Critical upper airway obstruction as the first symptom of acute myeloid leukemia - an anesthesiologic reminder

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Abstract

Acute upper airway obstruction can be fatal. Early recognition of airway distress followed by diagnostic laryngoscopy and prompt intervention to secure airway control is crucial. We here present a 62-year old male patient who presented with cough and increasing respiratory distress for three weeks. Within the next 24 h, he developed symptoms of critical upper airway obstruction, endotracheal intubation was not possible, and an acute surgical tracheotomy was performed to retain patent airways. A computer tomography scan revealed severe laryngopharyngeal soft tissue thickening and upper airway obstruction caused by leukemic infiltration. He was diagnosed with acute leukemia and responded to induction chemotherapy. This case report points out the importance of establishing the diagnosis of critical upper airway obstruction in patients presenting with respiratory symptoms, and highlights the emergency management of airway obstruction due to malignant infiltration of leukemic blasts.

Introduction

Acute airway obstruction is a potentially fatal medical emergency. It can be classified based on its location in the upper or lower airways. The main causes of acute upper airway obstruction include aspiration of secretions or foreign material, laryngotracheal trauma, bleeding, tonsillar hypertrophy, paralysis of the vocal cords or folds, allergic reactions, and acute infections affecting the upper respiratory tract.[1] We present a 62-year old male patient with cough and increasing respiratory distress for the last three weeks. Within 24 h in hospital, he developed symptoms of critical upper airway obstruction. Endotracheal intubation with the patient awakes and self-breathing using a fiber optic scope was not possible, thus an acute surgical tracheotomy was performed to retain patent airways. Acute myeloid leukemia (AML) with leukemic infiltrations of the upper airways was found to be the underlying cause.

Case Report

A 62-year-old man was admitted to the emergency department with a history of cough, shortness of breath and general fatigue for the last three weeks. He had no significant previous medical history and no hereditary diseases within his family. Physical examination revealed a respiratory rate at 20 per minute and oxygen saturation within the normal range. Stridor and an extended expiration phase were described. The initial laboratory tests are presented in Table 1, revealing severe leukocytosis with co-occurring anemia and thrombocytopenia. There were no findings in the oral cavity, or the head and neck exam performed. However, inspection of larynx showed swelling of epiglottis and both sinus piriformis. The vocal cords were not visualized. Intravenous steroids (hydrocortisone sodium succinate 200 mg) and antibiotics (cefotaxime and clindamycin) were administered for a possible upper airway infection including epiglottitis, and high-dose hydroxyurea for cytoreduction. Despite this initial treatment, his clinical condition deteriorated during the next 12 h and he developed an acute respiratory failure including severe inspiratory stridor with significant suprasternal retractions. Clinically, the patient currently presented a critical upper airway obstruction leading to acute respiratory failure. He was quickly moved to the emergency operative room, and propofol and remifentanil infusion was administrated, as he was awake and continuously self-breathing. Flexible fiber optic laryngoscopy through the nose showed an increased swelling of the epiglottis, both plicae vestibulares, and paralysis of the left plica vocalis. Endotracheal intubation while the patient was awake using the fiber optic scope proved difficult due to the narrowing of airway lumen. Therefore, an acute surgical tracheotomy was performed in local anesthesia, by use of xylocaine with adrenalin. The section was made between the cartilage cricoidea and jugulum, and a tracheal cannula, portex blue line eight with cuff, was inserted between the second and third tracheal ring (Figure 1A). This procedure secured his airways and stabilized his respiratory function.

A subsequent computer tomography (CT) scan with intravenous contrast of the neck revealed soft tissue thickening with swelling of the uvula, epiglottis and more severely the laryngeal soft tissue, causing narrowing of the lumen and upper airway obstruction (Figure 1A-C). Moreover, a homogeneous picture of 82% blasts with varying morphology was found in the bone marrow aspiration (Figure 2A-B). A peripheral blood smear demonstrated 76% blasts with a homogenous morphology and another homogenous population of about 15% with immature monocytoid cells with vacuolization (Figure 2C). Splenomegaly was detected, although no palpable glandular nodes or skin manifestations. The patient was diagnosed with AML-M4 according to the French-American-British (FAB) classification system,[2] based on cell morphology

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Key words: Upper airway obstruction; airway management; acute tracheotomy; acute myeloid leukemia.

Contributions: All authors contributed to writing the manuscript. SJ and NV prepared the figures. All authors have read and approved the final manuscript. Guarantor: Håkon Reikvam.

Conflict of interests: the authors declare no potential conflict of interests.

Ethical approval: No approval is required.

Consent: The patient gave written consent for publication of this case report.

Received for publication: 16 October 2019.
Revision received: 21 April 2020.
Accepted for publication: 18 May 2020.

Clinics and Practice 2020; 10:1214
doi:10.4081/cp.2020.1214

and immunophenotypic pattern analysis of the bone marrow aspiration and the peripheral blood. Conventional cytogenetics with G-banding and polymerase chain reaction (PCR) revealed 11q23 aberrations, with t(6;11) and *KMT2A* rearranged. This gave the diagnosis of AML with t(6;11)(q27;q23.3); *MLLT4-KMT2A*, classified as AML with recurrent genetic abnormalities after the World Health Organization 2016 classification system.[3]

Induction chemotherapy was initiated with idarubicin (12 mg/m^2; three days) and cytarabine (200 mg/m^2; seven days). His airway swelling decreased and the tracheostomy was removed without any complications seven days later. The patient obtained complete remission (CR) after the induction chemotherapy, and received further anthracycline (daunorubicine 60 mg/m^2; three days) and cytarabine (1 g/m^2; six days) based chemotherapy, before consolidation treatment with allogenic stem cell transplantation was performed. He is still in CR for his leukemic disease 18 months after the initial diagnosis.

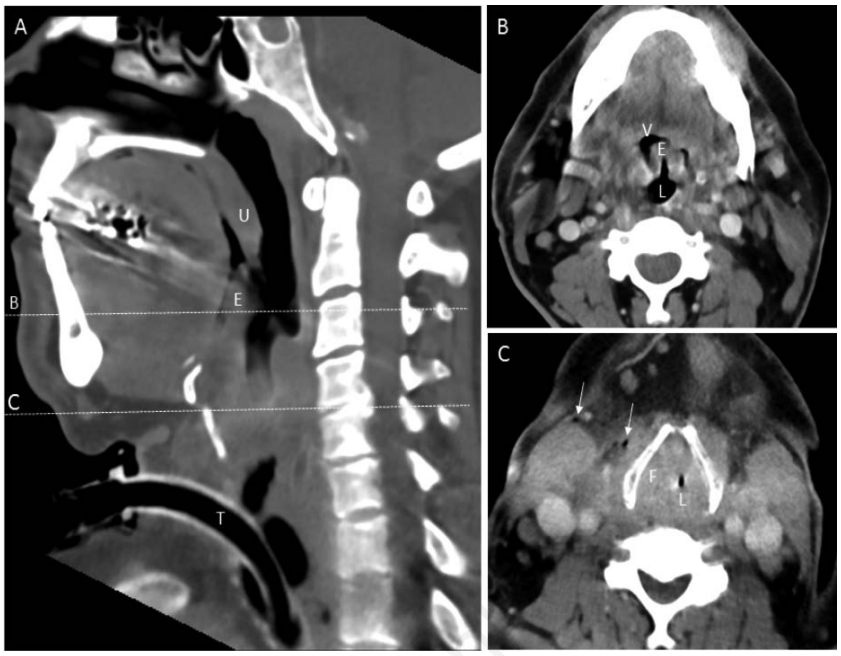

Figure 1. CT images of the critical upper airway obstruction. Midsagittal (A) and axial CT images at the level of epiglottis (B) and just above the vocal cords (C) showing laryngopharyngeal soft tissue thickening of the uvula (U), epiglottis (E) and larynx causing narrowing of the lumen (L) and upper airway obstruction. Small amounts of soft tissue air (arrows) related to prior acute surgical tracheotomy and the tracheal cannula/tube (T).

Discussion

Critical upper airway obstruction is a potentially fatal respiratory emergency. Infection, trauma, malignancy, and aspiration are the most common pathological processes resulting in upper airway compromise.[1] Early identification of airway distress, followed by diagnostic laryngoscopy and prompt intervention to secure airway control is essential for preventing progression to a potentially life-threatening disease state.

Management of patients with upper airway obstruction depends on its underlying cause. Most patients with obstruction sec-

Table 1. The table gives the laboratory tests at diagnosis of AML with upper airway obstruction.

	References	Diagnosis
Hemoglobin	13.4–17.0 g/dL	13.2
Leucocyte count	4.3–10.7x10^9/L	90.1*
Platelet count	145-348x10^9/L	93
Creatinine	45-90 µmol/L	115
Calcium	2.20-2.55 mmol/L	2.29
Albumin	39-48 g/L	39
Ionized calcium	1.13-1.28 mmol/L	1.17
Lactate dehydrogenase	105-205 U/L	511
C-reactive protein	<5 mg/L	136

*Machine differential counting could not differentiate the leucocyte subpopulations.

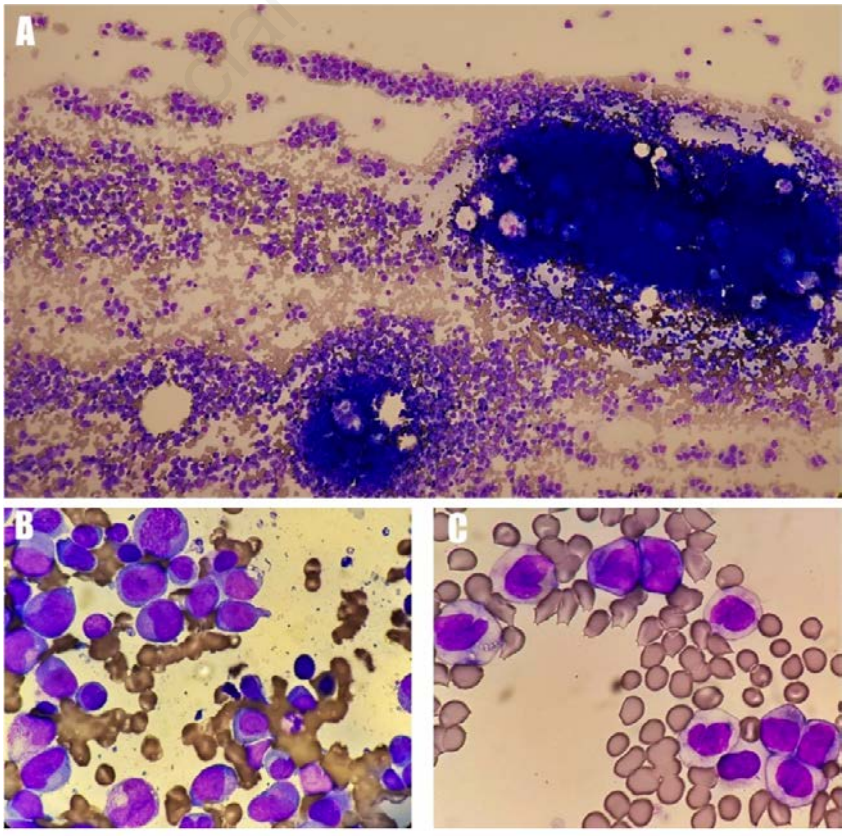

Figure 2. Bone marrow and peripheral blood smears at diagnosis. (A) Bone marrow smear: A hypercellular bone marrow. The cells appear to be homogenous. (MGG 10x) (B) Bone marrow smear: Immature cells, myeloblasts with mostly homogenous morphology. (C) Blood smear with two different immature morphological populations. One of the populations is myeloblast and the other has traits of monocytoid differentiation and contains vacuoles in the cytoplasm.

ondary to edema, trauma, or infection may be managed with orotracheal or nasotracheal intubation, which should be attempted prior to surgical management with cricothyroidotomy or tracheotomy.[4] After securing the airway and stabilizing the patient, the underlying cause or disease needs to be established and properly treated. For the patient presented here, a tracheotomy was necessary to secure his airway, and AML with extramedullary leukemic infiltrations were found to be the underlying cause.

Our case report describes a rare underlying cause of critical upper airway obstruction. Although AML have the potential to cause leukemic tissue infiltration and extramedullary disease,[5] leukemia affecting the airways is, to the best of our knowledge, only described in a few previous case reports;[6-9] as tonsillitis,[9] myeloid sarcoma of the mediastinum compressing the trachea,[8] and an enlarged lymphoid base of tongue resulting in rapid airway compromise.[6] Notably, pulmonary leukemic infiltrations can progress to acute respiratory distress syndrome.[10] Our patient probably had an insidious onset of symptoms that turned acute when his airways reached a critical diameter. Malignancies should be considered as an underlying cause of acute upper airway obstruction that may not be amenable to endotracheal intubation and should therefore warrant early surgical airways. However, awareness is required as life-threatening airway symptoms, with the potential of rapid progression, can be the first symptom in leukemic patients.

Extramedullary leukemic disease is associated with distinct clinical and pathological features.[5] AML subtypes with 11q23 abnormalities, as diagnosed in our patient, are associate with FAB M4 and M5 variants and an invasive phenotype.[3] However, the diagnosis of extramedullary disease in AML is usually based on clinical assessment without a tissue biopsy.[11] Lymph nodes, the spleen, and gingiva are extramedullary sites evaluated in the physical examination. In this case, no tissue biopsy was taken from the soft tissue swelling in the airways. However, the CT images demonstrated severe laryngopharyngeal soft tissue thickening, there were no positive findings in microbial cultures or PCR assays, and the respiratory symptoms increased during proper antibiotic and steroid treatments. Additionally, his respiratory symptoms had developed over the last weeks with an acute worsening. Altogether, this made an extramedullary leukemic tissue infiltration the most likely diagnosis, which was also underpinned by the good response to induction chemotherapy. Other causes of respiratory distress in leukemic patients such as pulmonary infections, pulmonary embolism, or pulmonary leukostasis were not found in our patient.

Conclusions

Critical upper airway obstruction is a potentially fatal respiratory emergency and malignancies may be the underlying cause. The respiratory symptoms can progress rapidly once a critical narrowing of the airway is reached due to the growth of the tumor. Awareness is needed for establishing the diagnosis and consequently initiate proper intervention and treatment.

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