The Impact of Intraoperative Magnetic Resonance Imaging (iMRI) In Cranial and Spinal Cases In A Community Hospital

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Introduction

Intraoperative magnetic resonance imaging (iMRI) allows surgeons to take real time high-resolution images throughout the course of an operation. iMRI has been shown to be useful in the evaluation of tumor resection and preventions of complications such as hemorrhage and brain shift. iMRI also plays a role in spinal surgeries but research has been limited. iMRI is found in many academic institutions but is relatively new in community hospitals. This study measures the effectiveness of iMRI in a community hospital in cranial and spinal cases by looking at additional tumor resection and the length of surgery, respectively.

Methods

We retrospectively analyzed 260 total cases from 2006 to 2015. All cases were performed using IMRIS technology. Of the 260 cases, 116 cases were cranial, 129 were spinal, and 15 were considered other (i.e., Chiari decompression, arachnoid cyst removal). Of the 116 cranial cases, 100 were malignant tumors, 4 were aneurysms, 1 was a stroke, 6 were hematomas, and 5 were other. The time duration of two one-level ACDF weas measured and averaged each year from 2006 to 2015.

Figure 1: IMRIS Magnet

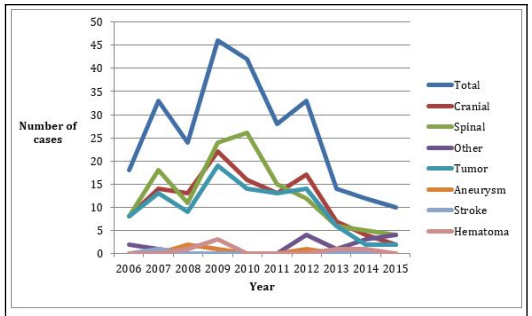

Figure 2: Number of cases performed with intraoperative magnetic resonance imaging based on location and indication by year

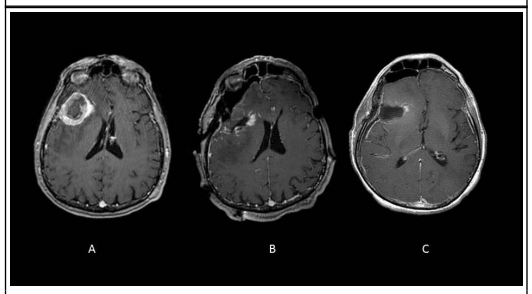

Figure 3: T1 contrasted MRI of right temporal glioma resection with (A) preoperative image. Intraoperative image (B) shows residual tumor, this was resected. Postoperative image (C) shows gross total resection.

Results

The overall use of iMRI decreased over time from a high of 46 total cases per year (2009) to a low of 10 total cases (2015). Tumor resection improved in 25 out of 100 cases where additional tumor was resected following the MRI. The amount of additional tumor resection decreased over time from 2006 to 2015. The time duration of one-level ACDF operations varied. In 2006, the average duration was 283.5 minutes and decreased to 156.6 minutes in 2010. The duration increased to 282.5 minutes in 2015.

Conclusions

The decrease in the number of iMRI cases may be from increasingly more selective indications over time. Physician bias may select patients with neoplasms over spine surgeries since studies show iMRI to be more beneficial for tumor surgery. Efficiency generally improved the more often iMRI was used. The time duration of a one-level ACDF was lowest in 2010. In the same year, our practice had performed 26 spinal cases, which is the highest number attained since having the iMRI. The shorter time duration in 2010 may be due to the increased repetition using the iMRI. The time duration of a one-level ACDF was highest in 2006 and in 2015. The increase in time duration in 2006 is most likely due to our practice getting familiar with the new iMRI technology. The increase in time duration in 2015 may be due to the decreased repetition as a total of 4 spinal cases were performed using iMRI technology that year.

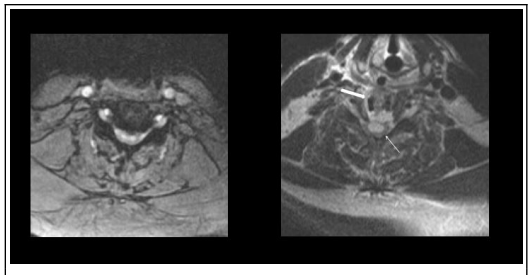

Figure 4: T2 axial MRI of cervical spine showing cervical stenosis with myelomalacia (left). Intraoperative MRI (right) shows decompressed canal with allograft bone (large arrow) and increased myelomalacia (small arrow).

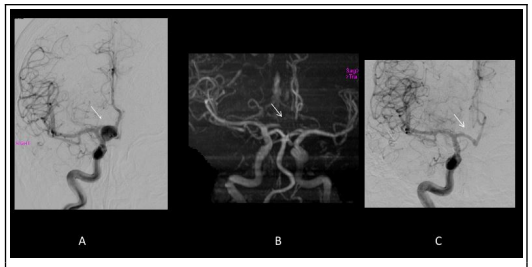

Figure 5: Angiogram of intracranial right internal carotid artery demonstrates anterior commmunicating artery aneurysm (A). Intraoperative MRA following clipping (B) shows signal void but intact distal flow. Postoperative angiogram (C) shows aneurysm secured and confirms distal flow.

References

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