SUBCORTICAL
SURGERY GROUP

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SSG CASE REVIEW: Post-LITT Glioblastoma Recurrence

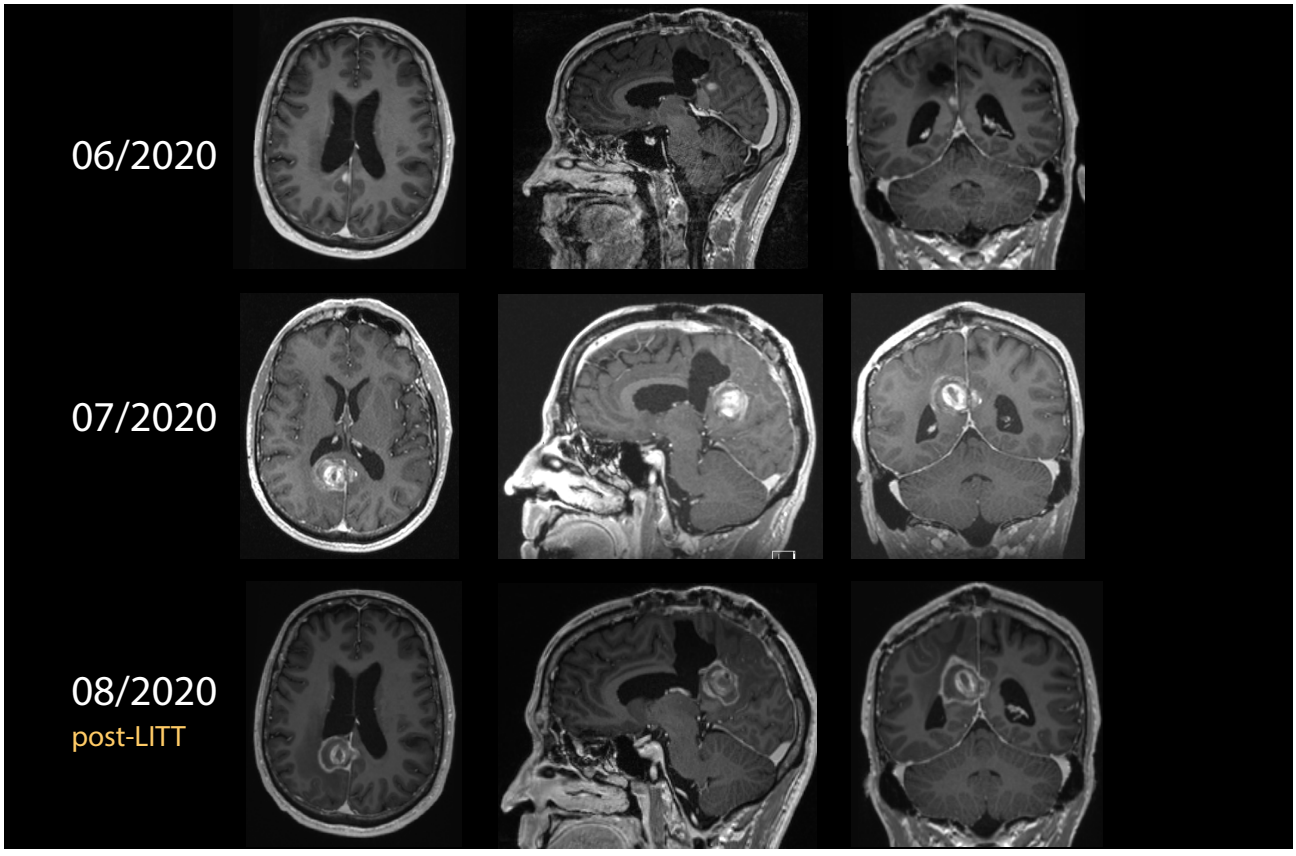
The Critical Importance of Large Volume Sampling to Assess Intratumoral Heterogeneity (ITH)

Abbreviations

IDHwt: isocitrate dehydrogenase wild type
MGMTm: methyl-guanine methyl transferase promoter methylated
TMZ: temozolomide
RT: radiation therapy

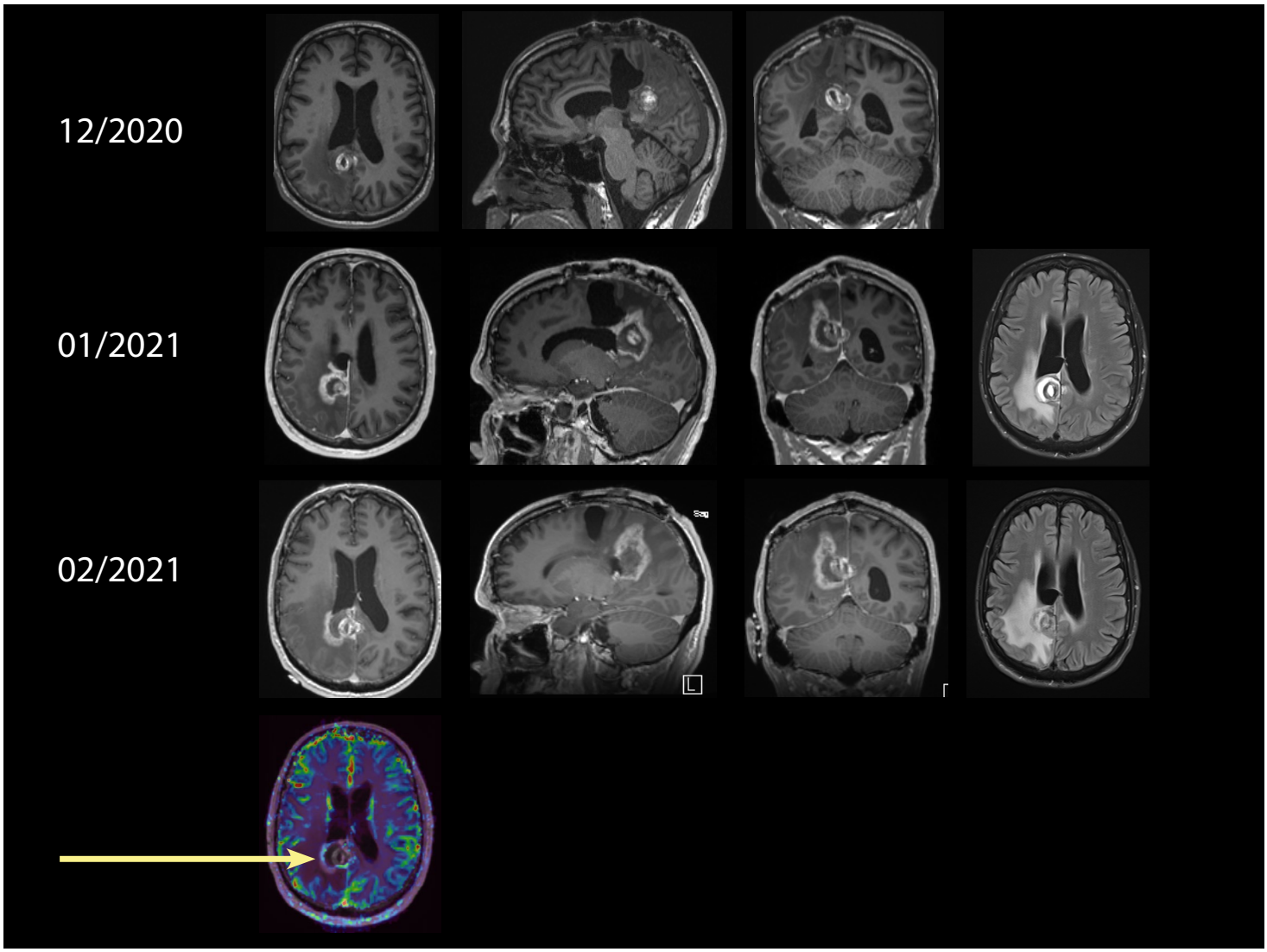
The patient is a 50-year-old male with a history of glioblastoma IDHwt, MGMTm, diagnosed 12/2018. He underwent TMZ/RT treatment followed by personalized tumor vaccine at that time. On 6/2020, the patient presented with an MRI showing a new contrast-enhancing lesion posterior to the previous resection cavity. **(Figure 1)**. The lesion enlarged in the subsequent MRI (7/2020) and ultimately underwent a stereotactic needle biopsy with LITT, the pathology demonstrated tumor recurrence.

Figure 1



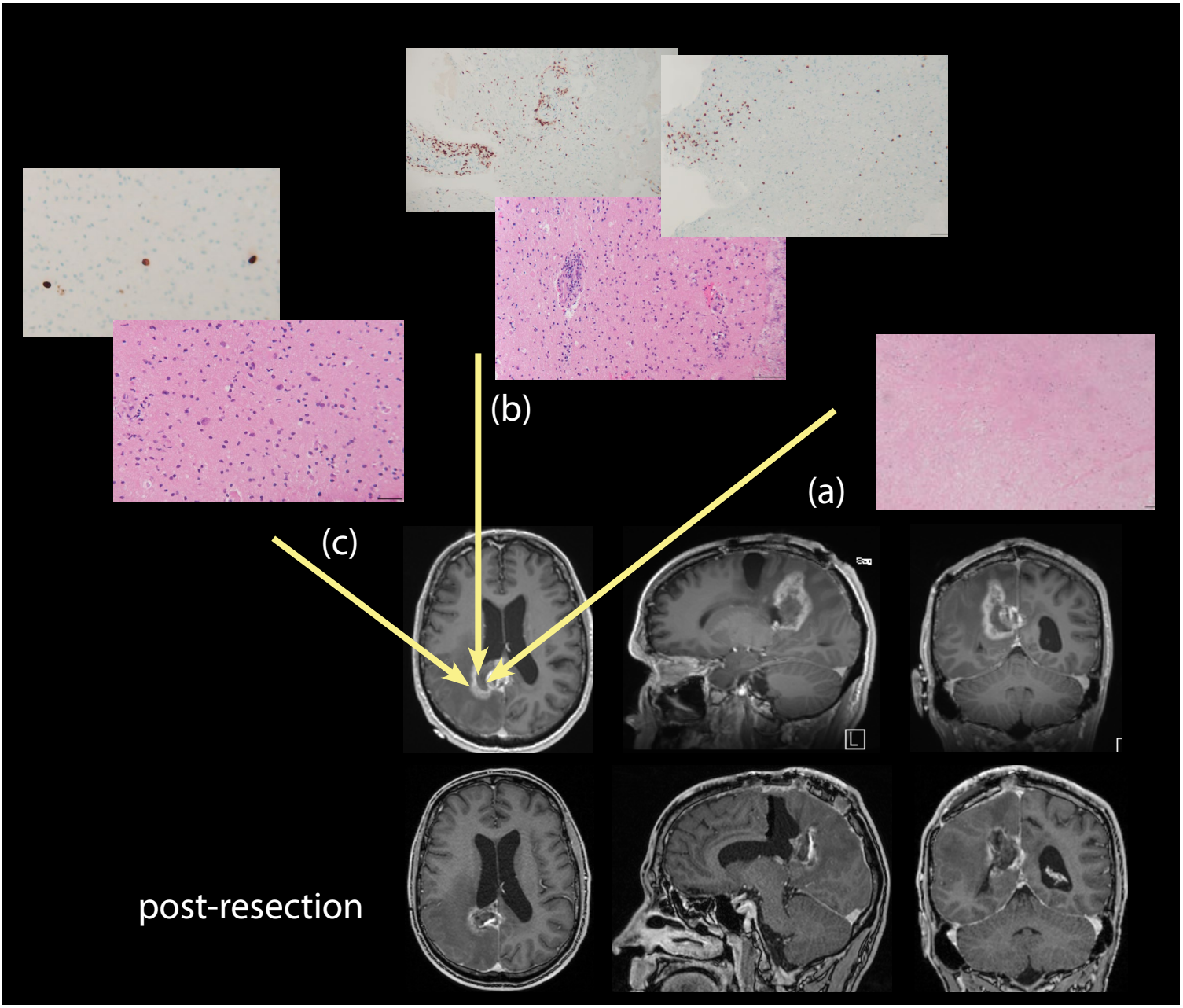
Retraction of ablation cavity was observed on subsequent interval scans until 1/2021, when ill-defined contrast-enhancing areas were observed adjacent to the ablation cavity **(Figure 2)**. These regions further expanded on the subsequent scan and became perfusion positive on 2/2021. Peri-lesional FLAIR abnormality also expanded. The patient reported worsening left hemi-body proprioceptive function and underwent an 11mm diameter BrainPath aided resection of the lesion using the Myriad resection device. Samples from three distinct locations were taken using the Automated Preservation System (APS), with changes in the specimen collector canister between sample collections.

Figure 2. Subsequent Surveillance MRI



Histologic features from these three regions **(Figure 3)** showed distinct features. The core region yielded samples that consisted of confluent coagulative necrosis **(Figure 3a)**. The inner rim of the contrast-enhancing region yielded samples that showed a mixture of coagulative necrosis and perivascular filtrates of mononuclear inflammatory cells that stained positive for CD3 and T cells that stained positive for CD8 **(Figure 3b)**. The outer rim of the contrast-enhancing lesion yielded samples that showed perivascular infiltrates and atypical glial nuclei that stained positive for Ki67, suggestive of active tumor growth **(Figure 3c)**.

Figure 3. Regional Sampling



The patient emerged from surgery neurologically unchanged, but subsequently experienced resolution of his presenting symptoms. He will be embarking on a new regimen of therapy based on the pathology diagnosis.

Comment: The physiology and histology of a post-LITT lesion is complex. It is likely that a stereotactic needle biopsy in this case may have missed the rare glioblastoma cells that stained for Ki67 and missed the opportunity for early intervention in this case of tumor progression. Moreover, a more extended resection afforded the opportunity of decompressing the mass effect related to the lesion and allowed neurologic recovery. Thoughtful, large-scale sampling of regions aided by stereotaxis and preservation tools such as the APS will allow clinicians to better decipher the nature of host immune response and tumor evolution as well as to determine optimal therapeutic options.