Plasma Leakage
Audio Narration Transcript

Plasma leakage is a process in which the protein rich, fluid component of the blood leaks from blood vessels into the surrounding tissue. Plasma leakage is the most serious complication that distinguishes dengue from severe dengue.

For some dengue patients, as fever begins to disappear, severe dengue will develop. The immune response against dengue virus begins when an infected mosquito inserts its proboscis into the epidermal layer of human skin and releases viral particles that are taken up by cells of the immune system known as antigen-presenting cells, or APCs. The dengue virus replicates within the APC, causing it to mature. The mature APC enters an afferent lymphatic vessel where it travels from the site of infection to the lymph node.

In the lymph node, the mature APC produces chemical messengers that attract and activate T cells. In a patient with dengue, these activated T cells react and secrete pro-inflammatory molecules, such as TNF-alpha, IFN-gamma, IL-6, and IL-8. In a patient with severe dengue, the production of pro-inflammatory molecules is significantly higher than in a patient with dengue. When these molecules enter the blood stream, they help eliminate the virus and might also play a role in plasma leakage.

The integrity of blood vessels is maintained by the endothelial surface glycocalyx and cell-to-cell junctions. The glycocalyx is a network of proteoglycans and glycoproteins that projects from the surface of endothelial cells and acts as the primary barrier against leakage of proteins and fluid across the vascular wall.

The mechanism causing increased vascular permeability during severe dengue is not clearly understood, but there is evidence suggesting that reactive oxygen species, enzymes, and pro-inflammatory molecules start to breakdown the glycocalyx layer, allowing plasma to reach the underlying intercellular junctions and leak out into the tissues.

The integrity of the blood vessel wall is altered in such a way that although plasma leaks from the blood vessels, the red blood cells are too large to pass into the tissue.

This causes an increase in hematocrit, also referred to as hemoconcentration. A patient will show a progressive increase in hematocrit level beginning three to four days after fever onset. Patients with severe plasma leakage will have a 20 percent or more increase in hematocrit levels, compared to their baselines.

Severe plasma leakage can result in hypovolemic shock. Plasma leakage can also cause pleural effusions and ascites, which can result in respiratory problems. Isotonic intravenous fluids and colloids are administered to replace plasma, but the amount must be carefully monitored. Vital signs, fluid intake and output, and hematocrit levels must be recorded.

Excessive IV fluid therapy can lead to pulmonary edema and respiratory failure. Patients can improve rapidly over 1 to 2 hours if resuscitated properly. However care must be taken as leakage continues for 24 to 48 hours during which time the patient may have several episodes of shock and look relatively well in-between.