approaching/has entered puberty ensure to ask about menstrual cycles and dysmenorrhea, which may be related to ovarian causes. For female teen patients pregnancy must be ruled out.

Finally it is always good practice to complete a quick review of systems at the end of the medical interview to ensure you have not missed any symptoms that the parents or patient failed to mention. You can go through each of the organ systems – neurologic, cardiac, respiratory, gastrointestinal, endocrine, cutaneous, genitourinary. Topics to touch on when concerned about malignancy are: neurologic – headaches accompanied by vomiting could be indicative of a cranial malignancy or metastases to the brain. Musculoskeletal – joint/bone pain is suspicious for malignancy including leukemia, primary bone tumors or metastases from neuroblastoma. It is also important to ask about cutaneous manifestations like purpura, which may also be present in certain malignancies.

Physical Exam:

Before completing the focused physical exam keep in mind that many abdominal masses are not palpable on exam, but may be identified (sometimes incidentally) through the use of imaging. A similar approach can be used for both palpable and non-palpable masses. Take a minute to judge the patient's general appearance. Ask yourself – does the patient appear to be healthy? Have they gained/lost weight since when you last saw them? Are they interacting with their environment or do they appear fatigued? General inspection should not be overlooked. Generalized pallor can suggest anemia and jaundice can hint towards a hepatobilliary cause.

Start with the patient's vital signs and weight/height in comparison to their previous growth chart. New onset hypertension can be suggestive of a mass arising from a renal or adrenal cause. Documented fevers can suggest malignancy or infection. Tachycardia can be related to adrenal tumors or pain.

On abdominal exam you should begin by inspecting the abdomen – does it appear notably distended? Is it asymmetric? Are there any skin abnormalities noted? Are there any notable hernias? Auscultation is not a particularly high yield maneuver, but occasionally can demonstrate decreased or increased bowel sounds. Percussion should be used alongside palpation to assess for hepatomegaly or splenomegaly, which would warrant U/S investigation.

On palpation ensure to describe the characteristics of the mass including the size, location, consistency, whether it is fixed, and if it is tender. Large, hard, fixed, nontender masses generally are more concerning. Try to elucidate which intra abdominal structures the mass could be arising from. This will help guide your investigations. Large volumes of stool may be palpable throughout the colon – which increases the chance that the mass could be due to constipation.

Examine the head, neck, axillary and inguinal regions for lymphadenopathy. Lymph nodes associated with systemic symptoms such as weight loss and fever > 1 week, as well as lymph nodes increasing in size, larger than 2 cm in size, hard in nature and those fixated to structures beneath them are concerning and further investigation must be completed.

A head to toe exam should be completed. Use sensitive clinical judgment to decide on whether or not a pelvic or rectal exam is needed.

Be aware that intra abdominal structures can occasionally be mistaken for pathologic abdominal masses. This includes the liver edge, the spleen, pelvic kidneys, a full bladder and rectosigmoid colon full of stool. Ensure to be able to distinguish normal from abnormal, and know when ultrasound and investigations are warranted.

Investigations

Not all patients who present with abdominal mass require investigations. If the individual's history and physical exam fits with functional constipation you likely do not need to complete any further work-up. Use clinical judgment and try to order tests, which will help you rule in/out different causes.

Initial lab workup may include: CBC/D & peripheral blood smear which may show abnormalities in the case of malignancy. Liver function tests are important if the mass is thought to have arisen from a hepatobilliary cause. If a renal mass is suspected, the patient appears dehydrated or is vomiting, or if there are urinary signs such as hematuria it is important to check the electrolytes, creatinine, BUN, uric acid and urinalysis. AFP or B-HCG can be considered in certain cases especially if considering malignancies arising from ovarian/testicular germ cells or the liver.

In most cases, the imaging modality of choice is an abdominal ultrasound, which can help to identify the location, vascular supply and characteristics of the mass. If concerned about constipation abdominal radiographs may be completed in order to rule out obstruction or to look for a transition point in the colon.

In certain cases, such as neoplastic processes, further imaging such as CT or MRI may be required to assess the mass and appropriately stage the disease.

Management and prognosis varies greatly based on the cause. Different specialists may have to be consulted. If imaging and initial lab work cannot ascertain a specific

cause referral to subspecialty care is essential.

Pediatric malignancy

If initial investigations are suggestive of malignancy then an urgent consultation with pediatric oncology and/or pediatric surgery is needed. Further imaging may be needed at this time.

Occasionally diagnosis is completed at the time of surgery, particularly when the tumor can be removed entirely. If the tumor is not deemed resectable, then other means of obtaining a tissue sample for diagnosis can be expedited by the interventional radiologist or surgeon. Once a tissue diagnosis is made, then treatment plan can be initiated and may include surgery, chemotherapy +/- radiotherapy or a combination of the three.

Often these cases are discussed as a multidisciplinary team consisting of pediatric oncologists, surgeons and radiologists.

Conclusion of part 1

1. Be aware of the wide differential diagnosis for pediatric abdominal mass. Try to simplify the differential diagnosis by anatomic involvement/ location of the palpable mass. Useful anatomic categories include: renal, hepatobilliary, adrenal, gastrointestinal, pancreatic, genitourinary and the spleen. Always ensure to have a high suspicion for malignant causes.

2. Use your physical exam to judiciously order investigations, which may be important. Not all abdominal masses require urgent lab work and imaging. If imaging is required the initial investigation of choice is an abdominal ultrasound.

That concludes part 1 of our series on pediatric abdominal mass! Ensure to return for part 2 of this podcast for more detail on two of the malignant causes of pediatric abdominal mass – Neuroblastoma and Wilms' Tumor. We will also return to the case presented at the beginning of this podcast and discuss the etiology of Tyler's abdominal mass.

Thanks for listening.

Resources

1. Chu, C., Rasalkar, D., Hu, Y, Cheng, F., Li, C., Chu, W. Clinical presentations and imaging findings of neuroblastoma beyond abdominal mass and a review of imaging algorithm. 2011 The British Institute of Radiology 84 P. 81-91.
2. Davidoff, A. 2008. Pediatric Abdominal Masses. Common Surgical Diseases, DOI: 10.1007/978-0-387-75246-4_63

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3. Dingeldein, M. 2015. Pediatric Abdominal Masses. Common surgical diseases. DOI: 10.1007/978-1-4939-1565-1_72
4. Kaste, S., McCarville, B., 2008. Imaging Pediatric Abdominal Tumors. Seminars in Roentegenology. Doi:10.1053/j.ro.2007.08.007
5. Kocaoglu, M., et al., 2010., Pediatric abdominal masses: diagnostic accuracy of diffusion weighted MRI. Magnetic resonance Imaging 28 p. 629-636.
6. Postisek, N. and Antoon, J. 2017. Abdominal Masses. Pediatrics in review 38 p.101-103
7. Up to Date: Clinical assessment of child with suspected cancer
8. Up to Date: Clinical presentation, diagnosis and staging evaluation of neuroblastoma
9. Up to Date: Epidemiology, pathogenesis, and pathology of neuroblastoma
10. Up to Date: Treatment and prognosis of neuroblastoma
11. Up to Date: Presentation, diagnosis and staging of Wilms' tumor
    Up to Date: Treatment and prognosis of Wilms' tumor.

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