Use of a Hemoglobin Based Oxygen Carrier as Bridge Therapy in Transfusion-Free Management of Pancytopenia in a Bleeding Patient with Primary CNS Lymphoma

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BACKGROUND

- Pancytopenia is challenging to manage
- Especially difficult in patients for whom blood is not an option and in a bleeding patient
- Successful multimodal therapy: supporting the patients own hematopoietic system during therapy and recovery.
- Goals:
    - minimize oxygen consumption
    - maximize oxygen delivery
    - minimize bleeding and blood loss.

OBJECTIVE

- Describe the clinical management strategies in a challenging condition to be treated successfully without the use of blood components.
- Included the use of a **hemoglobin-based oxygen carrier (HBOC)** as a **bridge therapy**

WHAT ARE HBOCs?

Initially developed as blood substitutes, several preclinical and clinical studies examined the safety and efficacy of HBOCs. HBOC-201 has been available in South Africa for 23 years, indicated for surgical patients with acute anemia. Several manufacturers have periodically provided their products under both compassionate use protocol and as expanded access.

In the USA, glutaraldehyde polymerized bovine hemoglobin has been used as “bridge” therapy in severely anemic patients.

They have been associated with several complications including hypertension, elevated liver enzymes, oliguria, and methemoglobinemia, however, their ability to improve/sustain oxygen delivery to the tissues can prevent multi organ failure, allowing native processes for blood production to stabilize.

CASE DESCRIPTION

The patient is a 46-year-old female in remission after chemotherapy for NHL, but now diagnosed with large B cell lymphoma, consistent with primary CNS lymphoma. Was receiving systemic therapy using the R-MVP protocol (Rituximab, Methotrexate, Procarbizine, and Vincristine), and subsequently received chemotherapy using etoposide-HiDAC, with supportive therapy of Udenyca® and NPlate®.

She presented to the emergency room with fever, abdominal pain, and hemorrhoidal bleeding. She was found to have pancytopenia and neutropenic fever but had negative cultures. On admission, she had a hemoglobin of 9.3 g/dL, a platelet count of <2, and a white blood cell count of 0.

Three days after admission her hemoglobin count had dropped to 4.2 g/dL, and at the one week mark it fell to 2 g/dL.

She continued to bleed and was admitted to the ICU, and was treated with two units of an HBOC, as well as dexamethasone and DDAVP, and she continued parenteral iron and an erythropoietic stimulating agent, as well as oxygen support.

Her Hgb count remained at 2 g/dL at this time. Her active bleeding ended but because of her persistent low hemoglobin levels, she received an additional dose of HBOC on the 12th day of hospitalization.

Over the next ten days, her hemoglobin level and other hematological parameters improved and at her discharge on the 20th day after admission, her Hgb level was 5.8 g/dL.

Post hospital visit two weeks later her Hgb was 12.4 g/dL, a normal level.

DISCUSSION

Patients for whom blood transfusion is not an option can present a challenge to clinicians, particularly in medical or surgical situations that typically include transfusion of blood components, as is this case.

In the case of this patient, she declined the use of blood transfusion based on her belief as one of Jehovah’s Witnesses.

Coordinated and successful management of this patient population, particularly in medical centers with organized programs to address the needs of these patients, gave rise to a new scientific discipline, known as Patient Blood Management (PBM) with wider application to all patient populations.

Challenging clinical situations can arise when patient become profoundly anemic. Blood is the only organ that can fully regenerate given support, time and protection, if other causative factors of blood failure can be managed.

To support patients in whom transfusion is not an option during a period of “blood recovery”, HBOCs can be used as a “bridge” therapy. HBOCs are biological products derived from purified hemoglobin (Hb), in this case bovine, and can bind and release oxygen.

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