Evaluation of Chest Pain in Children

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Evaluation of Chest Pain in Children

Steven M. Selbst, MD*

Chest pain in children is a frequent complaint but is not nearly as common as recurrent abdominal pain or limb pain which reportedly occurs in 11% and 4%, respectively, of all children. Chest pain has been reported to occur in 3/1,000 children who visit an emergency department or outpatient clinic of a children’s hospital. A survey of black, urban adolescents found chest pain to be the seventh most common health problem. An ongoing prospective study of chest pain in the emergency department of the Children’s Hospital of Philadelphia has identified more than 400 children in 1 year with the chief complaint or secondary complaint of chest pain (70,000 patient visits, occurrence rate 0.59%). The dramatic media accounts of sudden deaths of young athletes may have focused attention on chest pain as a sign of serious heart disease. The medical community has also emphasized the prevalence of hypertension and atherosclerotic cardiovascular disease in adults such that even young people are more aware of risk factors for cardiac diseases. Thus, in general, chest pain in children and adolescents is receiving increased attention.

Chest pain occurs in children of all ages. Most studies report the mean age of children with chest pain to be between 12 and 14 years. In one study, half of 267 children with chest pain were younger than 12 years of age. Chest pain has no sex predilection, but in patients with costochondritis or chest pain due to stress and anxiety, girls are affected about twice as often as boys. Previous studies of children with this symptom have involved mostly urban black and Hispanic populations, but there is no reason to think the complaint is less common in white children.

Chest pain is often chronic, lasting more than 6 months in 15% to 36% of children and for more than 1 year in 8% of children. In one study, 16% of children with chest pain had more than one visit to the emergency department for this same complaint.

DIFFERENTIAL DIAGNOSIS

Chest pain can originate from outside the chest (chest wall) or from within the chest (involving heart, lungs, esophagus, and other structures), or it may radiate from the abdomen. Consequently, there are numerous clinical conditions to consider in evaluating a child with chest pain (Table 1).

Idiopathic Chest Pain

Chest pain of idiopathic origin is the most common cause for chest pain in children and adolescents accounting for 28% to 45% of patients despite a thorough history, physical examination, and laboratory evaluation. The more chronic the complaint of pain, the less likely it is that a specific etiology will be found. There is some belief that children with idiopathic chest pain have persistent pain long after their evaluation and examination, but long-term follow-up studies are not available.

Musculoskeletal Chest Pain

Of those cases for which a specific etiology is found, musculoskeletal causes are most common. Included here is chest wall pain which has been known to mimic cardiac pain in adults. This is usually due to strain or overuse of muscles and occurs after excessive exercise or minor trauma such as from playing football or wrestling. A history of doing multiple push-ups, lifting weights, or participation in gymnastics is certainly helpful in diagnosing muscle strain. Such pain may involve the pectoral muscles or other muscles of the shoulder that produce pain over the anterior aspect of the chest. Strain of the upper back muscles (latissimus dorsi or trapezius) can cause lateral or posterior chest pain. A related chest wall disorder is costochondritis which accounts for 10% to 22% of all pediatric chest pain. This condition is characterized by sharp pain in the anterior chest wall which may radiate to the chest, back, or abdomen. It is diagnosed by eliciting tenderness when palpating the affected rib cartilages where the ribs are attached to the sternum. Such pain may be preceded by exercise or an upper respiratory tract infection, rather than direct trauma, and it may persist for several months. This condition seems to be more common in females. Costochondritis differs from the very rare disorder called Tietze’s syndrome in which there is visible, spindle-shaped swelling at the sternochondral junction.

Direct Trauma

Certainly direct trauma to the chest wall can produce significant pain. This can occur from sports, accidents, and child abuse. External signs such as swelling and bruises may not be noticed. Serious consequences, such as hemotorax or pneumothorax, may result or, in less serious injuries, rib fractures may occur. Posttraumatic pericardial effusion can occur 1 to 3 months after significant blunt chest trauma.

Slipping Rib Syndrome

A recent report in Pediatrics mentioned slipping rib syndrome as a cause of chest pain in children. This is thought to be an unusual sprain disorder produced by trauma to be costal cartilages of the 8th, 9th, and 10th ribs. These ribs, of course, do not attach to the sternum and the patient with this syndrome may re-
port that he or she feels a slipping movement of the ribs. Some hear a clicking or popping sound when lifting objects or flexing the trunk and most complain of pain under the ribs or in the upper abdominal quadrants. The pain can be duplicated by performing the “hooking maneuver,” whereby the affected rib margin is grasped and then pulled anteriorly.

**Psychogenic Pain**

Anxiety and emotional stress are common and important causes of chest pain in children. In one prospective study on childhood chest pain, patients were interviewed by a psychiatrist who concluded that chest pain caused concern in the child but psychiatric disturbance did not initiate the pain. However, other studies have shown that, in about one third of those with chest pain, a stressful situation could be causally related to the symptoms. Such stress can be the result of a recent death or separation, aggression, physical illness, or disability. Many of these children have school phobias or other somatic complaints. One-third have a history of significant sleep disturbances, and one half may have a positive family history of chest pain. The majority of these children with psychogenic chest pain are girls, and they are generally adolescents rather than young children. Several adolescents with psychogenic chest pain were hyperventilating when first seen by a physician. Hyperventilation alone can produce chest pain because of hypocapnic alkalosis. With prolonged hyperventilation, this can lead to coronary artery vasostriction. Also, during hyperventilation, stomach distension can occur as a result of concomitant aerophagia, which can lead to chest pain. Most patients with hyperventilation and chest pain have associated light-headedness, headache, and paresthesias. Certainly, psychogenic chest pain should not be a diagnosis of exclusion. However, other factors such as emotional stress are usually accompanying dyspnea, tachycardia, and possibly cyanosis and decreased breath sounds. Symptoms and signs depend on how large the pneumothorax is and whether or not it is under tension. Such pneumothoraces may be due to trauma or they may be spontaneous. Often, spontaneous pneumothoraces occur with exercise as a small unrecognized subpleural lung cyst ruptures. Some diseases such as asthma, cystic fibrosis, and Marfan’s syndrome are associated with the development of pneumothoraces.

In addition, in an occasional child a spontaneous pneumomediastinum with mediastinal emphysema will develop. This may cause severe pain, usually substernal, and it may radiate to the back, neck, shoulders, and rarely arms. Although radiographs are helpful in confirming the diagnosis, spontaneous mediastinal emphysema can be detected on physical examination by palpat ing subcutaneous air in the neck and by auscultating the typical “crunching sounds” over the precordium. Pneumothorax may occur later in these patients.

**Gastrointestinal Disorders**

Esophagitis, or indigestion, often presents as chest pain. Such pain is sometimes described as burning and may be worse in the reclining position or with intraabdominal pressure. The ingestion of certain spicy foods may be related to the onset of chest pain. Esophagitis accounted for 7% of chest pain in one retrospective study, but it was found far less often in a}

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**TABLE 1. Differential Diagnosis of Chest Pain in Children**

| Idiopathic | Musculoskeletal Disorders | Cardiac Disease | Psychogenic Pain | Dystrophies | Structural abnormalities | Coronary artery anomalies | Infections (pericarditis, myocarditis) | Coronaryarteritis (Kawasaki disease) | Myocardial infarction, ischemia | Respiratory Problems | Cough | Pneumonia | Asthma | Pleural effusion | Pneumothorax | Pneumomediastium | Gastrointestinal Disorders | Esophagitis | Esophageal foreign bodies | Caustic ingestions | Miscellaneous disorders | Thoracic tumor | Breast mass | Sickle cell crises | Shingles | Pleurodynia | Precordial catch | Cigarette smoking |

The presence of tachypnea, chest retractions, wheezes, rales, and fever helps make these diagnoses even prior to radiographic confirmation in many cases. Occasionally, a pleural effusion may be present as part of an acute infection (Staphylococcus aureus or Haemophilus influenzae pneumonia) or a systemic disease such as lupus. The patient may report that breathing deeply increases the pain. Decreased breath sounds and dullness to percussion may be noted on chest examination. Moreover, pneumothorax causes sharp chest pain, made worse with inspiration. The pain may radiate to the shoulder, the neck, or even the abdomen. There is usually accompanying dyspnnea, tachycardia, and possibly cyanosis and decreased breath sounds. Symptoms and signs depend on how large the pneumothorax is and whether or not it is under tension. Such pneumothoraces may be due to trauma or they may be spontaneous. Often, spontaneous pneumothoraces occur with exercise as a small unrecognized subpleural lung cyst ruptures. Some diseases such as asthma, cystic fibrosis, and Marfan’s syndrome are associated with the development of pneumothoraces.
Chest Pain

prospective series of adolescents with chest pain.

Foreign bodies, such as coins, can become lodged in the proximal esophagus and produce chest pain. This is seen in toddlers, and there is usually a history of the ingestion or a choking episode. Less commonly, ingestions of caustic substances such as dishwasher detergent and drain cleaners can cause significant damage to the esophagus and subsequent chest pain.

Cardiac Disease

Although heart disease is perhaps the most concerning diagnosis in evaluating chest pain, it is a relatively rare finding in children. It has been identified in less than 5% of children with chest pain. Still, myocardial infarction is a rare possibility in children and, therefore, several cardiac diseases should be considered. Dysrhythmias can occur throughout childhood, and these may cause palpitations along with chest discomfort or pain. Supraventricular tachycardia (paroxysmal atrial tachycardia) is the most common of these dysrhythmias. Premature ventricular contractions may also produce transient sharp chest pain and an irregular heart rhythm. In addition to dysrhythmias, some structural abnormalities of the heart can result in occasional chest pain. For instance, hypertrophic obstructive cardiomyopathy can cause ischemic myocardial dysfuction in young people. There is usually a family history of this problem because it is inherited with an autosomal dominant pattern. A murmur can be heard best when the child is standing or performing a Valsalva maneuver. These positions, and exercise, may also exaggerate the chest pain. On the other hand, squatting or lying supine will minimize obstruction and reduce the murmur. In addition to hypertrophic obstructive cardiomyopathy, aortic valve stenosis can cause ischemia and chest pain. This angina type pain has been variously described as squeezing, choking, or as a pressure sensation in the substernal region. Such pain may radiate to the neck, back, abdomen, or upper extremities. This is often associated with a harsh ejection murmur heard best at the upper right sternal border radiating to the carotids. A thrill is often present. Furthermore, children who are cyanotic with pulmonary stenosis and those with pulmonary vascular obstructive disease (Eisenmenger complex) are at risk for ischemia, arrhythmias, and sudden death. In contrast, those with mild pulmonic or aortic stenosis and those with a small atrial or ventricular septal defect should not be at risk for myocardial ischemia.

Another structural defect that can cause chest pain is mitral valve prolapse. Chest pain has been found in 18% of children with mitral valve prolapse; yet, in some cases chest pain has been attributed to other causes despite the finding of mitral valve prolapse. In this syndrome, pain presumably results from papillary muscle and/or left ventricular endocardial ischemia. Ventricular arrhythmias (premature ventricular contractions) have also been associated with mitral valve prolapse. Physical findings may vary greatly in this syndrome, and thus, the patient should be examined in the supine, sitting, and standing positions. Despite this examination, an inexperienced pediatrician may still not appreciate the characteristic mid-systolic click and late systolic murmur of this syndrome. Laboratory studies such as ECG and echocardiography may be quite helpful in diagnosing mitral valve prolapse.

A final structural defect of the heart involves coronary artery anomalies, particularly anomalous origin of the left coronary artery. This defect is quite rare but results in limited coronary artery blood flow that can cause ischemia, especially during exercise. Angina-type pain results, and this may be associated with syncope. On physical examination, a pansystolic, continuous, or mitral regurgitation murmur may be heard, as well as a gallop rhythm suggesting myocardial dysfunction. However, in some cases physical examination findings may be normal.

Another important class of cardiac diseases includes infections. Pericarditis causes chest pain as reported by children old enough to verbalize complaints. This pain is often described as sharp and stabbing. It is pericordial in location and relieved somewhat by sitting and leaning forward. Cough, fever, and respiratory distress are often present, and on examination there may be distant heart sounds, neck vein distension, pulsus paradoxus, and a friction rub. This infection is usually due to bacteria such as H influenzae and S aureus. Autoimmune disorders and collagen vascular diseases such as lupus and juvenile rheumatoid arthritis can also cause pericarditis. In addition, myocarditis can cause substernal, dull chest pain in older children, in association with fever and respiratory distress. There may be muffled heart sounds on examination and a prominent gallop rhythm. Viruses such as coxsackie B are the most frequent etiologic agents.

Another consideration is coronary arteritis which may have result from Kawasaki disease. More than 15 years ago a report in Pediatrics described coronary thrombosis and myocardial infarction in a 4-year-old boy. He had chest pain and subsequently died more than 3 years after an illness that could well have been Kawasaki disease. More recently, it has been discovered that 15% of children with Kawasaki disease have coronary artery involvement, and 1% to 2% may die in the first few months of illness of myocardial infarction or dysrhythmia. Coronary artery aneurysms may develop and cause serious problems as the patient gets older. Although half of the coronary lesions in Kawasaki disease improve, many patients have an uncertain future.

Finally, angina pectoris is rare in children except when associated with the structural lesions described above. However, some children with chronic systemic disorders may be at risk for angina pectoris. Angina has been reported in a 7-year-old boy with sickle cell disease. It was believed that tachycardia associated with chronic anemia, along with increased oxygen demand of exercise and limited oxygen-carrying capacity, led to hypoxemia and angina in this patient. This angina resolved with transfusion therapy.

Miscellaneous Disorders

A small group of miscellaneous disorders should also be considered in...
evaluating a child with chest pain. Very rarely a thoracic tumor such as Hodgkin disease or non-Hodgkin lymphoma can cause chest pain. However, there would undoubtedly be additional signs or symptoms that would lead one to suspect this problem. A more common disorder encountered in adolescents is the presence of tender breast masses, accounting for 5% of chest pain in this age group. Such masses are seen in boys and girls at the onset of puberty. They may precipitate chest pain because the mass can indeed be tender, and it may also provoke anxiety in a young boy. Postpubertal girls may have painful breast cysts. Another cause of chest pain is vasculitis or herpes zoster infection (shingles) can have pain in the chest area that precedes the vesicular lesions by several days. Another unusual infectious process that causes chest pain is pleurodynia (devil’s grip). This is caused by coxsackievirus, occurs in rare epidemics, and is characterized by paroxysms of sharp pain in the abdomen or thorax. A more common syndrome of precordial pain is the so-called “precordial catch” or “Texas” heartburn. This is a form of sporadic, brief (less than five minutes), left-sided chest pain. Such pain may recur frequently for a few hours and then remain absent for months. The pain does not radiate and does not occur with exercise. Instead, it is associated with “slouched” posture or bending. The pain is relieved by shallow breaths (sometimes one deep breath) and assuming a straightened posture. This pain is thought to arise from the parietal pleura, or from pressure on an intercostal nerve, but it is certainly not well understood. Finally, it is possible that cigarette smoking is a cause of chest pain or is at least associated with this symptom. A large questionnaire study that involved several thousand teenagers and adults indicated that chest pain was more common in smokers than nonsmokers. This was true for angina-like chest pain as well as other types of pain. It was true even when coffee and alcohol consumption was compared in smoking and nonsmoking groups. Certainly, more data are needed to draw conclusions, but one should consider a smoking history (in the patient or family members) when evaluating a child with chest pain.

**APPROACH TO THE CHILD WITH CHEST PAIN**

**History**

It is essential to obtain a thorough history when assessing a child with chest pain (Table 2). As with any complaint of pain, the pediatrician must first establish the severity of the pain. Is it severe enough to cause a child to limit his or her activity or to miss school or work? It has been reported that two thirds of adolescents with chest pain restrict their physical activities and as many as 40% are absent from school because of their pain. It is also important to obtain information about the frequency and duration of the chest pain. A child with constant or frequently occurring intermittent chest pain probably has a more serious problem than the child with one episode of brief, mild pain. Such frequent pain does not necessarily imply an organic etiology, but it indicates a more troublesome situation in which the pain is more likely to interfere with the child’s daily activity. Next, one needs to learn the type and location of the chest pain. Children, in general, are vague in their descriptions of chest pain, and many cannot localize the pain sensation. Thus, this information is not always reliable, particularly in younger children. However, if a child describes a syndrome of sharp, pleuritic chest pain that occurs intermittently and is somewhat relieved by sitting up and leaning forward, pericarditis should be strongly considered. Likewise, a “burning” sensation in the sternal area may suggest esophagitis. In addition, it is important to ascertain the onset of chest pain. Studies have shown that chest pain that has persisted for several months rarely has an organic etiology. In contrast, historical evidence of acute angoral chest pain that is exercise induced should be taken quite seriously. Moreover, pain that begins soon after eating meals or a particular food should lead one to a diagnosis of esophagitis or reflux. A confusing factor is that eating a large meal may also precipitate anginal pain. The physician must also ask the patient or family whether there have been any recent episodes of choking (particularly in young children) because the ingestion of a foreign body may be forgotten soon after the event. Similarly, it is very important to ask about possible trauma to the chest. Certainly major trauma and direct chest trauma is easily recalled, but patients often overlook recent horseplay and strenuous exercise which can contribute to chest wall pain or more serious injury. Furthermore, one needs to consider other precipitating factors. For instance, it is important to discuss the possibility of school phobias, sleep disturbances, family turmoil, and the presence of other somatic complaints. Anxiety can be a major factor in precipitating chest pain if a stressful situation seems to be temporally related to the onset of pain. The physician should specifically question a teenage girl about her menstrual history, because anxiety about a possible pregnancy may manifest itself as chest pain. Moreover, a review of systems is essential to determine whether there are associated complaints that may indicate that chest pain is part of a more complicated disorder such as a collagen vascular disease, infection, asthma, sickle cell disease, or acute rheumatic fever. For example, the presence of fever, malaise, and myalgia may lead one to consider pericarditis or myocarditis.

**TABLE 2. Important Items of History in a Child With Chest Pain**

<table>
<thead>
<tr>
<th>Associated complaints</th>
<th>Type, location, onset of pain</th>
<th>Precipitating factors</th>
<th>Family history</th>
<th>Known heart disease</th>
<th>Smoking history</th>
<th>Fear and concerns about pain</th>
</tr>
</thead>
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**BEHAVIORAL DEVELOPMENT**

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Chest Pain

as the cause of chest pain. An associated cough can imply respiratory infection with strain of chest wall muscles. In addition, chest pain that is associated with syncope, palpitations and light-headedness is more likely to be the result of anxiety, mitral valve prolapse, dysrhythmia, or angina and deserves serious consideration. Finally, the pediatrician should know what previous treatment has been used. Knowing what medicine, posture, or therapeutic regimens seem to relieve the child's chest pain may help to establish the etiology of the pain. For instance, chest pain that usually resolves when the child is allowed to sleep with his or her parents suggests an emotional problem.

Additional history of importance includes the family history. About half of children with chest pain have other family members with similar complaints, yet this does not always help in establishing the etiology of the pain. Still some cardiac disorders, such as hypertrophic obstructive cardiomyopathy and mitral valve prolapse, are familial; therefore, this history is important. Previous history of known heart disease in the patient is obviously important because ischemia may result from aortic or pulmonary stenosis or pulmonary vascular disease. Likewise past history of Kawasaki disease increases the chance that myocardial infarction or dysrhythmia may be responsible for the chest pain. Furthermore, history of smoking in the patient or family may have some contribution to determining the etiology of the pain. One might also ask about the use of oral contraceptives in teenage girls. Thromboembolic disorders are thought to be extremely rare in women less than 30 years of age, especially non-smokers. But this risk has not been well studied in teenagers. Some recommend that the use of oral contraceptives be discontinued with unexplained chest pain. Finally, the pediatrician should allow the patient and family to express their fears and concern about the symptom, as this may be quite helpful in directing the therapeutic approach.

Physical Examination

A complete physical examination is essential in every child with chest pain (Table 3). Whereas cyanosis may be readily apparent, it will take a more careful evaluation to distinguish a child who is hyperventilating from one who is truly dyspneic. Both hyperventilation and true respiratory distress may cause a child to appear anxious, but cyanosis and nasal flaring are rare in hyperventilation. Also, hyperventilation may be accompanied by carpopedal spasm and acral paresthesias.

Poor growth, pallor, or a sallow appearance may suggest that the symptom of chest pain is only part of a chronic disease. The skin should be carefully examined because the presence of a rash may indicate the existence of a systemic illness such as a collagen vascular disease. Bruising noted on the extremities, back, or head may suggest chest trauma that was previously unsuspected. In addition, the abdomen should be examined for tenderness and masses that could refer pain to the chest. The joints must be evaluated to determine the presence of arthritis in consideration of collagen vascular disease. Finally, the physician should note any signs of anxiety during the examination such as excessive hand wringing, tics, or muscle tightness. Although these signs may only reflect the child's fear of being examined, they could also indicate the presence of an underlying stressful home situation.

Physical examination of the chest must be carefully performed (Table 4). Inspection may reveal evidence of chest trauma or asymmetry of the chest due to breast enlargement, cardiomegaly, or scoliosis. Inspection may also reveal an abnormal breathing pattern. Next, auscultation may reveal tachycardia, dysrhythmias, or a significant heart murmur. The finding of a gallop rhythm suggests myocardial dysfunction, and a murmur suggests structural heart disease. The heart should be examined in the upright, supine, and standing positions, especially if one hopes to elicit the midsystolic click and late systolic murmur of mitral valve prolapse. Friction rubs, muffled heart sounds, or a crunching sound over the precordium should be sought. Examination of the lungs for the presence of rales, wheezes, or breath sounds that are asymmetric is necessary. Finally, the chest wall should be palpated for tenderness at the costochondral junctions, xiphoid process, the breasts, ribs, and major muscle groups such as the pectorals. Musculoskeletal chest pain is usually reproducible by such palpation or by moving the arms and chest through a variety of positions. In addition, subcutaneous emphysema, suggesting a pneumothorax or pneumomediastium, may be palpable at the neck or upper chest. Finally, if one suspects slipping rib syndrome, the examiner should palpate the lower ribs and perform the hooking maneuver described earlier.

FURTHER EVALUATION AND MANAGEMENT (FIGURE)

For most children with chest pain, laboratory tests are not of great value. However, a chest x-ray film is indicated if the history or examination suggest that significant trauma has occurred. Certainly, if cardiac disease or pulmonary problems are suspected on the basis of the initial evaluation, then roentgenographic evaluation is a useful procedure. Radiographs are generally not helpful in evaluating muscle overuse syndromes, costochondritis, slipping ribs, precordial catch, or idiopathic
chest pain. Previous studies have shown that, if the history and examination are unrevealing, a chest x-ray film is unlikely to identify the etiology of pain.

Likewise, an electrocardiogram should not be a routine test for every child with chest pain. It is valuable if a dysrhythmia is suspected by examination. It may also help confirm the diagnosis of pericarditis, myocardial ischemia, infarction, or mitral valve prolapse.

Additional laboratory tests are rarely needed and should be reserved for unusual circumstances. However, if a dysrhythmia is strongly suspected, use of a Holter monitor for 24 hours may be of value. An echocardiogram is the best laboratory test to diagnose mitral valve prolapse. However, because the significance of this diagnosis and its relationship to the symptom of chest pain remains unclear, it does not seem justifiable to perform this test on all children with unexplained pain. A complete blood cell count and sedimentation rate have limited usefulness unless an infection or collagen vascular disease is suspected. Finally, suspected esophagitis does not usually require radiographic or endoscopic documentation of reflux.

Only a small group of children with chest pain require referral to a specialist for further evaluation (Table 5).

**TREATMENT AND FOLLOW-UP**

Most children can be followed by their pediatrician until the symptoms resolve. Analgesics, rest, heat, and relaxation techniques are useful for most common musculoskeletal problems. Antacids should be given a therapeutic trial if esophagitis is suspected. Of course, bronchodilators and antibiotics are indicated if asthma or pneumonia is diagnosed. Pediatricians can also provide counsel and treatment for those with minor stress and anxiety.

Follow-up care and reevaluation is important. Chest pain, especially idiopathic pain, may persist for several months and can interfere with a child’s normal daily activities. The pediatrician may decide to further investigate such pain or refer the child to a specialist if it dramatically limits the child for a prolonged period. Otherwise, the pediatrician can be reassuring to the patient and the family by telling them such pain rarely has significant consequences. Long-term follow-up data are not yet available, but there is little reason to believe that serious cardiac or pulmonary disease will be found if the initial evaluation is negative for specific findings of such diseases.

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**TABLE 5. When to Refer a Child With Chest Pain**

<table>
<thead>
<tr>
<th>Acute distress present</th>
<th>Significant trauma present</th>
<th>Pain associated with syncope, dizziness, palpitations, exertion</th>
<th>History of cardiac or Kawasaki disease</th>
<th>Pleural effusion or pneumothorax present</th>
<th>Serious emotional problems found</th>
<th>Esophageal foreign body or caustic ingestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Distress</td>
<td></td>
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<td>Yes</td>
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**Figure. Management of Child With Chest Pain**

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*Figure: Management of Child With Chest Pain*
SUMMARY

Childhood chest pain is a common complaint and often a recurrent, chronic symptom. A detailed history and complete physical examination are the most important aspects of evaluating a child with chest pain. Childhood chest pain has a good prognosis. Laboratory tests should only be ordered if they are indicated on the basis of history and physical examination findings.

SUGGESTED READING


EDUCATIONAL OBJECTIVE

3. Appropriate awareness of the diagnostic features of ectopic pregnancy (Recent Advances, 86/87).

Diagnosis of Ectopic Pregnancy


The rate and incidence of ectopic pregnancy in the United States has nearly tripled in the last 10 years and now has emerged as a leading cause of maternal mortality. This increasing prevalence underscores the need for accurate diagnosis and timely therapy. Pediatricians caring for adolescents need to be aware of the condition.

The risk of ectopic pregnancy is increased by previous pelvic infections, previous abdominal or pelvic surgery, infertility, use of progestin-only contraceptives, and use of an intrauterine contraceptive device. One should suspect this diagnosis when any of these risk factors is present in a patient with recent menstrual irregularity and/or lower abdominal pain. The physical examination may only reveal a tender adnexal mass, and this finding should be sufficient to raise suspicion. If the tubal pregnancy ruptures, signs of blood loss may develop (ie, hypotension and rapid pulse).

A variety of diagnostic procedures are helpful and should be done promptly.

1. Pregnancy test: The usual rapid test may not be sensitive enough to detect the low hormone levels that are associated with ectopic pregnancy. A radioimmunoassay of the $\beta$ subunit of human chorionic gonadotropin ($\beta$-HCG) is the most reliable pregnancy test. A negative $\beta$-HCG virtually excludes the possibility of pregnancy.

2. Sonography: The location of the products of conception is best detected by sonography. This test is most reliable following the fifth week after the onset of the last menstrual period for a woman with cycles of average length. In a normal pregnancy, an intrauterine gestational sac should be visible when the $\beta$-HCG level exceeds 6,000 to 6,500 U/mL. If an intrauterine sac is not present, an extrauterine pregnancy should be highly suspected.

3. Culdocentesis: Aspiration of bloody fluid from the cul-de-sac is helpful but only after the ectopic pregnancy ruptures.

4. Laparoscopy: This is a helpful tool when the diagnosis is suspected in a patient who is stable and does not have intraperitoneal hemorrhage.

The definitive therapy is surgical. Ideally, the diagnosis should be suspected and confirmed before surgical intervention becomes an emergency procedure. (R. Johnson, MD, UMDNJ-New Jersey Medical School)
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