

# CASE 1

## Bone Marrow Transplant

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### A 46-year-old man with chronic lymphocytic leukemia

R.H. is a 46-year-old man who was diagnosed with chronic lymphocytic leukemia in April 2009 and was initially treated with rituximab, cyclophosphamide, vincristine, and prednisone. A year later, his disease progressed, and he was treated with six cycles of pentostatin, cyclophosphamide, and rituximab. He presented in January 2014 with back pain, and a magnetic resonance imaging scan showed a bulky 10 cm periaortic mass with extensive disease in the abdomen. A biopsy of this mass confirmed transformation to large cell lymphoma. R.H. is now in complete remission after three cycles of bendamustine and rituximab. He is admitted to the blood and marrow transplant (BMT) unit in July for a myeloablative bone marrow transplant with a matched unrelated donor. The preparative or conditioning regimen is

- Busulfan 1 mg/kg PO on days –6 through –3
- Cyclophosphamide 50 mg/kg IV on days –2 and –1
- Cyclophosphamide 50 mg/kg IV on days +3 and +4 for graft-versus-host disease (GVHD) prophylaxis post-transplant.

On admission, R.H.'s laboratory values are all within normal limits. He has no other significant past medical history. He denies smoking and alcohol or illicit substance use. His pretransplant workup is unremarkable.

### **What early complication of transplant should the nurse be aware of when admitting R.H., based on his past history and transplant plan?**

Veno-occlusive disease (VOD), also called sinusoidal obstruction syndrome, is the most common hepatic complication in the immediate

post-transplant period and one of the most common causes of death after transplant (Sosa, 2012). The incidence of VOD is approximately 30%, with mortality as high as 70% (Anderson-Reitz & Clancy, 2013). GVHD prophylaxis using methotrexate can increase the risk. Other risk factors for VOD include (Anderson-Reitz & Clancy, 2013; Sosa, 2012)

- Prior liver impairment
- Older age
- Pretransplant chemotherapy
- Abdominal radiation
- Elevated transaminases prior to conditioning
- Allogeneic transplant
- Mismatched or unrelated donors
- Myeloablative conditioning regimens using busulfan, total body irradiation, and cyclophosphamide.

### **What are the signs and symptoms of veno-occlusive disease?**

Two sets of diagnostic criteria are widely used for VOD: the Baltimore criteria and the Seattle criteria. The Baltimore criteria include serum bilirubin equal to or greater than 2 mg/dl within 21 days of transplantation and two of the following: enlarged liver, ascites, or weight gain of at least a 5% increase from baseline. The Seattle criteria include at least two of the following within 20 days of transplant: serum bilirubin greater than 2 mg/dl, enlarged liver or right upper quadrant pain, or sudden weight gain greater than 2% from baseline due to fluid retention (Sosa, 2012).

During R.H.'s preparative regimen, the busulfan dose is increased once based on the kinetics that were drawn with the first dose. He has no other complications during the preparative regimen. In the first week following the transplant, R.H.'s alanine transaminase and aspartate transaminase become elevated, and he complains of nausea, diarrhea, and diffuse abdominal pain. Between days 11 and 14 after his transplant, R.H.'s total bilirubin is elevated at 2.8 mg/dl, his abdomen is distended, he complains of bloating and cramping, and his weight has increased 4 kg (8.8 lbs) since admission.

### **How is veno-occlusive disease diagnosed?**

The diagnosis of VOD is based on clinical symptoms that follow the Baltimore criteria or the Seattle criteria, as well as Doppler ultrasound of the liver that indicates reversed portal flow (Anderson-

Reitz & Clancy, 2013; Sosa, 2012). The BMT nurse should be aware of these signs and symptoms to aid in the early detection of VOD.

On day 15, R.H. is diagnosed with VOD after an ultrasound shows reversal of flow in the portal vein. On this day, his weight is up 6 kg since admission. In the following weeks, R.H.'s total serum bilirubin peaks at 41.5 mg/dl, and his creatinine peaks at 7.2 mg/dl, requiring continuous venovenous hemodialysis. He has mental status changes and respiratory failure requiring ventilator support.

### **What are the nursing interventions when caring for someone with suspected or confirmed veno-occlusive disease?**

It is extremely important for the BMT nurse to understand the risk factors as well as the signs and symptoms of VOD to aid in early identification of patients with VOD. The RN should monitor liver function tests and coagulation studies, monitor the patient's weight for sudden increases, and accurately record intake and output. The RN should also assess for abdominal pain and edema (Sosa, 2012). After a patient has a suspected or confirmed diagnosis of VOD, it is imperative that the RN continues to monitor the patient's weight twice daily, monitor the abdominal girth, evaluate and treat pain and nausea, and monitor the patient's mental status and reorient as needed. The patient's safety should be assessed frequently because of the potential for changes in mental status. The RN should also survey the patient's environment to ensure safety (Anderson-Reitz & Clancy, 2013). Patients should be on bleeding precautions, as coagulopathy often occurs with VOD. The RN should also be aware of medications that could be potentially harmful to patients when liver enzymes or bilirubin are elevated and communicate these findings to the team (Sosa, 2012).

### **What is the treatment for veno-occlusive disease?**

At this time, no U.S. Food and Drug Administration–approved treatments exist for VOD. Supportive measures are extremely important in the care of these patients. Mild VOD can resolve on its own, but moderate to severe VOD will require supportive interventions, such as diuretics, fluid restrictions, blood transfusion, paracentesis, and potential treatment of multi-organ failure (Sosa, 2012). Treatment should focus on managing the symptoms of VOD. Patients should be on strict fluid management to minimize intravascular and extravascular fluid overload (Anderson-Reitz & Clancy,

2013). Patients' renal function should be assessed frequently, and providers should look for ways to reduce renal injury, such as renal dosing medications and avoiding nephrotoxic agents. Acute renal failure can occur and may require hemodialysis or continuous venovenous hemodialysis (Anderson-Reitz & Clancy, 2013). Patients may require opioids for pain management, with fentanyl being the drug of choice because of its limited hepatic metabolism. Ascites and pleural effusions can be managed with paracentesis or thoracentesis; however, these procedures have their own risks, including bleeding and post-procedure hypotension due to fluid shifts. Patients have the potential for bleeding and may require frequent platelet and factor transfusions (Anderson-Reitz & Clancy, 2013).

### **What teaching related to veno-occlusive disease should the RN provide to patients and family members?**

Prior to transplant, the RN should include education about VOD when discussing the transplant course and potential side effects of the preparative regimen. The patient should be aware of the risk of developing VOD and be willing to proceed with the transplant course (Anderson-Reitz & Clancy, 2013). Patients who exhibit signs and symptoms of VOD or who have been diagnosed with VOD should be educated about how VOD is diagnosed and treated and the importance of reporting signs and symptoms to the nurse and providers. Patients and families should be taught about bleeding precautions, including signs and symptoms of bleeding to report. Families should be informed about the signs and symptoms of mental status changes so they can report findings to the nurse. The family should be given information about support available to them, such as social workers and chaplains, as they navigate this potentially difficult time (Sosa, 2012).

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#### ***Key Points***

- VOD is the most common hepatic complication in the immediate post-transplant period and one of the most common causes of death after transplant.
- Two widely accepted criteria are used to diagnose VOD: the Baltimore criteria and the Seattle criteria.
- The BMT RN has an extremely important role in identifying and monitoring symptoms of VOD and needs to be skilled in symptom management.

- Patient and family education related to VOD should begin prior to the transplant and continue throughout the transplant process.
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## Conclusion

BMT nurses have a very important role in identifying and treating VOD. Nurses are often the first to be aware of the subtle changes that can occur in patients that lead to a diagnosis of VOD. It is imperative that all BMT nurses are aware of the signs and symptoms of VOD so that they can report these to the providers if they occur. BMT nurses also need to be aware of how important symptom management is in the treatment of VOD so that patients remain safe and comfortable during this time. Finally, BMT nurses should ensure that patients and families receive education about the risk of VOD, as well as the signs and symptoms of VOD and treatment options.

## References

- Anderson-Reitz, L., & Clancy, C. (2013). Hepatorenal complications. In S. Ezzone (Ed.), *Hematopoietic stem cell transplantation: A manual for nursing practice* (2nd ed., pp. 191–199). Pittsburgh, PA: Oncology Nursing Society.
- Sosa, E.C. (2012). Veno-occlusive disease in hematopoietic stem cell transplantation recipients. *Clinical Journal of Oncology Nursing*, *16*, 507–513. doi:10.1188/12.CJON.507-513