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Introduction

Pediatric cervical lymphadenopathy is a challenging medical condition for the patient, the parent, and the physician. 38-45% of normal healthy children (Larsson) and 90% of children aged 4-8 years old (Park) will have cervical lymphadenopathy. Although the majority of these masses will be benign the fear of malignancy is ever present. In this review I will describe the important history and physical findings, including work up, associated with cervical lymphadenopathy. Next I will touch on common pathogens present in both acute and subacute lymphadenitis. I will next review the literature for insight into the most common pathogens, presentations, ancillary tests and management strategies in treating lymphadenopathy, and finally I will propose a plan based on the literature for properly treating children with this disease process.

Definitions

A pathologic or abnormal lymph node is commonly quoted to be >1cm in size however in the pediatric population >2cm is considered abnormal (Cummings). Acute lymphadenopathy is 2 weeks duration, subacute is 2-6 weeks duration, and chronic is considered any lymphadenopathy that does not resolve by 6 weeks.

Pathophysiology of Lymphadenopathy

An initial insult such as an upper respiratory infection, pharyngitis, odontogenic infection or otitis media starts in the head and neck region. After a local inflammatory reaction occurs, organisms from the initial site are carried to the draining lymph nodes via afferent lymphatics. Once in the lymph nodes dendritic cells and macrophages trap, phagocytose, degrade, and present the organisms as antigens on MHC molecules. These antigens are presented to T cells for which leads to proliferation of clonal cells and release of cytokines important for chemotaxis of other inflammatory cells. One such cell is the B cell. B cells, with the help of T cells are activated, proliferate, and release immunoglobulins that aid in the immune response. The result

of this immune response within the lymph node is cellular hyperplasia, leukocyte infiltration, tissue edema, vasodilation and capillary leak, and capsule distension leading to tenderness.

History

Now that a mass is observed there are a plethora of historical and clinical findings that are vital to help differentiate what the cause of the mass is. Certainly you want to start with the mnemonic OLDCARTS as you do with all patients: “Onset, Location, Duration, Character, Aggravating factors, Relieving factors, Timing, and Situations in which the problem is occurring”. You want to make sure and inquire about symptoms of fever, malaise, fatigue, and anorexia which may suggest a systemic disease process. You want to ask about recent head and neck infections such as URI’s, pharyngitis, ear infections or tooth infections. Insect bites, exposure to animals, and exposure to sick contacts are important. Finally medications and immunizations are also important to ask about.

Physical Exam

After a thorough history, a solid methodical physical exam is the next step. It is important to start generally and just look at the child and ask yourself, “How sick are they?” If the child is febrile or toxic appearing it is perfectly reasonable to admit the child, start antibiotics, and consider some type of imaging to evaluate for abscess formation. Next you are going to evaluate the skin for signs of cellulitis, impetigo and rash. Cellulitis may suggest bacterial cause while a rash may just suggest a viral xanthem. On your ENT exam focus on primary sites of infection as described previously.

The neck exam is vital to your differential. Things you cannot forget to evaluate and document are size, unilateral vs bilateral, tender vs nontender, mobile vs fixed, and hard vs soft. Not only are these parameters important initially but they can also help guide decision making in the future should any of these findings change significantly.

Ancillary but important exam systems are lung, abdomen, and extremities. Lymphadenopathy should be considered a systemic disease process until proven otherwise. Therefore, you should listen to the lungs to evaluate for consolidations that might suggest TB. You should palpate the abdomen for hepatosplenomegaly a sign found in lymphoma and infectious mononucleosis. Finally you should palpate the inguinal and axillary regions for adenopathy as well.

A good history and physical exam will go a long way to helping you differentiate not only benign from malignant but also lymphadenopathy from other forms of neck masses that may resemble a lymph node but truly be something different.

Differential Diagnosis

Although the majority of masses diagnosed as being lymphadenopathy will be just that, approximately 22% (Yaris) of patients will have some other type of head and neck mass. The following is a list, however not exhaustive, of the differential diagnosis of lymphadenopathy, including history and physical findings that can help aid making the correct diagnosis.

Thyroglossal duct cyst	Moves with tongue protrusion and is midline.
Dermoid Cyst	Midline and often has calcifications on plain films.
Branchial Cleft Cyst	Smooth and fluctuant along SCM border.
Laryngocele	Enlarges with valsalva.
Hemangioma	Mass is presents after birth, rapidly grows, plateaus, and is red or bluish in color
Cystic Hygroma	Transilluminates and is compressible
Sternocleidomastoid Tumor	Presents with torticollis, lymphadenopathy does not
Cervical Ribs	Bilateral, hard and immobile
Mumps	Mass palpated superior to jaw line, not just inferior to it.

Further workup

For most patients who present with acute, unilateral lymphadenopathy minimal workup is necessary. Many patients will get a CBC with differential. Subacute disease or disease that is not responding to therapy needs to be further evaluated. Common laboratory tests are as follows: ESR, Rapid Streptococcal test, serology (EBV, Toxoplasmosis, Bartonella, CMV, Syphilis, and HIV), PPD placement, urine VMA and LDH. Many of these tests are self explanatory however others can be very specific to disease processes. ESR may be significantly elevated in Kawasaki disease. A PPD test is often positive in patients with mycobacterial lymphadenitis regardless being tuberculous or non-tuberculous. Urine VMA can be elevated in children with neuroblastoma and while LDH is often elevated in lymphoma.

Imaging can include CXR, CT, MRI, Ultrasound, EKG/ECHO, and finally biopsy. CXR is useful for patients in whom systemic disease is suspected and can be helpful in identifying cavitory TB lesions and even mediastinal lymphadenopathy. CT, MRI, and ultrasound can all be used to evaluate for abscess formation and to follow the progress of an abscess after it forms, however ultrasound is probably the better choice to decrease the amount of radiation and resources spent performing the study. EKG and ECHO are also commonly used in patients suspected of having Kawasaki disease.

Common findings in lymphadenopathy

In 2006 Yaris et al. performed a retrospective review of 126 patients in Clinical Pediatrics. Their aim was to identify clinical and laboratory findings that aided in the diagnosis of lymphadenopathy. Here they pointed out the importance of history and physical exam with the help of laboratory findings produced a diagnosis in 61.2% of cases. They went on to say that biopsy helped identify the diagnosis in an additional 38.8% of cases. Of the 126 patients 22.2% were found to have disease other than lymphadenopathy. Of those with lymphadenopathy, 76.6% had benign disease and 23.4% had malignancies.

Location of lymphadenopathy was also important. The most common area for benign and malignant lymphadenopathy was is the submandibular gland followed by the superior cervical region. In terms of lymphadenitis vs reactive lymphadenopathy, lymphadenitis was more commonly associated with nodal size of >3cm and localized disease.

Finally they looked at risk factors for malignant disease. They found that old age, supraclavicular nodes, generalized lymphadenopathy, nodal size >3cm, hepatosplenomegaly, enlarged mediastinal nodes, and elevated LDH levels were all statistically significant and associated with malignant disease. Interestingly, supraclavicular lymphadenopathy has been quite a significant risk factor. In a study performed by Ellison et al in 1999 of 309 supraclavicular fine needle aspirations, they found that 55% of nodes sampled were malignant. Therefore it is recommended that any supraclavicular node be biopsied due to its malignant potential.

Acute Lymphadenopathy

Acute lymphadenopathy is almost always due to infectious causes and again lasts less than 2 weeks duration. Viral lymphadenopathy is the most common form of reactive lymphadenopathy. Common viruses implicated in the formation of lymphadenopathy are Adenovirus, Rhinovirus, Enterovirus' such as Coxsackie A and B, and Epstein Barr Virus just to name a few. Lymphadenopathy is often diffuse, bilateral, and nontender. Patients will commonly complain of cough, rhinorrhea, and low grade fever. Management is usually expectant however because lymph nodes often persist longer than 2 weeks they are commonly biopsied. Secondary bacterial infection does occur at times in these patients.

Suppurative bacterial lymphadenopathy is most commonly caused by Group A Streptococci and *S. aureus*. These represent about 57.5% of all cases of lymphadenitis and 70% of bacterial cases are represented by unilateral lymphadenopathy. Common physical findings included erythema or tenderness of the overlying skin in 48.3% and fever in 24.1% of cases. Diagnostically 31% of patients with bacterial lymphadenitis had a phlegmon, infiltrate or abscess (Niedzielska). Management is with oral or intravenous antibiotics depending on the general appearance and reliability of the parents of the child. CT with contrast and Ultrasound is an important adjunct in the evaluation if abscess is suspected. Common findings of abscess formation would be spiking fevers, fluctuance, dysphagia, or airway compromise.

Subacute Lymphadenitis

Subacute lymphadenopathy persists for 2-6 weeks and again is most commonly infectious in nature. These patients are typically treated with antibiotics first, however when they don't get better, parents want to know "What is this mass growing on my child's neck?" Therefore more aggressive workup is necessary. In 1995 Margalith et al looked at the most common causes of subacute lymphadenitis and showed that Atypical Mycobacteria, Cat Scratch disease, and Toxoplasmosis are the most common causative organisms found. To a lesser extent EBV and CMV are also implicated at times.

In 2009 Choi et al retrospectively reviewed 60 patients less than 18 years old who had subacute lymphadenopathy and negative cultures at 48 hours. They evaluated the usefulness PCR as a tool to rapidly diagnose the causative organism, what organisms were most commonly diagnosed, and what type of surgical therapy was most effective in curing disease. The average age of patients was 4.7 years old with a slight female predominance of 53%. Average lymph node size was 3.2cm and superior cervical and submandibular lymphadenopathy were the most common presenting site.

Mycobacteria was implicated in 61.7% of cases and *M. avium-intracellulare* was the most common pathogen. Legionella and Bartonella were both implicated in 10% of cases and in 18.3% of cases no organism was identified. Acid fast stain, culture and PCR were all relatively good at identifying mycobacteria, however acid fast stains are not specific for tuberculous vs non-tuberculous types and cultures often take up to 2 weeks or longer. In terms of Bartonella and Legionella infections, PCR was the only diagnostic modality to identify these pathogens. Therefore PCR is superior to stain and culture if available because it provides a diagnosis within 2-3 days so that proper treatment recommendations can be instituted.

Finally this study looked at the ability of different surgical techniques to cure lymphadenitis. They found that incision and drainage, curettage, and lymphadenectomy had cure rates of 22%, 58%, and 95% respectively. They concluded then that lymphadenectomy is the treatment of choice in patients with subacute mycobacterial lymphadenitis, but that the sample size was not large enough in either the Legionella or Bartonella subgroups to make a definitive statement. It is important to note, however, that in the case of Legionella infections, 6/7 cases treated with incision and drainage plus postoperative antibiotics had recurrences. It appears then that lymphadenectomy might also be required for Legionella disease as well, but more studies are needed.

Atypical Mycobacteria

Atypical Mycobacterial infections are the most common cause of subacute lymphadenopathy. The most commonly involved species include *M. avium-intracellulare*, *M. haemophilum*, and *M. scrofulaceum*. These infections develop over weeks to months and untreated cases usually will develop sinus tracts and cutaneous drainage for up to 12 months. Common findings on physical exam are lymph nodes that are tender, rubbery and have a violaceous discoloration of the overlying skin. Diagnosis can be made by acid fast stain, culture and even PCR as described earlier. Historically treatment has been surgical excision however there is some evidence that expectant management may be the best treatment. It is important to note that atypical infections differ from tuberculous mycobacterial lymphadenopathy in that tuberculous adenopathy is often an ominous signs of disseminated disease and needs to be treated more aggressively.

A study by Zeharia et al in 2008 was performed retrospectively on 92 children diagnosed with atypical mycobacterial lymphadenopathy. The parents of all 92 children in this study opted for non-surgical and non-medical conservative management, and patients were followed for a minimum of 2 years. Diagnostic characteristics were as follows:

- 80% of patients were less than 4 years old
- 80% of patients had lymphadenopathy greater than 3cm in size
- 90% of patients had unifocal lymphadenopathy
- Lymphadenopathy was most commonly found in Submandibular (50%), Cervical (25%), Preauricular (10%) regions
- 85% of patients had a positive PPD (>10mm)
- 90% of cases were due to *M. avium-intracellulare* and *M. haemophilum*
- 97.4% of patients had a dominant node with purulent drainage for 3-8 weeks

Lymph node size and purulent drainage of lymph nodes speaks highly about the severity of disease in these children. Amazingly, however, patients showed total resolution of the lymphadenopathy at 6 months (71%), 9 months (98%), and 12 months (100%) with the only complication being a flat, skin colored scar in the area of cutaneous drainage.

A previous randomized, controlled study by Lindenboom et al. in 2007 showed that surgical management of atypical mycobacterial infections was superior to antibiotic therapy. Although surgical therapy was superior they also found that approximately 28% of surgical cases had complications such as secondary wound infections, and transient for permanent facial nerve injury. Zeharia concluded then, that observation is superior to surgical therapy because although patients may have a protracted course of illness, you avoid the complications of surgical management.

Cat Scratch Disease

Cat Scratch disease is a form of lymphadenitis caused by *Bartonella henselae*. Age of onset is usually less than 20 years of age and there is a male predominance. 90% of patients have been exposed to a cat bite or scratch, however fleas and dogs have also been known to carry the organism. Lymphadenopathy can take up to 2 weeks to develop and is usually tender, but systemic signs of malaise and fever are mild and present in less than 50% of patients (Twist). Diagnosis is made with serology and or PCR if available. Historically antibiotic treatment has been reserved for patients with severe disease and normal management has been expectant (Windsor). Antibiotics are almost always given to immunocompromised patients due to the risk of disseminated disease, which can be deadly.

In 1998 Bass et al published a prospective, randomized, double-blinded, placebo controlled trial comparing 5 days of azithromycin therapy to no treatment at all. Patients were followed for by ultrasound and a success rate was determined to be a reduction in the size of lymphadenopathy to 20% its original size. They found that 50% of patients treated with azithromycin met this criterion at the 30 day follow up, but only 7% met this criterion in the placebo group. After 30 days however there was no statistically significant difference between groups. So although antibiotics were good at rapidly decreasing the size of lymphadenopathy, in the long run observation proved to be just as effective.

Toxoplasmosis

Toxoplasma gondii is the causative organism in toxoplasmosis. The consumption of undercooked meat or ingestion of oocytes from cat feces are the most common route of transmission. Symptoms include malaise, fever, sore throat and myalgias, and 90% of patients will have cervical lymphadenopathy. The diagnosis is made by serologic antibody testing. Complications include pneumonitis, myocarditis, and risk of transmission to the fetus of pregnant women leading to TORCH infection. Treatment is absolutely necessary given the complications and antibiotic choices include pyrimethamine or sulfonamides.

Infectious Mononucleosis

Epstein Barr Virus is the most common pathogen causing this disease process however Cytomegalovirus has also been found to be involved. Interestingly 50% of us have been exposed

and are seropositive by 5 years old and 90% are seropositive by 25 years of age. Signs and symptoms include fever, a grey colored exudative pharyngitis, painless and generalized lymphadenopathy, and axillary lymphadenopathy with splenic enlargement increases the likelihood of the diagnosis. On peripheral blood smear patients will have greater than 50% lymphocytosis and greater than 10% of the lymphocytes will appear atypical. Diagnosis is confirmed with monospot test or a positive serum heterophile antibody test.

Treatment of patients with infectious mononucleosis is supportive, however there are several important considerations and things to counsel patients about with respect to this disease. First, airway edema and swelling can become significant enough to cause obstruction. You must pay special attention to the airway in these patients and be ready to obtain a definitive airway if necessary. Prophylactic steroids in the acute phase can help prevent airway compromise. Second, you should not treat these patients with ampicillin as up to 80% will develop an iatrogenic maculopapular rash due to circulating immune complexes. Finally, you must counsel patients against contact sports for 2 months to prevent splenic rupture in the case of splenomegaly.

Noninfectious Lymphadenopathy

In addition to infectious and inflammatory causes of lymphadenopathy there are several rare forms of noninfectious lymphadenopathy to know about in case a child does present with the common constellation of symptoms.

1. Kawasaki Disease

This disease is also known as Lymphomucocutaneous disease. There are 5 characteristic signs and symptoms associated with the disease and 4/5 are required for diagnosis. The five signs are fever for more than 5 days, cervical lymphadenopathy that is usually unilateral, edema and erythema of the palms and soles that eventually leads to desquamation of skin, non-purulent bilateral conjunctivitis, and a strawberry tongue. Complications include coronary artery aneurysms, coronary thromboses, and myocardial infarction. All patients suspected of having this disease process should get an EKG and echocardiogram to evaluate the heart. Treatment is with IVIG and Aspirin to prevent the inflammatory insults on the heart.

2. Kikuchi-Fujimoto Disease

This disease is also known as necrotizing lymphadenitis. It presents in young Japanese females and is a benign disorder. Associated signs and symptoms include fever, malaise, arthralgias, weight loss, nausea, night sweats and in some cases hepatosplenomegaly. The etiology is thought to be viral or autoimmune. Treatment is expectant as the majority of cases regress within 6 months however there have been reports of recurrent disease.

3. Rosai-Dorfman

Rosai-Dorfman disease is a benign disease that usually presents in the first decade of life with males twice as affected as females. The cause is a generalized proliferation of sinusoidal histiocytes. Fever, neutrophilic leukocytosis, and polyclonal hypergammaglobulinemia are common associated findings but the massive, painless, and bilateral cervical adenopathy is the most alarming finding. Most patients will get a biopsy due to the nature of the lymphadenopathy.

The biopsy findings are diagnostic showing sinus expansion with histiocytes and phagocytosed lymphocytes (Foucar). Treatment is supportive and most patients have spontaneous regression.

4. Langerhans Cell Histiocytosis

There is a wide spectrum as to the severity of this disease process. One third of patients will have background lymphadenopathy and histopathology shows normal lymph node architecture but increased sinusoidal Langerhans' cells, macrophages and eosinophils. Eosinophilic granuloma is the mildest form of the disease and it is characterized by solitary bone, skin, lung, or stomach lesions. Treatment is with either topical or systemic steroids and possible enucleation of bone lesions. Hands-Schuller-Christian disease is a triad including diabetes insipidus, exophthalmos, and lytic bone lesions. This more moderate form of disease is often treated with systemic steroids and desmopressin for the diabetes insipidus. The most severe form is Litterer-Siwe disease and is a life threatening multisystem disorder with a 50% 5 year survival. This is treated with systemic steroids and even chemoradiation therapy has been used.

Chronic Lymphadenitis

Once a lymph node has been present for greater than 6 weeks, the risk of malignancy increases especially if the mass is enlarging or the patient is experiencing systemic signs and symptoms. Subacute pathogens, however, are still implicated as it can take months for subacute disease, once diagnosed, to resolve without surgical therapy. Because malignancy is more common in this group than any other it is important to know the demographics of the patients you are taking care of. In children, there are very few common malignancies found to cause lymphadenopathy. Leukemia and lymphoma are by far the most common. Aside from these two entities, Neuroblastoma, Rhabdomyosarcoma, and nodal metastases from a Nasopharyngeal carcinoma are the next most common malignancies. It is important to remember the risk factors for malignancy found by Yaris et al in 2008 as previously described. Supraclavicular (Ellison) and posterior triangle (Putney) lymphadenopathy are all much more suspicious for malignancy.

Almost all of the patients in this chronic lymphadenopathy group will receive a biopsy, most often a fine needle aspiration. Excisional biopsy is often needed, however, because FNA often times does not provide enough tissue for diagnosis if a malignancy is present. Management of malignancy is often a referral to the medical oncologist given the age of these patients and the types of cancers that they face.

Drug Induced Lymphadenopathy

There are very few medications that can cause lymphadenopathy but knowing about them can help you find a benign cause for a relatively worrisome lymphadenopathy. Dilantin is classically the most common medication causing lymphadenopathy. Any child with a seizure disorder that has been on it for some time may be at risk. Other medications implicated are isoniazide, phenylbutazone, allopurinol, pyrimethamine. Lymphadenopathy usually resolves once the medication has been discontinued but long term dilantin use has reports of prolonged adenopathy.

Immunizations can also cause adenopathy. Historically the small pox vaccine was one of the most common but now in children MMR, DPT, and polio vaccines are the most commonly

implicated. Typhoid fever vaccine can also be a cause, but adenopathy usually resolves with time.

The Role of Ultrasound

In 2005 Ahuja et al described the use of ultrasound to differentiate reactive from malignant lymphadenopathy. Reactive lymphadenopathy had the following characteristics; size less than 1 cm, oval shape with short:long ratio less than 0.5, normal hilar vascularity, and a low resistive index with high blood flow when using Doppler technology. Malignant lymphadenopathy had the characteristics of being greater than 1cm, round with a short:long ratio greater than 0.5, necrotic center, no echogenic hilus, a high resistive index with low blood flow, and the ability to identify extracapsular spread. Using these parameters they found a sensitivity of 95% and a specificity of 83% success rate of differentiating reactive from malignant lymph nodes.

The Role of Biopsy

Fine needle aspiration is by far and away the least invasive form of biopsy and with the help of ultrasound you are much more able to biopsy the area of choice. The problem with FNA is that it is not as reliable in children as it is in adults, and therefore you can only trust a positive biopsy (Twist). Chau et al in 2003 looked at 289 fine needle aspirations out of 550 patients that were referred to a lymphadenopathy clinic in Great Britain. They found that of those 289 biopsies, there was 97% specificity but only 49% sensitivity. Also they showed a false negative rate of 45% and of those false negatives 83% of the cases were lymphomas.

Although fine needle aspiration has such a low sensitivity and high false negative rate it should still be the first line biopsy due to its relative ease and ability to be performed without general anesthesia. If FNA is inconclusive or negative, however, and suspicion is still high for malignancy, excisional biopsy should be performed. Throughout the literature excisional biopsy is considered the gold standard. The biopsy must be carried out so that the largest and firmest node palpable node is excised with the capsule intact (Twist). This prevents seeding in the case of malignancy or bacterial pathogens.

Plan of Action

After reviewing the literature regarding the workup and management of cervical lymphadenopathy, the following recommendations can be made.

1. A thorough history and physical exam is vital to forming a valid differential diagnosis and can be very helpful in directing treatment.
2. Any acute lymphadenitis should be treated with 2 weeks of broad spectrum antibiotics as an outpatient unless the patient appears toxic. In this case the patient should be admitted and receive intravenous antibiotics plus or minus CT/MRI/Ultrasound to evaluate for abscess formation
3. When patients present or return for re-evaluation with a history of 2-6 weeks of lymphadenopathy at minimum patients should get a PPD and CXR to look for signs

- of malignancy or mycobacterial infection. Additional serologic testing can be sent at this time should there be history that predisposes patients to other less common causes (Cat Scratch, Toxoplasmosis, Mononucleosis, HIV, Syphilis).
4. If available PCR can be used to obtain a very quick diagnosis so that treatment options can be discussed without a prolonged worrisome waiting period.
 5. If patient is found to have Atypical Mycobacterial infection patients should be counseled about the possible protracted course cutaneously draining lymph node, skin discoloration and scar with observation only. They should also be counseled that surgical therapy has it's own complications, and patients should be allowed to decide the type of therapy they want.
 6. If a patient is found to have Cat Scratch disease, parents should be counseled that the condition is benign in most cases and that it will go away on its own, however, 5 days of antibiotics have been shown to rapidly decrease the size and deformity of lymphadenopathy.
 7. If you are unsure whether or not to biopsy a lymph node, ultrasound with Doppler can be a very useful adjunct to tell you whether the node is just reactive or abnormal.
 8. FNA biopsy should be performed if:
 - a. The patient has an enlarged supraclavicular node
 - b. The node has been present for 2-6 weeks and the patient has concurrent systemic signs of disease that put them at increased risk for malignancy.
 - c. The node is larger than 3 cm, has not responded to antibiotics, has been present for 2-6 weeks.
 - d. The node has been present for over 6 weeks
 9. Excisional biopsy should be performed in all children when FNA has returned inconclusive or negative and the suspicion for malignancy is still high.

Conclusion

Cervical Lymphadenopathy is a challenging clinical problem especially in children. History and physical exam are very helpful in determining the cause of lymphadenopathy. The good news is that in the majority of patients the causative organisms or pathology is benign, but it is important to be vigilant and pay careful attention to objective data to drive your decision on when to be conservative or aggressive with both workup and therapy.

DISCUSSION: Shraddha S. Mukerji, MD -- Lymphadenitis in children

As Andrew mentioned, majority of the head and neck masses in children are benign. Important benign differentials include congenital causes and inflammatory/infectious lesions.

A systematic approach is required to clinically evaluate cervical lymphadenopathy in children.

When there is a high likelihood that a lymph node is reactive because of atypical mycobacteria, then surgery should be offered if the lymph node is at a accessible site. Two important differentials include lymphoma and tuberculous lymphadenopathy. Chest Many a time excisional biopsy is not possible, because the lymphoid tissue is soft and curettage may be another option. The latter is associated with a slightly lower rate of complication.

Biopsy suspicious lesions.

If there is a question about abscess or not, I always order a CT with contrast. If the child is showing clinical improvement, no imaging is required. If the child does not show improvement on a confirmed abscess, I will follow with a US to define whether there is suppuration or not.

DISCUSSION: Harold Pine, MD -- Lymphadenitis in Children.

Seeing the pediatric patient with enlarged lymph nodes can be quite a challenge not only because there is an extensive differential diagnosis but also because it's never clear exactly when to offer an FNA or surgery for biopsy and culture. If the patient is sent from the hematologist and or infectious disease specialist asking specifically for an open biopsy, then I will usually offer this service and the family already comes in expecting a surgery. The more common scenario is that the parent and or the pediatrician feel an incidental node and the child is sent to the ENT surgeon for evaluation. In these cases, a good understanding of the entities that cause enlarged nodes in children can help direct the appropriate work up including lab tests, radiographic evaluations and possibly surgical intervention.

As many of the infectious/inflammatory conditions that affect the head and neck may cause prolonged lymph node enlargement, it is certainly reasonable to tease out a recent history of infection and possibly send off titers to the common etiologic agents like EBV (Mono) and Bartonella henselae (Cat Scratch). Many of the patients that get referred in to see me have already been on a good course of antibiotics and have been ruled out for the above. Occasionally I will send the child to see the infectious disease specialist for their opinion. They are likely to send off additional titers to some of the more esoteric causes. They are often the ones who will place a PPD, get a CXR and try a different antibiotic, usually a combination of two for the best coverage. If radiographic tests have not been done yet, an ultrasound and or CT with contrast can help sort out the simple enlarged node vs. generalized adenopathy.

In the end, the underlying concern driving many of our decisions is the issue of whether the node is representative of a cancer. As ENT surgeons, we would hate to offer reassurance only to find out later that another surgeon did a biopsy and it came back cancer. The main cancers to consider of course are lymphomas, sarcomas, followed by thyroid carcinomas, nasopharyngeal carcinomas (in adolescents), salivary gland malignancies, and neuroblastomas (especially if child is under 1). Except in some special centers around the country, an open biopsy is superior to FNA for the diagnosis of lymphoma. Don't forget to send the tissue "fresh" to the pathologist.

When a node or group of nodes is rapidly enlarging and especially when they present in the supraclavicular region, suspicion for cancer should go up and I would tend to offer excisional biopsy rather early. When there are some small nodes in the cervical chain and they are not getting bigger, and the child is healthy without constitutional symptoms, and has an otherwise

normal head and neck exam, I think watchful waiting is certainly quite reasonable. Bad things tend to get worse and so with good follow up at reasonable intervals, the clinical situation will improve or change allowing for a reasonable recommendation for continued observation or excisional biopsy. Sometimes the parental concern is so great that the best course is to offer removal early and put the issue to rest.

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