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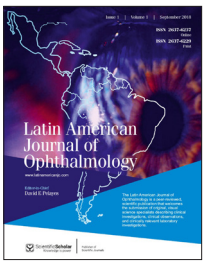

Case Series Retina

Ocular manifestations of acute myeloid leukemia during induction phase of chemotherapy: A case series

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ABSTRACT

The aim of this series is to report diverse ocular features noted in patients during the induction phase in acute myeloid leukemia (AML). Three female patients undergoing induction therapy for AML reporting for various ocular complaints were examined. Detailed history, including the onset of AML and chemotherapy and any past ocular or systemic ailment, was taken. Best-corrected visual acuity, anterior segment, and posterior segment examinations were performed. Intraocular pressure was measured, and color vision was tested. Routine hematological, and biochemical investigations and imaging were done when required. Patients with abnormal parameters were referred to an oncologist for management. A varied spectrum of ocular manifestations was noted in these three female patients, including preseptal cellulitis, orbital cellulitis, and subhyaloid hemorrhages. Immediate treatment was given to patients with vision-threatening conditions in consultation with an oncologist and otorhinolaryngologist, and patients responded well to the treatment. Owing to its cytoreductive action, AML induction therapy exposes the patient to various adverse events, causing significant ocular and systemic morbidity. All the diagnosed patients of AML are recommended to undergo a baseline ocular assessment.

Keywords: Leukemia, Induction phase, Preseptal cellulitis, Orbital cellulitis

INTRODUCTION

Acute myeloid leukemia (AML) is a heterogeneous disorder of clonal proliferation of leukopoietic bone marrow stem cells and generalized infiltration of the vital organs, tissues, and peripheral blood through immature neoplastic leukocytes.[1,2] Ocular involvement is common in adult patients with AML. Ocular involvement in acute leukemia can be either due to direct infiltration by leukemic cells or by hematological abnormalities such as anemia, thrombocytopenia, blood hyperviscosity, or immune suppression, leading to indirect ocular abnormalities. These alterations may lead to hemorrhage, infection, or sometimes, vascular occlusion. Rarely, ocular involvement may be the first sign of leukemic relapse.[3] Leukemia may involve any ocular tissue such as conjunctiva, sclera, cornea, anterior chamber, iris, lens, vitreous, retina, choroid, and optic nerve.[4-8] Treatment is divided into induction and consolidation phases. The goal of induction treatment for AML is to clear the blood and bone marrow of immature blood cells (blast cells or blasts) and bring about complete remission or complete response by reducing tumor burden.[9,10] The aim of this series is to report diverse ocular features noted in patients during the induction phase in AML.

CASE REPORT

Three female patients aged 6, 35, and 48 years undergoing induction therapy for AML reporting to the Ophthalmology Outpatient Department between January and June 2022 for various ocular complaints were examined. Patients were included in the report after an informed oral consent. Detailed history, including the onset of AML and chemotherapy and any past ocular or systemic ailment, was taken. Best-corrected visual acuity was taken on Snellen's chart at 6 m in a well-lit examination room. Anterior segment examination was performed with a slit lamp under diffuse and direct illumination to examine the ocular structures, including the adnexal examination; intraocular pressure (IOP) was measured with Goldmann applanation tonometry, gonioscopy was done using single mirror gonio lens, and general fundus examination was performed by 90D lens using slit-lamp biomicroscope or with direct and indirect ophthalmoscope to evaluate macula and peripheral retina. Color vision was tested by the Ishihara chart. Routine hematological, and biochemical investigations and imaging was done when required. Patients with abnormal parameters were referred to an oncologist for management. Immediate treatment was given to patients with vision-threatening conditions in consultation with an oncologist and an otorhinolaryngologist.

Case 1

A 6-year-old female diagnosed case of AML who was started on induction therapy 4 days back, presented with complaints of swelling and mild pain in the right upper eyelid of 3-day duration which was insidious in onset and rapidly progressive associated with a history of high-grade fever of the same duration. Her uncorrected distant visual acuity was 20/20 in both eyes, with normal near vision and color vision. Slit-lamp examination of the right eye (RE) revealed marked edema of the upper eyelid and mild conjunctival congestion [Figure 1]. The pupil was central, circular, and reacting to light. Extraocular movements were full and free in all directions. The ocular fundus was normal on direct and indirect ophthalmoscopy with no disc edema or engorged retinal veins. Examination of the left eye (LE) was essentially within normal limits. IOP was 12 mmHg in RE and 14 mmHg in LE. Her laboratory investigations revealed hemoglobin value of 9.8 g/dL, a total leukocyte count of 1500/µL, and a platelets count being 36,000/µL. The patient was diagnosed with a case of pre-septal cellulitis RE and managed conservatively with topical and systemic antibiotics. Granulocyte colony-stimulating factor (G-CSF) injections were administered by the treating oncologist for febrile neutropenia. The patient responded well to treatment with complete remission of ocular symptoms.

Case 2

A 35-year-old female diagnosed with AML who was started on induction therapy five days back, reported complaints of sudden-onset painless diminution of vision in both eyes. Her uncorrected distant visual acuity was RE: 20/200 and LE: 20/400, with normal near vision and color vision. Anterior segment examination of both eyes was within normal limits. The pupil was central, circular, and reactive to light in both eyes. IOP recorded was RE: 16 mmHg and LE: 18 mmHg. Fundoscopy of the right and LE revealed large subhyaloid or "boat-shaped" hemorrhages in the pre-macular area of both eyes with few superficial hemorrhages with no evidence of neovascularization or vasculitis [Figure 2]. The optic disc was normal in size, shape, color, and margin. Her laboratory investigations revealed hemoglobin value of 6 g/dL, a total leukocyte count of 3500/µL, and a platelets count being 40,000/µL., The patient, was immediately treated with double frequency neodymium-doped yttrium aluminum garnet laser hyaloidotomy in both eyes for pre-macular subhyaloid hemorrhage with a 532 nm green laser (Suprascan, Quantel medicals) (power 150 mW, duration 0.02 ms, and six spots using a macular area centralis lens). She was concurrently treated with packed cells and platelets transfusion. On subsequent follow-up at 4 weeks, distant

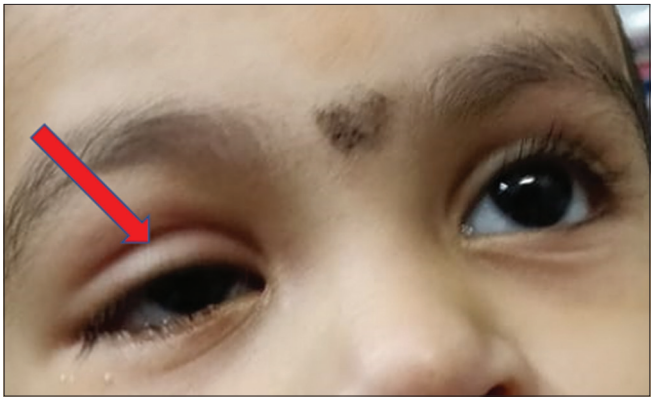
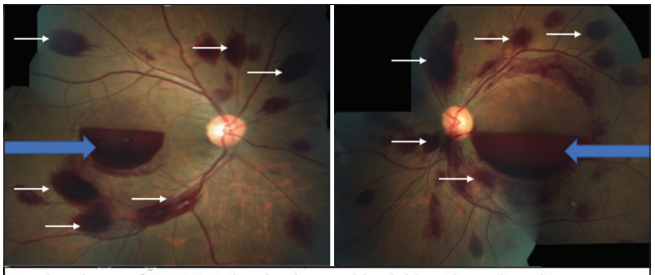


Figure 1: Preseptal cellulitis right eye.



Fundus photos of RE & LE showing large subhyaloid or "boat-shaped" haemorrhages (blue arrows) in pre-macular area of both eyes with few superficial haemorrhages (white arrows) with no evidence of neovascularization or vasculitis

Figure 2: Subhyaloid hemorrhages in both eyes. RE: right eye, LE: left eye.

visual acuity improved to RE – 20/30 and LE – 20/40 with a progressive resolution of pre-macular hemorrhages with no signs of recurrence. Hemoglobin levels improved to 9 g/dL and platelet counts to 80,000/μL.

Case 3

A 48-year-old female, with a known case of AML, on induction therapy for the past 1 week presented with complaints of pain, redness, and swelling of the right eyelid for 3 days. It was gradual in onset with rapid progression within 3 days with a significant diminution of vision and was associated with a history of fever, headache, and generalized body aches of the same duration. Her uncorrected distant visual acuity was RE: 20/80 and LE: 20/20, with normal near vision and color vision. Extraocular movements were totally restricted in RE with complete involvement of the 3rd, 4th, and 6th cranial nerves suggestive of external ophthalmoplegia RE. A slit-lamp examination of RE revealed tender swelling of the upper and lower lids with ptosis and axial proptosis with tenderness over the ethmoidal sinus. Conjunctival congestion and chemosis were present with purulent discharge [Figure 3]. Pupil was central, circular, and sluggishly reactive to light. Fundus examination of RE was within normal limits with no disc edema or engorged retinal veins. LE examination was essentially within normal limits. IOP pressure was 18 mmHg in RE and 14 mmHg in LE. Her investigations revealed a total leukocyte count of 2000/μL and axial and coronal computed tomography scans showed a subperiosteal abscess in the upper medial wall of the orbit originating from the ethmoid sinus, which showed signs of sinusitis. Based on the presentation, clinical findings, supporting investigation, and clinical imaging, the patient was diagnosed with a case of orbital cellulitis RE. The patient was managed with broad-spectrum parenteral antibiotics for orbital cellulitis. G-CSF was administered for febrile neutropenia, followed by drainage of the abscess under general anesthesia. The patient responded well to treatment, with improvement in the general condition of the patient. On follow-up at four weeks, her distant visual acuity improved to 20/40 with a resolution of lid swelling and proptosis. There was an improvement in extraocular movements also.

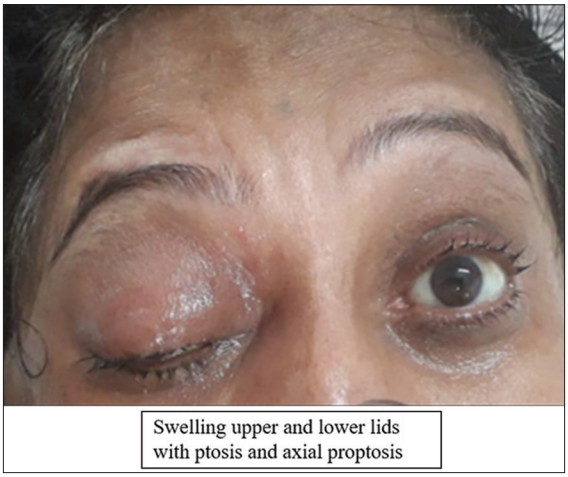


Figure 3: Orbital cellulitis right eye.

DISCUSSION

Leukemia is a malignant disorder of bone marrow that also involves organs of the body, including the eyes. Ocular involvement is commonly seen in leukemia, with reported prevalence from 10% to 90% in various studies.[11] Leukemia can affect any coat of ocular tissue. However, posterior segment involvement has been commonly documented in different studies, with retinal hemorrhages as the most common posterior segment ocular finding.[12]

Chemotherapy is the mainstay of treatment in cases of AML, and the protocols, however, are not standardized. Chemotherapy includes both intensive and consolidation phases.[9,10,12] Induction phase treatment of AML regimen includes cytarabine combined with anti-tumor antibiotics (anthracyclines such as daunorubicin or idarubicin), given in treatment protocols.[9] Induction destroys most of the normal bone marrow cells as well as the leukemia cells, so most patients develop dangerously low blood counts, leading to adverse complications.[9,10] Most patients need antibiotics and blood product transfusions. The presentation can be diverse, ranging from preseptal and orbital cellulitis to macula involving retinal and subhyaloid hemorrhages and so on.[4-7] All these cases require urgent attention by ophthalmologists and oncologists to prevent possible life and vision-threatening complications such as cavernous sinus thrombosis.

CONCLUSION

Owing to its cytoreductive action, AML induction therapy exposes the patient to various adverse events, causing significant ocular and systemic morbidity. All the diagnosed patients of AML are recommended to undergo a baseline ocular assessment before induction therapy and thereafter, frequent follow-ups for prompt recognition and timely intervention to avoid grave ocular complications and sequelae.

Ethical approval

The research/study complied with the Helsinki Declaration of 1964.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consents.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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