

Advanced Neurosciences Center

Recurrent Glioblastoma Resection with Microvascular Free Flap Reconstruction and Associated GammaTile<sup>®</sup> Implantation: A Personalized Approach with Oncologic and Reconstructive Integration



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### Introduction

Glioblastoma multiforme (GBM) is the most common malignant primary brain tumor in adults [1]. Standard treatment includes surgery followed by chemotherapy and intensity-modulated radiation therapy (IMRT) [1-4]. Despite this, recurrence near the surgical cavity is inevitable in most cases.
Increasing radiation doses to control regrowth has shown marginal survival benefits but significant adverse effects [5].

## **Surgical Course**

- Three weeks after revision craniotomy, the patient developed scalp dehiscence with exposure of the temporoparietal flap (Figure 2).
- . Conscious craniotomy was performed for tumor resection, and
- GammaTiles were placed in the resection bed (Figure 3).
- . Scalp defect was addressed with a pedicled fasciocutaneous



- . **GammaTile® therapy** offers a novel solution by providing surgically targeted radiation therapy (STaRT) directly to the tumor bed at the time of resection delivering highly localized radiation and reducing radiation induce adverse events [1,2,4].
- Traditional treatment and recurrent surgeries often compromise scalp integrity, requiring complex reconstructive techniques like microvascular free flaps.
  Irradiated tissues carry an increased risks of wound dehiscence, necrosis, and delayed healing [6-9].
- This case presents the first integration of GammaTile therapy with free flap reconstruction, addressing oncologic and reconstructive needs simultaneously.



anterolateral thigh free flap anastomosed to the right facial artery and common facial vein.

 Radiation exposure from GammaTiles was measured at 125 mR/hr at a distance of 3 inches from the resection cavity, suggesting significant localized exposure to the free flap.

# **Postoperative Course**

- . The patient had an uneventful recovery, with no evidence of arterial ischemia, venous congestion, or flap necrosis.
- . She was discharged after 7 days, and the incision sites healed without complications.
- . Nine months post-surgery, the free flap remained fully viable, with excellent aesthetic and functional outcomes (Figure 4).



Figure 2:

Right temporal wound dehiscence with exposure of underlying temporoparietal flap.

#### Figure 1:

<u>A)</u> Pre-operative axial MRI demonstrating the right temporal GBM, highlighting the extra-axial infection as well as the recurrent tumor's location and extent before surgical intervention. <u>B)</u> Post-operative axial MRI

<u>C)</u> Post-operative axial CT illustrating the integration of titanium mesh following craniotomy

### **Case Presentation**

- A 37-year-old woman diagnosed with GBM underwent a right temporal craniotomy with tumor resection, followed by postoperative chemotherapy and IMRT.
- Three months post-treatment, she presented with wound induration and yellow drainage. MRI revealed a small extradural collection under the craniotomy, concerning for epidural infection, and an enhancing nodule in the posterior resection cavity, suggestive of tumor recurrence (Figure 1).
- . Revision craniotomy confirmed epidural purulence, necessitating removal of the

### Figure 3:

<u>A)</u> Pre-operative MRI showing nodular enhancement in recurrent neoplasm before resection, GammaTile placement, and free flap
 <u>B)</u> Post-operative MRI after surgery with free flap intact

### Discussion

- GammaTile therapy provides immediate localized radiation to the surgical cavity, reducing the risk of tumor regrowth during the critical postoperative period [3].
  Free flaps are essential in reconstructing large defects and improving healing in compromised tissues but are traditionally associated with wound complications when combined with radiation therapy [6-8].
- . Previous studies report complication rates as high as 38.33% with brachytherapy and free

Figure 4:Right scalp free flapreconstruction nine monthsfollowing surgery

infected bone flap, titanium mesh cranioplasty, and temporoparietal fascial flap reconstruction.

. Cultures grew *Staphylococcus aureus*, and she was treated with a six-week PICC-

administered Cefazolin course, followed by oral suppressive therapy with cefadroxil.

flap reconstruction, including risks of necrosis and wound dehiscence [7,9].

. Despite these challenges, this case demonstrated no complications in the flap's vascularity

or wound healing, suggesting GammaTile therapy's compatibility with free tissue transfer.

. This integrated approach addresses both oncologic and reconstructive needs in GBM, providing a novel framework for future surgical and therapeutic advancements.



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