

Hemoconcentration – What is it? #3210



Hemoconcentration can be a difficult concept to understand. Take the word hemoconcentration apart and you get “hemo” (blood) and “concentrate.” Put them together and you get “concentrated blood.” Hemoconcentration is a condition in which blood cells, coagulation factors, and other large molecules accumulate in larger concentrations than would normally exist. Think of a tourniquet as being like a dam built by a beaver on a stream. The tourniquet slows down the blood stream just like a beaver dam slows down the water in a mountain stream. As you can see in this picture, the water level upstream is higher than downstream. It should be noted that the water upstream has spilled over its banks due to the blockage in the stream, flooding the surrounding area. Some water, dirt, small fish, little twigs, and other small debris will

get through the dam and continue downstream. The rest is too large to pass. Big fish, branches, and other debris that can't get through the small openings in the dam will accumulate in a higher concentration than it does downstream. Tourniquets and beaver dams are a lot alike.

When hemoconcentration is caused by prolonged tourniquet time, not only are the cells, clotting factors, and some analytes such as potassium accumulating temporarily in greater numbers below the tourniquet, but the smaller elements and fluids also begin to leak out of the swollen capillaries and into the surrounding tissues. Hemoconcentration begins altering test results in one minute of tourniquet constriction.

What does hemoconcentration mean to the patient? Hemoconcentration can cause erroneous test results to be reported to the physician. When the blood sample is tested, the results reported to the physician may indicate the patient's red cell (RBC) count, white cell (WBC) count, potassium, and other analytes are higher than they really are. If the test results do not reflect the actual physiology of the patient and the physician treats the patient according to the erroneous results, the patient may not receive proper care. For patients and their physicians, hemoconcentration is a very big deal. Treating a patient according to erroneous results could have tragic consequences. No physician wants to make diagnostic and treatment decisions based on erroneous test results.

Sometimes the test results are so far out of the normal range that the physician may not trust the results. He would then request another sample of blood to be obtained and tested to insure the accuracy of the first test. This means the patient must endure another sample collection and incur additional expenses for the repeat testing. To the physician, the lab loses credibility and patient care is delayed.

The Cost of Hemoconcentration

<ul style="list-style-type: none"> <li>• Patient pain and discomfort</li> </ul>	<ul style="list-style-type: none"> <li>• Increased expenses to patient &amp; healthcare provider</li> </ul>
<ul style="list-style-type: none"> <li>• Patient and family dissatisfaction</li> </ul>	<ul style="list-style-type: none"> <li>• Physician dissatisfaction</li> </ul>
<ul style="list-style-type: none"> <li>• Delays in medical management of patient</li> </ul>	<ul style="list-style-type: none"> <li>• Potential mismanagement due to inaccurate results</li> </ul>

The facts about hemoconcentration:

Hemoconcentration is a condition in which blood cells, coagulation factors, and other large molecules pool below the tourniquet and temporarily accumulate in larger concentrations than elsewhere in the blood stream.

Hemoconcentration can be prevented. If the tourniquet has been in place for one minute or it would appear the sample will not be obtained within one minute, release the tourniquet. After locating the vein, allow two minutes to pass before reapplying the tourniquet to allow the circulation in the extremity a chance to equilibrate. Don't have the patient pump his/her fist.

The phlebotomist who collects the specimen has 100% control over whether or not hemoconcentration is introduced into the sample due to extended tourniquet time. You make a difference for your patients with each and every specimen collection you make. Just make sure the difference you make is one you can be proud of.



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### Test your knowledge:

1. Of the options below, which is the best definition of hemoconcentration?
  - a) the breakage of red blood cells during sample collection
  - b) a condition in which red cells, coagulation factors, and other large molecules temporarily accumulate in larger concentrations than elsewhere in the blood stream
  - c) the concentration of blood below the surface of the skin, such as with a severe bruise
  - d) a higher concentration of cells above the tourniquet
2. What test values could be falsely elevated in a hemo-concentrated sample?
  - a) potassium
  - b) RBCs
  - c) both a and b
  - d) ANA
3. What causes the preanalytical error known as hemoconcentration?
  - a) forceful shaking of the tubes after filling
  - b) a tourniquet left in place beyond one minute
  - c) collecting the tubes in the wrong order
  - d) clenching and holding the fist
4. What are some of the costs of a sample that is hemoconcentrated?
  - a) there could be a delay in patient care
  - b) the patient may be medically mismanaged as a result of erroneous results
  - c) the physician may question the quality of the laboratory's testing
  - d) all of the above
5. Who is responsible for making sure specimens are not impacted by hemoconcentration?
  - a) the phlebotomist
  - b) the physician
  - c) the medical technologist testing the sample
  - d) the patient
6. How can hemoconcentration be prevented?
  - a) release the tourniquet after one minute and allow circulation to normalize for two minutes
  - b) have the patient pump their fist to facilitate quicker filling of the tubes
  - c) apply pressure to the site before bandaging
  - d) both a and b

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Facility/Supervisor \_\_\_\_\_ Dept: \_\_\_\_\_