

# Computed Axial Tomography Machines

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**Abstract**—Over the past forty years, CAT scan machines have helped revolutionize medical imaging. From the first one invented, every machine has helped medical professionals help patients with diagnosis and treatment of illnesses. The most modern ones are equipped with the capacity to scan and reproduce high-resolution images in just minutes. However, there are some restrictions on their use.

## I. INTRODUCTION

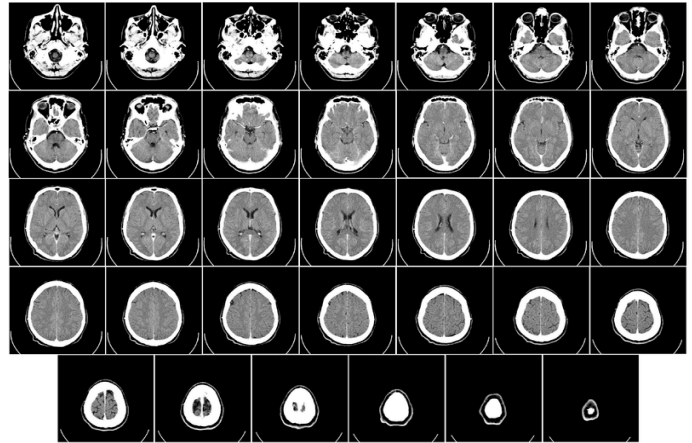
COMPUTED axial tomography machines (CAT Scan Machines) are machines that non-invasively produce tomographic ('slices') images of a specific area being examined, using a combination of X-rays and computer processing. This allows for a 3D representation of the image instead of a 2D image generated from a traditional X-ray machine. For this reason, the machine has multiple purposes in the medical field, and is very widely used. While the first CAT scan machines were only able to head, over the course of their existence, major improvements have been made to their functionality. Today, the machine can be used to conduct a full-body scan, however this is only in some circumstances. Generally, there are four classifications of the types of scans that are most commonly done. The first is the abdominal, the second is the bone, the third is the head, and the last is the vascular scan. Each of these scans are done in the targeted area of examination, and can be done within minutes, under normal conditions.

## II. METHODS

While there are many uses for these machines, they are primarily used to detect cancerous tumors, internal bleeding in the brain, abnormalities in any of the organs, bone density, and also to help aid during surgeries and biopsies of any sort. When a CAT scan is required, the ordering medical professional may also require the use of contrast with the scan. This contrast is used to better help define and identify the structures scanned in the examination. There are two ways contrast may be used. The first is intravenous, where the patient is injected with the contrast dye. The second is the oral drink that the patient has to drink several hours prior to the exam. If contrast is required, the patient is not supposed to eat/drink in the hours leading to the exam time. If no contrast is needed, when the time comes for the scan, all metal and electronic possessions that can be removed, must be removed, and then the patient is ready to be scanned.

## III. RESULTS

The radiologist in charge of the examination examines the results of the CAT scan. These results are then relayed over to the ordering medical professional and then conveyed to the patient. The printed image that the radiologist sees looks similar to the image below. (The image is a CAT scan of the head).



The image is produced by a 360 degree rotating X-ray source in the machine, which emits a fan-shaped beam of X-rays. The X-rays penetrate and exit the patient and area in the region of exposure and collide with a detector opposite the emitting source of the X-rays. This detector is always opposite the emitting source of rays, and also rotates in sync with the emitting source. This rotating process helps generate hundreds of cross-sectional images, which are combined with the help of a computer to create a final 3D image of the scan.

## IV. DISCUSSION

While CAT scans are extremely beneficial in the medical field, there are some setbacks and limitations on their use. The first is the cost of a traditional scan. Even though most insurance companies will cover the expense of a CAT scan, some patients may still be required to pay out of their pocket. The bill can vary anywhere from \$250 to over \$5000, depending on the type of scan. Another setback is the fact that the machine requires the use of radiation. Multiple scans in a short period of time may increase the possible risk of cancer from the exposure of radiation. Medical professionals will inform the patient when chances increase, but the 'cool-off' period may be a long period of time. In addition, women who are pregnant are discouraged from having CAT scans done, because of the delicate nature of the fetus and developing child. Even though there are many cons, CAT scans have been one of the most beneficial technologies in the medical field in the discoveries of medical illnesses.

## REFERENCES

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