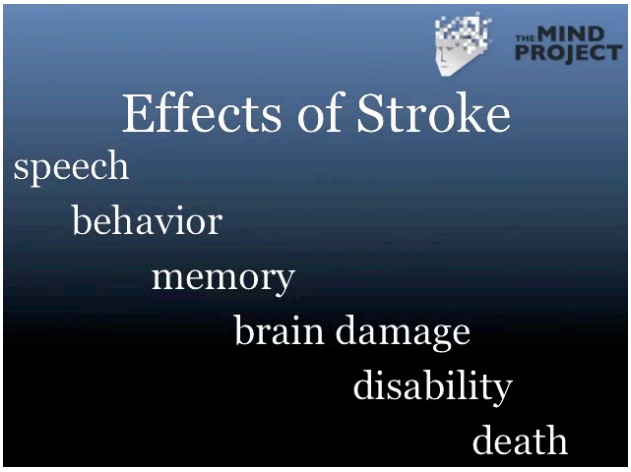
Script for the
Virtual Stroke Lab
Tutorial

Overview

http://www.ilstu.edu

Background and Vocabulary

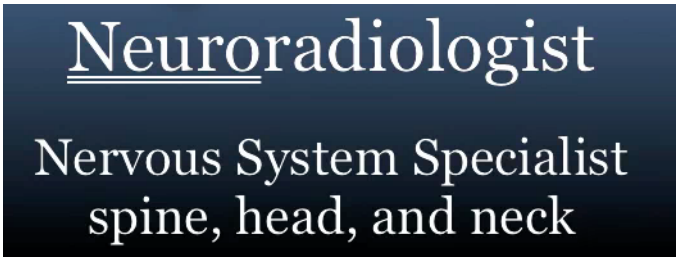
This podcast provides an overview of "The Virtual Stroke Lab," a free virtual lab available from The Mind Project. This tutorial includes background information about strokes as well as an overview of the three sections that you will complete as part of your virtual lab experience.



A Stroke sometimes called a "brain attack" is the sudden lack of function of a person's peripheral nervous system. Essentially, blood flow is interrupted depriving brain cells of the oxygen they need. It is most certainly an emergency. Symptoms range from numbness or weakness of face, leg, or arm, especially on one side of the body. Sudden confusion or trouble speaking and/or understanding speech, sudden dimness or loss of vision in one or both eyes, terrible headaches, dizziness, or loss of balance. If you suspect someone is having a stroke, call 911 immediately. Every minute counts because depending on what area of the brain is affected, a stroke can cause problems with speech, behavior, thought patterns and memory, and can result in permanent brain damage, disability or death.

Purpose

In this virtual laboratory, you become a neuroradiologist. A radiologist is a specialized physician who is trained in interpreting images with the purpose of diagnosing and treating disease and trauma within the human body.



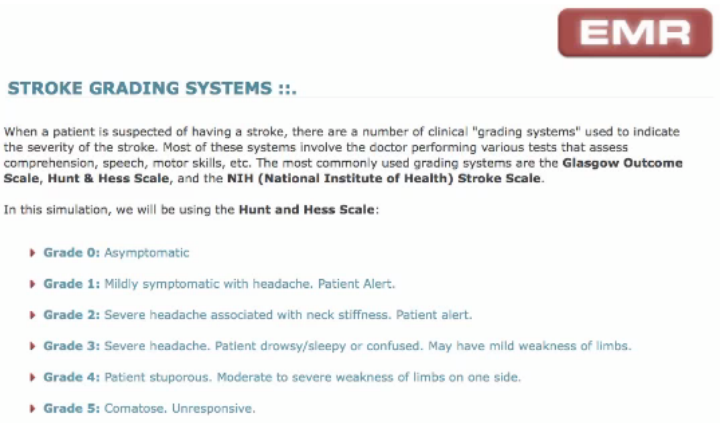
A NEUROradiologist is a subspecialty whose focus is the central and peripheral nervous system, spine, and head and neck. As the neuroradiologist, you will diagnose and treat a stroke victim. It is your job to determine which tests to order, to interpret what the images mean, order additional tests, and then eventually decide what, if any treatment the patient may need. It is possible that you will perform a life-saving procedure on your patient.

The Virtual Stroke Lab is divided into three separate sections. The first two sections focus on identifying which type of stroke the patient had, as well as identifying the exact anatomical location within the stroke

victim's brain. This is referred to as the diagnostic portion of the lab. Often times several tests are needed. Be sure to read the Electronic Medical Record, or EMR as you make these very important decisions. The last section of the lab is the treatment portion of the lab, and takes the longest time to complete. In this part of the lab you may perform a medical procedure to help save your patient.

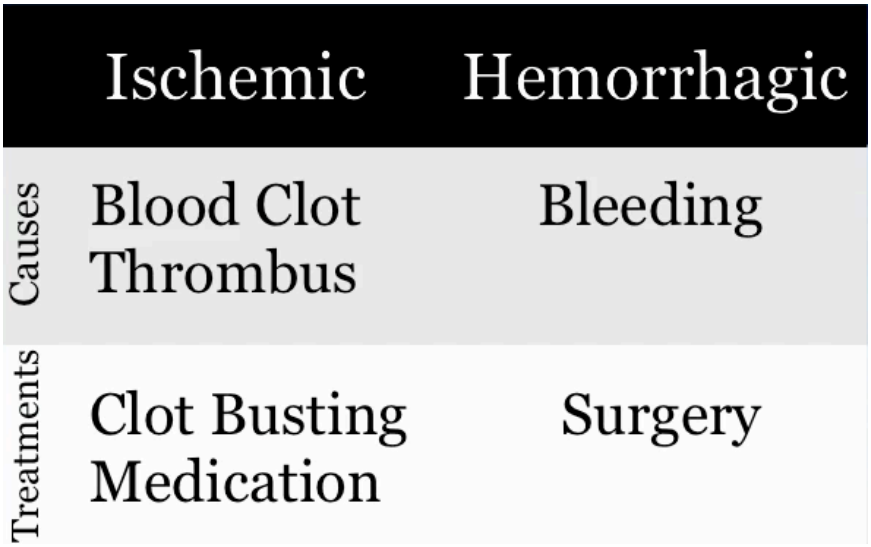
Section 1 Overview

After you have clicked on each of the navigation menu buttons, you will be paged to the Emergency Room to diagnose a patient who has just arrived. Once you are in the ER, be sure to bring up the protocol in the green info screen so you know what you are supposed to do. Based on the Patient Data and information you can read in the EMR you will make decisions about the patient's stroke risk factors and Hunt and Hess score before you determine what test should be ordered to help you diagnose the specific anatomical issues of this stroke victim.



Click the "Continue" button to move through the decision-making process. Some of the questions have several correct answers that must be selected before you can move on. You can always go back and reference the EMR to help you as you answer these diagnostic questions.

An important decision you will be making is whether the stroke is ischemic or hemorrhagic.



An Ischemic stroke is caused by a blood clot called a thrombus, which reduces blood supply to parts of the brain. Hemorrhagic strokes are bleeds within the brain. The symptoms of a stroke are a result of brain cells dying because of the vessel damage and vary depending on what kind of stroke the individual has had.

The treatments doctors give stroke victims depends on the type of stroke they've had, and where in the brain the stroke occurred.

Eighty percent of strokes are ischemic. And if patients get treatment within three hours of the symptoms, clot-busting medications can minimize long-term damage.

Twenty percent of strokes are hemorrhagic. This bleeding in the brain can be difficult to stop. But there are several surgery options that can be performed in attempt to strengthen the weakened artery wall and prevent a re-bleed.

With stroke victims, you are searching brain scans looking for blocked blood vessels, bleeding in the brain, or ballooned blood vessels.

The role of imaging, or taking pictures, has become increasing important in the health and medical fields. ER and primary care doctors order CT, MRI, PET, and angiography exams so that radiologists, can provide a thorough report of the anatomical trauma and/or disease. The diagnoses that come from these images allow individualized treatment plans for each patient.

After making important decisions regarding your patient, the doctor's notes and protocol are updated, and notifications of this pop up in the upper right-hand corner when these updates occur. Once you have decided on a primary diagnostic test, you will have completed section 1.

Section 2 Overview

ORIENTATION OF CT SLICE THROUGH THE SKULL. MULTIPLE SLICES ARE ACQUIRED.

CT SLICE OF BRAIN WITHOUT IODINATED CONTRAST

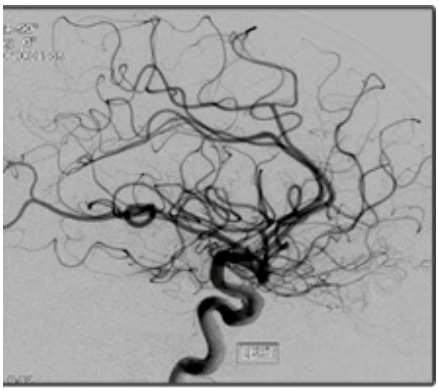
CT SCAN WITH IODINATED CONTRAST. BLOOD VESSELS APPEAR WHITE.

X-ray beams are used in CT scans, which stands for computerized tomography. During this procedure an X-ray beam is rotated around the head to create an image "slice of the brain." These image slices are pictures of cross-sections of the brain.

If you perform a CT, you will be asked to position the patient in the machine. Use your keyboard arrow keys to do this. When going to the control room, click on the chair in order to sit down. In real life, the radiologist, who is a medical doctor, is not the one who positions the patient, or manipulates the imaging machines. A radiology technician completes this. The images are then sent to the radiologist who views the scans and reports the results. The doctor may consult other physicians before suggesting the next step to the patient and family.

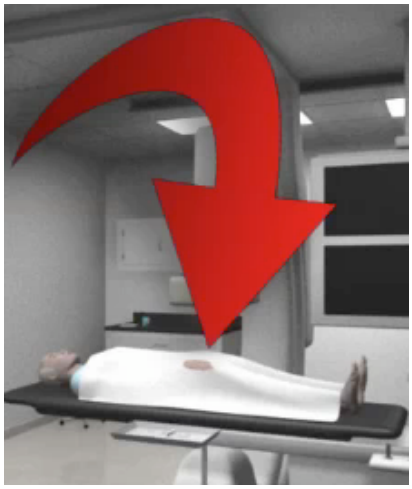
The treatments doctors give stroke victims depends on the type of stroke they've had, and where in the brain the stroke has occurred. The majority of strokes are ischemic. And if patients get treatment within three hours of the symptoms, clot-busting medications can minimize long-term damage. A smaller percent of strokes are hemorrhagic. Bleeding in the brain can be difficult to stop and are more likely to be fatal. Sometimes bleeding caused by aneurysms can be stopped surgically. Two current surgery options are called clipping or coiling.

At some point, you will need a diagnostic test to confirm the cause of the stroke. This can be done using a procedure called a Digital Subtraction Angiography or DSA. This is an X-ray procedure where tubes called catheters are inserted into blood vessels so that X-ray dye can be injected. Images are then recorded to show the anatomy of the blood vessels. This is called digital road mapping.



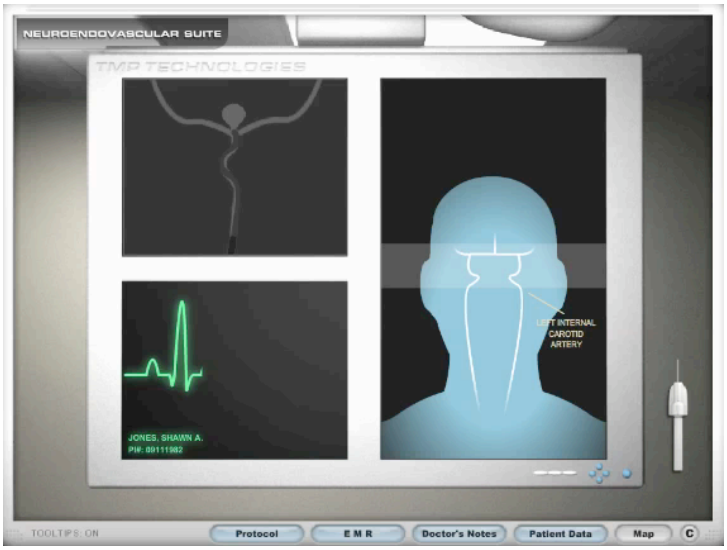
THE DSA IMAGE

Digital road mapping is often used to determine the type and severity of the blood vessel damage, so that prompt and proper treatment can be given. Once contrast dye is delivered, the computer subtracts out all the bony structures so that you only see the blood vessels. This will clearly highlight any blocked blood vessels, burst blood vessels, or aneurysms.



While it may seem strange, the easiest way to access the blood vessels in the brain is through the groin, via the femoral artery. While there is some distance to travel from the groin to the brain, it is the safest path within the circulatory system to access these vessels.

Neuroradiologists perform DSAs using computer monitors to aide in the insertion of catheters and dye. While this simulation makes the procedure seem relatively simple, it takes hours for the doctor to reach the brain, all the while, carefully pushing catheters through blood vessels, pulling back when they hit resistance and twisting and turning the catheter to make it move around corners that way they need to.



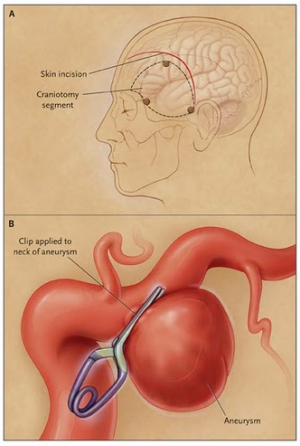
Here on this screen, you see three images. The lower left is a heart rate monitor and is where any 3D models or other images will appear throughout the procedure. The upper left shows the blood vessel shown in the lighter gray color, with the catheter being a darker gray. In this simulation, you are using the line control on the right. Clicking and pulling the line control up, will move your catheter upward through the vessel, and pulling it down, moves the catheter backwards. If you accidently place the catheter in the wrong vessel, you can back out and try again. The knob on the end of the line control allows you to "twist" the catheter to help you move it around corners. This is equivalent to the radiologist using pressure and twisting of the catheter at the entry point in the groin.

The anatomical graphic of a person on the right, was added for this simulation. It will help you associate the blood vessel you are traveling through, with a specific location in the patient's body.

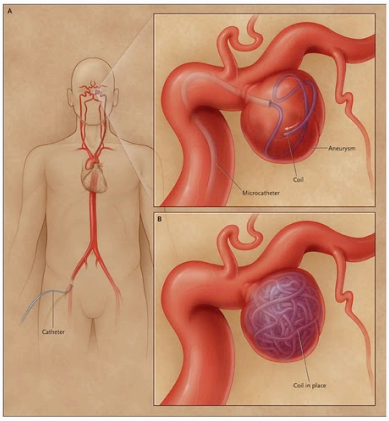
The purpose of diagnostic imaging for stokes, is to get a clear look at any blood vessel damage in the brain. The scans you view will help you to identify the cause of the stroke. You are looking for blocked vessels, bleeding vessels, or bulging vessels. If you see a blocked vessel, a thrombus (or clot), may be the cause. You will need to know the location, and how severe the block is. If you see blood outside the blood vessels, a ruptured vessel may be the cause. Or if you see bulging vessels, the cause of the stroke is an aneurysm. You will need to pay close attention to the diameter of the aneurysm itself, and the aneurysm neck size. This will help you to determine whether the treatment should be clipping the aneurysm, coiling the aneurysm, or leaving the aneurysm untreated.

Section 3 Overview

If you decide to perform a surgery to treat the patient, be sure to follow the directions in the protocol. You will be choosing between either clipping or coiling.



If you choose to perform a clipping surgery, this includes a craniotomy, which means surgically drilling and cutting a window into the skull in order to gain access to the aneurysm. You will then physically move brain tissue out of the way in order to locate the affected vessel. Then you'll use a small titanium clip, which looks like a clothespin to pinch off the aneurysm to prevent the ballooned area from bursting. Clipping works best on young patients and if the aneurysm is easy to access. And clipping is permanent.



On the other hand, if you decide to treat the patient by inserting coils into the aneurysm, you will be using the main catheter you already have placed near the aneurysm to fill the aneurysm with platinum coils of different diameters, so that blood can no longer flow into the ballooned blood vessel. Coiling works on both ruptured and unruptured aneurysms, but sometimes coils compact over time, and therefore additional coils must be added.

After completing either treatment, you will have to run tests to confirm the lack of blood flow through the ballooned aneurysm. You know the surgery was successful if the images indicate that the blood flows normally through the blood vessel, and does not enter into the aneurysm.

The goal is to block blood flow from entering into the aneurysm, so that the pressure is relived to prevent a re-bleed of the blood vessel.

This Virtual Science Lab has been supported by NSF grant #0127561 and NIH/NCRR/SEPA grant #R25RR020425.

Thank you for watching this tutorial of the Overview of the Virtual Stroke Lab. We hope that you enjoy your virtual laboratory experience, made available from The Mind Project.