Glucose Monitoring for Detection of Ischemic Tissue

Published date: Feb. 1, 2012

Technology description

Description

Ischemia is a restriction in blood supply to tissue that can be caused by either trauma or disease. The lack of blood flow prevents oxygen from getting to cells and waste from being removed from the cells. The ability to quickly detect when vessel blockage is occurring is necessary to administer treatment effectively.

After tissue transfer procedures such as breast reconstruction, blockage of blood vessels may lead directly to tissue ischemia. If detected early, blood vessels can be surgically unblocked and the transferred tissue can be salvaged. However, if the blockage is not corrected within six hours of vessel occlusion, the potential for complete tissue loss exists. Conditions such as thrombosis after kidney transplant and ischemia in the brain after neurological trauma are similar to tissue transfer ischemia. Treatment of these conditions also depends on rapid and accurate ischemia detection.

Several methods currently exist to monitor tissue ischemia, including microdialysis, ultrasound and localized oxygen concentration measurement. The device to perform microdialysis costs at least $40,000, and each test costs up to five dollars per patient. Ultrasound monitoring is operator dependent and less effective in detecting venous blockages than arterial blockages. The tissue oximeter required for monitoring oxygen concentrations costs around $30,000, and each probe costs about $500. This method is also relatively new and questionably reliable. An inexpensive, real-time and accurate method of identifying ischemic tissue is needed.

UW-Madison researchers have developed a method of monitoring absolute glucose levels and the rate of change in glucose levels in tissue as a means of identifying ischemic tissue. Both absolute glucose levels and the rate of change of glucose are independent markers of ischemia. A reduced glucose concentration or a negative rate of change of glucose concentration in the tissue as compared to a control indicates ischemia.

Advantages

The method combines the two variables in a composite log regression to very accurately detect blood vessel occlusion with up to 100 percent sensitivity and specificity in as little as twenty minutes. Monitoring blood glucose levels requires a relatively inexpensive device with cheap disposable sensors

and can be completed quickly, as opposed to the costly equipment and/or long wait times required with current methods. Monitoring blood glucose through this method is a quick, precise and accurate solution to real-time detection of ischemia.

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