Title: Case Presentation of Leukemia in an Adolescent with Polycystic Ovary Syndrome

Abstract:

Purpose The purpose of this case study is to alert primary care providers of unusual finding in an adolescent girl with acute onset of lymphoblastic leukemia and history of polycystic ovary syndrome.

Methods A case study presentation

Conclusions Healthcare providers should be astute for patients with vague symptoms and rely on parent's observation in care of this population. The genetic nature of both diseases may indicate the need for further research in this adolescent population.

Key Words: Polycystic Ovary Syndrome, Obesity, Adolescent, Acute Lymphoblastic Leukemia

During the past eight years, the rate of obesity among people in the United has increased to a record 30% of the population [1,2]. Ogden et al. reported that Hispanic adolescents demonstrated the greatest increase in rate of obesity as an ethnic group [2]. Obesity can often be a symptom of adolescent females with Polycystic Ovary Syndrome [3]. This is a report about an adolescent female with a history of polycystic ovary syndrome and onset of new symptoms including depression. The review of systems, physical exam and presentation were not impressive but this adolescent was critically ill with acute lymphoblastic leukemia.

Clinical Observation

Our patient is a 13 year old Hispanic female that has been seen in this primary care pediatric office since she was 34 months old. On this date, nausea, dizziness and nasal congestion brought her to her primary care provider. She was in the clinic three days prior with a complaint of pain in her right side, and a headache. She stated that she had taken both acetaminophen and naproxen sodium which did not decrease her pain. Her chief complaint on this date was of unresolved pain. She reports vomiting once, dizziness, fatigue, runny nose, and nighttime congestion. She also reports that she has felt ill for about one week.

Socially, she is an eighth grade student in a public junior high school. She enjoys school and has friends. Her mother is from a large Hispanic family with a history of hypertension, cardiac disease, diabetes, and maternal family history of amenorrhea. Mother's father and a sister are currently on dialysis for end stage renal disease secondary to diabetes. Her father reports his mother has a history of diabetes and hypertension. He also stated his sister's child died at in infancy from cancer but he does not know what type of cancer.

Her review of systems includes her mother reporting her daughter has not been herself lately and the mother is concerned about depression. She has had a decreased appetite for the

past week, and has lost 10 pounds. She states that she feels hot a lot of the time but has not checked her temperature. The patient reports she is having some dizziness that has been increasing over the past few days and is currently complaining of nausea and states she has vomited one time today. Her last menstrual period was 6 months ago and denies sexual activity. On exam she complained of a headache, which she describes as waxing and waning for about a week.

Her physical examination includes her vital signs: Weight: 169 lbs (100^{th}%), Height: 64.5 inches (75^{th}%), BMI: 28.2 (97.5^{th}%), Pulse: 91, B/P: 120/90, Temp: 98.7 oral. She appears to be a mildly ill teenage girl, sitting on exam table and denies current pain. She responds to questions, but answers slowly. Her skin is warm and dry. She has a pronounced dark band of velvety texture around the circumference of her neck that extends from the angle of her mandible proximally to the level of her shoulders with multiple nevi and skin tags throughout the band on her neck. Her eyes are within normal limits for her age. She has nasal congestion with scant discharge, nasal mucosa is pink, her pharynx and tonsils are pink without exudates, and no oral lesions were noted. Her cardiac and respiratory effort is within normal limits with no adventitious sounds or murmurs noted. Her abdomen has audible bowel sounds with no palpable masses. Her liver is at the level of the ribs and spleen is non palpable. She has full range of motion of all extremities without pain. Cranial Nerves II-XII intact, deep tendon reflexes are brisk.

Due to the concern for effects of Type II diabetes in obese adolescents, fasting laboratory test were scheduled for the morning. Differential diagnosis considered for this patient should include diabetes mellitus, thyroid disease, congenital adrenal hyperplasia, Cushing's syndrome, and hyperprolactinemia. Laboratory results revealed our patient was acutely ill (see Table 1).

Discussion

Our patient was rapidly transferred to a tertiary children's hospital for immediate care. She was diagnosed with Acute Lymphoblastic Leukemia (ALL) by a bone marrow core biopsy. ALL is a malignant disease of blood forming organs. Lymphoblastic leukemia is subtype by the proliferative production of lymphoblast that does not synthesize to complete functional immunoglobulins. Hematology and primary care coordinated her transfer to the intensive care unit for plasmapheresis. Rapid initiation of chemotherapy was a priority. Truong et al. [4] suggests she is at risk of developing tumor lysis syndrome due to her extremely elevated white blood cell count. Due to her age and high white cell count at diagnosis, she is considered a high risk patient requiring a longer span of chemotherapy to prevent recurrence of her ALL.

Han et al. [5] describe the onset of ALL as insidious or acute. In this patient's case, her symptoms of headache, slight alteration of her mental status, fatigue, nausea, and vomiting were suggestive the insidious onset presentation of an adolescent with acute leukemia. ALL is more common in males and adolescents [6]. Bungaro et al. [6] found that 79% of all case of ALL demonstrates genetic abnormalities and 29% of that group had deletion of chromosomes. In our patient, fluorescent in situ hybrid (fish) analysis demonstrated a deletion of chromosome 14 and rearrangement of chromosome 20. Franceschini et al [7] found a similar presentation of a child with acanthosis nigricans and hyperlipidemia that developed pre b lymphoblastic leukemia in much the same clinical picture as our patient has developed. Kawamata et al. [8] discussed the relationship between other chronic diseases that may have a correlation with the pathogenicity of leukemia but state that this type of inference has not been founded.

Behavior and insidious symptoms in adolescent patients can be difficult to identify. Subtle behavior changes are an area primary care providers must be astute to listen to parent's

comments and observed behaviors in their children. Currently, the patient is 18 months into her the second year of her chemotherapeutic regimen. She developed insulin dependent diabetes mellitus within the first month of chemotherapy. If treatment regimen remains uneventful she will receive treatment for about 30 months. Our patient is resilient and has returned to school where she is involved in her high school's activities.

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