

# Improvement of Brain Aneurysm Surgery through Biomedical Imaging

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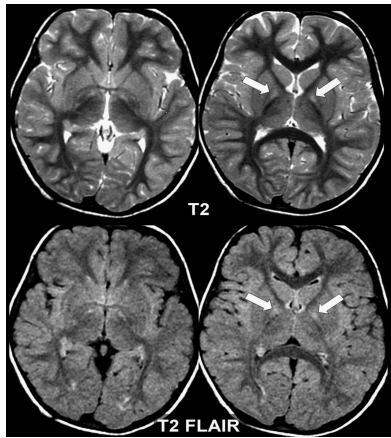
**Abstract**—Ruptured brain aneurysms can be fatal if not treated and examined regularly. Surgery and frequent MRI checks can prove extremely beneficial in helping those with aneurysms. BrainSuite is a newly developed imaging software designed to improve the accuracy and efficiency of MRIs involved in brain surgery.

## I. INTRODUCTION

A Cerebral brain aneurysm is a weak or thin spot on a cranial blood vessel that fills with blood. If the aneurysm presses on nerves or surrounding tissues it can rupture and burst. This causes a lot of health problems, including memory loss, loss of vision, and can sometimes be fatal [3]. The symptoms of a brain aneurysm are very dependent on size and can sometimes go unnoticed; this is why frequent MRI's are essential to prevention.

## II. SURGICAL TREATMENT

When an aneurysm is ruptured, emergency surgery is required. During this, the scalp, skull, and brain coverings are opened and a small metal clip is placed at the base of the aneurysm to prevent it from bursting any further [3]. Not all aneurysms need to be treated right away. Aneurysms that have never bled and are very small do not need to be treated because are less likely to break open. In this case, MRIs

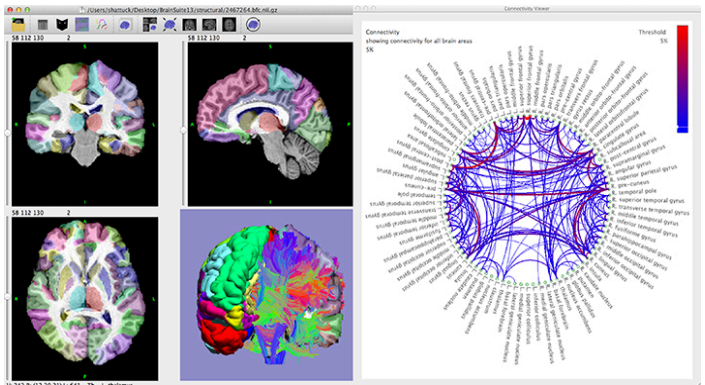


(Magnetic Resonance Imaging) are frequently performed to watch the aneurysms growth and change. The picture shown to the left shows a typical image display done on an MRI machine [3]. Over the last few years, medical imaging has undergone many advancements. Despite this, there are still risks associated with surgery. In particular to brain aneurysm surgery, some of these risks include blood clotting, swelling, infection, and permanent brain loss.

## III. BRAINSUITE

Although we do not currently have the technology to have 100% accuracy during brain surgery, scientists have been making many improvements. The most recent of this is a software called BrainSuite. BrainSuite is utilized to enable automated processing of MRIs of the human brain. The purpose of these tools is to extract and parameterize the inner the cerebral cortex and to divide and mark gray and white matter elements [1]. The software contains visualization tools for exploring data, and can produce interactive maps of regional connectivity. The key features that allow the software

to enhance the quality and efficiency of MRIs include tools for processing of diffusion data, tools for visualizing data, brain surface extraction, and cerebrum labeling [2]. The image below shows an example of an MRI utilizing BrainSuite software [1]. It is clearly much more detailed and clear than in utilizing the basic software.



## IV. TEST/DISCUSSION

In an intensive study lasting from 2007 to 2013, 105 patients affected by both ruptured and unruptured aneurysms underwent clipping surgery using BrainSuite software. In all cases, the aneurysms were clipped and excluded from blood circulation and no difficulty was encountered. Compared to a normally-equipped neurosurgical operating theater, the outcome was an immense success [4]. The conclusion of this study was that BrainSuite is highly affective and contains very few limitations in comparison to its advantages. The conclusion of this report also stated that although it was an extremely helpful tool, BrainSuite was not “essential in aneurysm surgery” [4].

The conclusion of this study shows the importance of imaging advancements and how significant it has been in medical study in the last decade or so. With this information, scientists and engineers can go to inquire more about this technology and broaden the usage in hopes to raise efficiency and productivity levels during surgery.

## REFERENCES

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- [4] D'Andrea G, Frati A, Pietrantonio A, Familiari P, et al. Surgery of Brain Aneurysm in a BrainSuite Theater. *Clinical Neurology and Neurosurgery* 97, 2015.