TITLE: Drop metastases from pineal gland germ cell tumor on $^{18}$F-FDG PET/CT.

RUNNING TITLE: $^{18}$F-FDG PET in spinal cord drop metastases

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Abstract:

The pineal region tumors are rare and account for <1% of all intracranial neoplasms. 50% of pineal regional tumors are germ cell tumors (GCT). However intracranial GCT with spinal seeding and extracranial metastases are rare. The authors present a case of a young female patient with pineal gland GCT where $^{18}$F-FDG PET/CT imaging demonstrated the drop metastases to spinal cord in addition to tracer uptake in the primary lesion.

Key Words: germ cell tumor; pineal gland; spinal seeding; $^{18}$F-FDG PET/CT; drop metastases
Introduction: This case report illustrates the utility of whole body $^{18}$F-FDG PET/CT in visualization and characterization of pineal germ cell tumor and drop metastases.

Case Report:

A 32-year-old female presented with sudden onset of progressive blurring of vision in the left eye followed by the right eye and spinning sensation of six weeks duration. She had complaints of progressive weakness in all four limbs leading her confinement to the bed. Her contrast enhanced MRI brain (Fig. 1) showed a well-defined (~1.2 x 1.5 cm) oval shaped minimal enhancing lesion in the pineal gland region with sheet like intensely enhancing soft tissue in the epidural space of lumber spine. The patient was suspected to have pinealocytoma with spinal metastases. The patient underwent whole body $^{18}$F-FDG PET/CT for characterization of the pineal gland lesion and to look for additional lesions/metastases. The study protocol was approved by Institutional Ethics Committee and the subject in this study signed written informed consent for this study. The PET/CT (Fig. 2) revealed $^{18}$F-FDG avid enhancing nodular lesion (~1.4x1.3cm) in the pineal gland and tracer avid ill-defined densities in the spinal canal extending from L1-L5 vertebrae. Her cerebrospinal fluid (CSF) cytology and biochemistry revealed malignant cells with elevated β-human chorionic gonadotropin (β-HCG) - 43 (normal levels: 0.0-5.0 mIU/ml) and normal α-feto-protein -1.6 (normal levels:
0.0-5.5 mIU/ml) levels. The serum and urinary β-HCG levels were also elevated. The surgical biopsy done revealed inadequate tissue material for definite diagnosis.

**Discussion:**

The pineal region tumors account for less than 1% of all intracranial tumors with majority of them being pure germinomas. The germ cell tumors (GCT) commonly affect children and young adults (1). Patients with suspected intracranial GCT are imaged with non-contrast and contrast MRI head and post-contrast sagittal MRI spine. The detail imaging analysis may help in predicting the histological diagnosis. The α-feto-protein and β-HCG markers in serum and CSF are also obtained in patients with intracranial GCT; however the surgical biopsy may or may not be available in these patients (2). The spinal and extracranial metastases had been infrequently observed in patients with intracranial germinoma that might be missed on regional imaging modalities. Large and multifocal intracranial diseases are independent risk factors for spinal recurrences, and spinal radiotherapy and chemotherapy has shown to be effective salvage treatment (3). The $^{18}$F-FDG PET/CT may help in demonstrating the extent of disease in addition to primary lesion in the single sitting. Most of GCTs are hypermetabolic in nature and show increased $^{18}$F-FDG uptake except mature teratoma with very little or no FDG uptake (4). No $^{18}$F-FDG uptake was observed in pineal germ cell tumor in 14-year-old boy with histopathology of mixed germ cell tumor (5).
Conclusion: This case showed the utility of $^{18}$F-FDG PET/CT in demonstrating the tracer uptake in pineal GCT and in the spinal metastases with better lesion characterization.
References:


Fig.1: T1 axial pre-contrast image showing isointense lesion in the pineal gland region (A), with post-contrast enhancement (B). Post-contrast sagittal images of the dorso-lumbar spine showing sheet like intensely enhancing soft tissue in the epidural space (C).
Figure 2

Fig. 2: FDG PET/CT maximum intensity projection image revealed abnormal FDG uptake in the lumbar spine region (A). Transaxial and sagittal CT & fused images of head revealed FDG avid enhancing nodular lesion (~1.4x1.3cm) in the pineal gland (arrow) (B-E). Sagittal CT and fused images revealed increased FDG uptake in ill-defined densities in the spinal canal extending from L1-L5 vertebrae (arrows) (F, G).