

Morbidity and Mortality Rounds: An Interesting Case of a Patient with Lethargy

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Abstract:

A 21 year-old white male with a history of Down's syndrome presented to the emergency department with the chief complaint of "not feeling well". A decline in appetite and activity level had been observed over the past several months. Typically a vibrant young man, the patient had acutely become more listless, prompting the family to bring him to the emergency department.

Dr. Brenner (Chairman): This case illustrates many important fundamentals of emergency medicine and our approach to patient care.

Dr Palmer (resident): Today's case involves a 21 year-old white male with a history of Down's syndrome who presented to the emergency department with the chief complaint of "not feeling well". His father, the primary historian, reported that the patient had a decline in appetite and activity level over the past several months. More recently, he had been spending the majority of his time in bed, only rising for meals. Typically a vibrant young man, the patient had acutely become more listless, prompting the family to bring him to the emergency department. Further questioning revealed that the

patient had a mild non-productive cough over the past 2 weeks. He denied any nausea, vomiting, or diarrhea. He had been afebrile.

Dr Bean (attending): How did the patient appear on initial evaluation?

Dr Palmer: Vital signs were as follows: blood pressure 160/62 mm Hg, pulse 75 beats per minute, respiratory rate 10 breaths per minute, temperature 26°C, and pulse oximetry 88% on room air. He was an ill-appearing and pale, with shallow respirations. He was minimally responsive to his environment with some spontaneous movement. He would withdraw to painful stimuli and only occasionally would groan. There were coarse breath sounds bilaterally.

Dr Kass (residency director): The patient appears to have multiple emergent issues. What interventions were taken at this point?

Dr Palmer: The patient was placed on 100% O₂ by non-rebreather mask and a cardiac monitor. Two peripheral intravenous lines were established with 0.9% NS running wide open. The patient was then intubated via a rapid sequence protocol utilizing a defasciculating dose of vecuronium, sedation with etomidate, and a paralytic dose of succinylcholine. An 8.0 mm endotracheal tube was passed orally, and placement was confirmed by auscultation, end-tidal CO₂ detection, and chest radiograph. After intubation, the patient's blood pressure dropped to 80/40mm Hg, and he was given a 500cc bolus of 0.9% NS. When his hemodynamic status failed to improve with intravenous fluids alone, he was started on inotropic support with dopamine, which stabilized his blood pressure.

Dr. Melton (attending): So once the patient had been stabilized, what did a thorough physical exam reveal?

Dr. Palmer: Pupils were equally round and reactive to light. Fundoscopic exam was normal. Tympanic membranes were clear. Oropharynx was clear. The lung exam was significant for equal but coarse breath sounds bilaterally. Heart sounds were regular rate and rhythm without murmur, gallop, or rub. Abdomen was soft with normal bowel sounds, no organomegaly and no masses. The bladder was palpable just above the symphysis pubis. The skin was "doughy" in texture, and a scaly rash was noted on his thorax and face. He had decreased body hair and generalized non-pitting edema.

Dr Kass: What were your differential diagnoses at this point?

Dr. Bean: The major life threatening illnesses that should be considered in this case include sepsis, myxedema coma, and Addisonian crisis. Being hypoxic with mental status changes would force consideration of pneumonia and pulmonary embolus.

Dr. Melton: Toxic ingestion and traumatic head injury should also be very high on the differential for this patient.

Dr Kass: Was there anything else pertinent in this patient's history?

Dr Palmer: He was not on any medications. However, he had a history of hypothyroidism and had been on thyroxine in the past. The family reported that he was given the option of refusing his medications. They stated that he had not taken thyroxine in at least 3 months, but that it may have been up to 3 years since thyroxine had been administered on a regular basis.

Dr Bean: What clues in this case would help to narrow the differential?

Dr Melton: The patient's physical exam findings combined with his history strongly suggested severe hypothyroidism.

Dr. Palmer: A TSH and free T₄ were ordered to help confirm the diagnosis. However, the other diagnoses that were considered could not be eliminated initially. Further testing included a chest radiograph, which was negative for infiltrate and a urinalysis that was negative for evidence of infection. Urine and serum drug screens were also obtained. Additionally, a complete blood count and serum electrolytes, glucose, cardiac enzymes, and liver function tests were ordered.

Dr Bean: What is myxedema coma?

Dr Palmer: Myxedema coma is a rare life-threatening condition that can be thought of as a progression of severe hypothyroidism. Primary and goitrous hypothyroidism together account for 95% of hypothyroidism. Patients with Down's syndrome have a higher incidence of hypothyroidism than the general population. In compensated hypothyroidism, homeostasis is maintained by a variety of neurovascular adaptations including peripheral vasoconstriction, a reduction in blood volume, decreased heart rate and reduced cardiac output. These adaptations help to maintain normal core body temperatures [1]. Secondary hypothyroidism is most often a result of surgical or radiation ablation (5).

Myxedema coma is a form of decompensated hypothyroidism in which adaptations are no longer sufficient (6). It is characterized by an altered mental status, defective thermoregulation, and a precipitating event[1]. However, patients

rarely present comatose, thus a more accurate term may be myxedema crisis. This condition is more common in elderly women and patients typically have a long prior history of severe primary hypothyroidism [2]. The typical features of myxedema should be present, i.e. dry, coarse skin, sparse hair, edema of the periorbital tissues as well as the hands and feet, macroglossia, and delayed deep tendon reflexes [2]. This condition is more common in elderly women and patients typically have a long history of severe primary hypothyroidism [2].

Dr. Brenner (Chairman): How do you discern macroglossia?

Dr. Palmer: You look at the overall size, but more objectively look for teeth marks or impressions on the side of the tongue.

Dr. Kass: What are some of the physiologic changes associated with severe hypothyroidism?

Dr. Palmer: Alterations in the neurologic, cardiovascular, respiratory, and renal systems are seen in myxedema coma. Neurologic changes can manifest as confusion, extreme lethargy, or psychosis. Common cardiovascular changes include bradycardia, hypotension, and shock. Pericardial effusions are not uncommon [2] and can present as cardiac tamponade. The respiratory system is less responsive to hypoxia and hypercapnia, leading to persistent alveolar hypoventilation [3]. Glomerular filtration rate is also reduced and creatinine is often elevated.

Dr. Melton: Common precipitating factors include infection or sepsis, cold exposure, toxin exposure, stroke, congestive heart failure, gastrointestinal bleed, or omission of or non-compliance to hormone replacement therapy [4].

Dr. Bean: What are the lab abnormalities associated with severe hypothyroidism.

Dr. Palmer: Although there are frequent laboratory abnormalities associated with myxedema coma, they are seldom diagnostic. First of all, the TSH should be elevated and the free T4 should be very low. A mild normochromic and normocytic anemia may be present. A leukocytosis may be present in the setting of infection. Platelet count is usually normal. Hyponatremia is common and can exacerbate the mental status changes associated

with myxedema coma. CPK and LDH are often elevated and may suggest myocardial infarction; however the predominant CPK isoenzyme is the skeletal muscle fraction reflecting increased muscle cell membrane permeability [1]. Arterial blood gas analysis will often reveal hypercapnia and hypoxia.

Dr. Bean: In addition to grossly abnormal thyroid function tests, this patient's laboratory results also demonstrated several of the perturbations just mentioned. For example, the hemoglobin and hematocrit were 10.3 and 32.8g/dl. BUN and creatinine were 22 and 1.7mg/dl. Furthermore, CPK was 1260ng/ml with a CK-MD of 57.6ng/ml and a troponin of <0.1ng/ml. Arterial blood gas analysis was as follows: pH 7.23, pCO₂ 75, pO₂ 61 and HCO₃ 30.7 on 15L per minute on non-rebreather mask. An atypical finding was thrombocytopenia with a platelet count of 77k/μl.

Dr. Melton: In addition to stabilization of the patient and a search for underlying causes, what is the key in the management of a patient in myxedema crisis?

Dr. Palmer: Replacement of thyroid hormone should begin immediately, without waiting on thyroid studies, if myxedema coma is suspected. There is some controversy as to the strategy of replacement. There are several treatment options. The use of thyroxine (T4) alone, triiodothyronine (T3) alone, or a combination of the two has all been advocated. Many clinicians prefer a loading dose of 300 to 500 μg intravenous T4 in order to quickly restore circulating levels of T4 to approximately 50% of the euthyroid level [1]. This should be followed by 50-100 μg daily until the patient can take the medicine orally. Additionally, stress doses of corticosteroids should be given to these patients. A common strategy involves intravenous hydrocortisone at a dose of 300mg [7]. Steroids are necessary because myxedema may be either a manifestation of panhypopituitarism or a coexisting condition with adrenal failure [7]. Supportive care with aggressive fluid resuscitation and vasopressors if needed should also be given.

Dr. Bean: What is the prognosis of a patient with myxedema coma?

Dr Palmer: Untreated, myxedema coma is lethal [7]. Current mortality rates have decreased from 60-70% to 15-20% with intensive support and prompt replacement of thyroxine [2].

Dr Kass: Can you give a brief overview of this patient's hospital course?

Dr Palmer: He was admitted to the medical intensive care unit where he was mechanically ventilated for 2 days. During this time his TSH trended down and his condition improved. On hospital day number 3 he was extubated without difficulty and by the end of day 4 his family stated that the patient's mental status had returned to baseline. He quickly advanced to a regular diet. By hospital day 4 he had been weaned from dopamine and was able to be transferred to a general floor bed. A head CT was normal and an echocardiogram revealed a small pericardial effusion. He was ultimately discharged from the hospital in stable condition.

Dr. Brenner (Chairman): An additional point to ponder is that morbidity and mortality in emergency medicine seems to cluster in these cases of congenital abnormalities and also the very young and the very old.

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