The Role of FIESTA MRI for Assessment of Delayed Enhancement of Fat Graft Packing on Post-Operative Imaging After Acoustic Neuroma Surgery

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Introduction

Follow up imaging after acoustic neuroma resection is very important to monitor for tumor recurrence. T1-weighted MRI with gadolinium enhancement is the diagnostic modality of choice for recurrent tumor surveillance. Fat grafts are used after surgical resection of acoustic neuroma to prevent CSF leak, yet several studies have shown that grafts create difficulty in interpreting MR images due to delayed enhancement of graft materials. Due to this enhancement near the IAC, there has been an increased use of fat suppression to get a better visualization of the surgical bed. There can also be enhancement of the fat graft in the IAC at 3-6 months after surgery which may indicate tissue reactions to trauma and dural enhancement. These factors create interference in the MR images and create difficulties in identifying potential recurring tumor.

FIESTA provides a high resolution image which can be used in conjunction with standard T1 and T2-weighted sequences to provide clarity in imaging. This study attempts to show the efficacy of FIESTA imaging in assessing fat grafts in the surgical bed. We hypothesize that the enhancement of the fat graft in T1 with Gadolinium and fat suppression can be resolved when compared with the appearance of the fat graft in FIESTA images.

Methods

We identified 33 patients who underwent retrosigmoid and translabyrinthine acoustic neuroma resection from 2009-2016 at University Hospital. Patients who had at least two sets of imaging were included in the study. Radiograph images were collected at different time points: preoperative, immediate postoperatively (24-48 hours), 3-6 months postoperatively, and yearly postoperatively (if available). The image sets contained T1, T2, Fat Suppressed T1 with Gadolinium, and FIESTA. After patient identifiers were removed, radiographs were presented at random for analysis for postoperative enhancement on the fat suppressed T1-weighted image to a neuroradiologist and neurosurgeon. Then, they were compared with the T2 and FIESTA images.

Results

All of the patients exhibited delayed enhancement of the fat graft on the post-gadolinium fat-suppressed T1-weighted MRI at 3 months and thereafter. This enhancement raised the suspicion of possible early tumor recurrence with gadolinium image. Six of the patients showed enhancement on the immediate postoperative image set. An additional 22 patients showed enhancement on imaging done 3-6 months postoperatively, and 5 of the patients showed enhancement after 1 year postoperative imaging.

FIESTA imaging showed hyperintensity at the site of the fat graft and hyperintensity around the graft structures. When comparing the FIESTA image with the post-gadolinium fat-suppressed T1-weighted MRI, the enhancing signal within the fat graft correlated with signal characteristics of the fat graft, and not with tumor recurrence. The enhancement of the fat graft was likely due to delayed neovascularization of the fat graft. FIESTA was very useful in clarifying whether enhancing signal was due to recurrent/residual tumor versus postoperative changes. In one case, there was a recurrent tumor which was in the enhanced fat graft bed. FIESTA imaging showed hypointensity around the tumor with hyperintensity showing fat.

Conclusion

This study demonstrates the utility of FIESTA imaging in providing additional information and insight to standard imaging modalities when assessing tumor recurrence after acoustic neuroma surgery. Post-gadolinium fat-suppressed T1-weighted MRI can show delayed enhancement in the fat graft by 3 months after surgery due to neovascularization of the fat graft. FIESTA can help resolve whether this delayed enhancement represents tumor versus postoperative changes.

References