

MRI Machines

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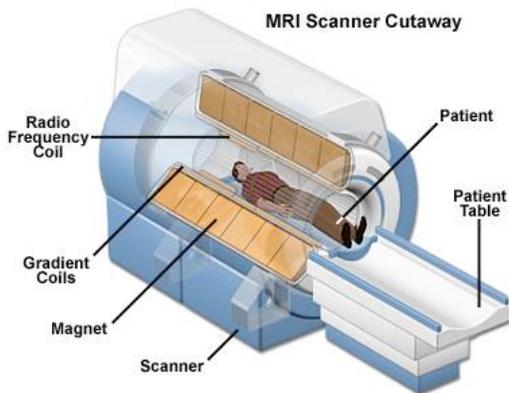
Abstract—Biomedical Engineers are developing new and improved MRI machines that scan faster and safer than past ones by advancing old technologies.

I. INTRODUCTION

MRI machines are mainly used for the diagnosis of several diseases/problems by examining blood vessels in several parts of the body (ex: brain, back, heart, etc.). The MRI machine does not use the common form of radiation to produce the scans; instead it uses a mix of magnetic and radio frequency waves. The purpose of an MRI is not to see bone; rather, it is used to scan tissues within a person. By doing this, doctors can detect potentially dangerous things from a clearer image of the body segments. However, there are several problems with these scans, including the inability of persons with metal implants to use it, the amount of time the patient needs to be in it, and the size of the machine.

II. METHODS

An examination begins with the patient getting into the machine after being prepped. While in the machine the patient must remain still, so that clear scans can be taken. It is important to note that the machine is loud, so the patient has to wear noise-cancelling headphones.



As shown, the machine is very large, and consists of many parts. The major parts are the radio frequency coil, magnet, gradient coils, and scanner. The magnet itself is surrounded by liquid helium, to keep it working correctly. The magnet is what is used to align the hydrogens on water molecules, while radio frequencies (RF) are pulsed through the patient. The RF pulses that are received back from the patient's body create the final image.

III. RESULTS

The images are preferred most by experts over any other x-ray type scan because of how clear the images are. The results of these images will tell the radiologist what is wrong with the portion of the patient's body. This could be ruptured

discs, cancer, heart problems (valve problems), etc. From there the doctors will try to figure out the best way to cure the ailment.

IV. DISCUSSION

Although the images are extraordinarily clear, there are several set backs to the device, such as how small the radius of the machine is that the patient has to fit in, the amount of noise coming from the machine, the inability of people with metal implants to enter the machine (due to the magnet), and the length of the process, as well as the claustrophobic feeling that occurs in some patients.

However, there have been some advances due to biomedical engineers in some of these areas. In 2012, Henry Halperin, M.D. (professor of biomedical engineering) with Saman Nazarian, M.D. found a process that allowed people with metal implants to undergo an MRI [4]. Other advances include, making the process seven times faster than before [6]. There has even been advances in making the machine have glass walls, in order to try to reduce the risk of a claustrophobic feeling in patients. Due to all the improvements in building an MRI machine, it is clear that the machine is only in its infancy. In the years to come there will be better models available to the public.

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