Factors Associated With Pituitary Tumor Volume: Social Vulnerability and BMI

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Introduction

Pituitary tumors are the most commonly encountered intracranial neoplasm, with prevalence in the general population estimated to be anywhere between 5% and 20%. They can present with a wide variety of clinical manifestations, including symptoms of excess secretion of hormone, other symptoms due a deficit of hormone secretion, and symptoms due to mass effect and compression of adjacent structures, including the optic chiasm[1]. The latter is much related to tumor size and volume, as a larger tumor is more likely to impinge on nearby structures. Tumor volume ranges greatly. Frequently, these tumors are less than 10 mm and are discovered incidentally at autopsy, labeled as microadenomas. On the flip side, they can be quite large, even invading the cavernous sinus[2]. The literature is limited on what patient factors are associated with tumor volume. At our institution in the Bronx, we treat patients who are socially vulnerable and often who have a high BMI.

In this single-center study, we aimed to determine if social vulnerability and body mass index (BMI) are associated with size of pituitary tumors.

Methods and Materials

We conducted a retrospective chart review of patients treated for pituitary adenoma between 2017 and 2023 at a single academic tertiary care center. A total of 153 patients were included in this study. By race, 79 (51.6%) patients were Black, 14 (9.2%) patients were White, 2 (1.3%) were Asian, and 58 (37.9%) were other or declined to respond. By ethnicity, 50 (32.6%) patients were Hispanic/Latino, 86 (56.2%) were non-Hispanic/Latino, and 17 (11.1%) declined to respond. Social Vulnerability Index (SVI) scores were collected for each patient based upon home address, drawn from a series of metrics from 2020 census data, with a higher value indicating greater social disadvantage. Tumor volume was calculated using the traditional formula: (AP x CC x TR)/2, where AP, CC, and TR refer to the three dimensions of the tumor in centimeters.

Statistical analysis was carried out using GraphPad Prism and Microsoft Excel.

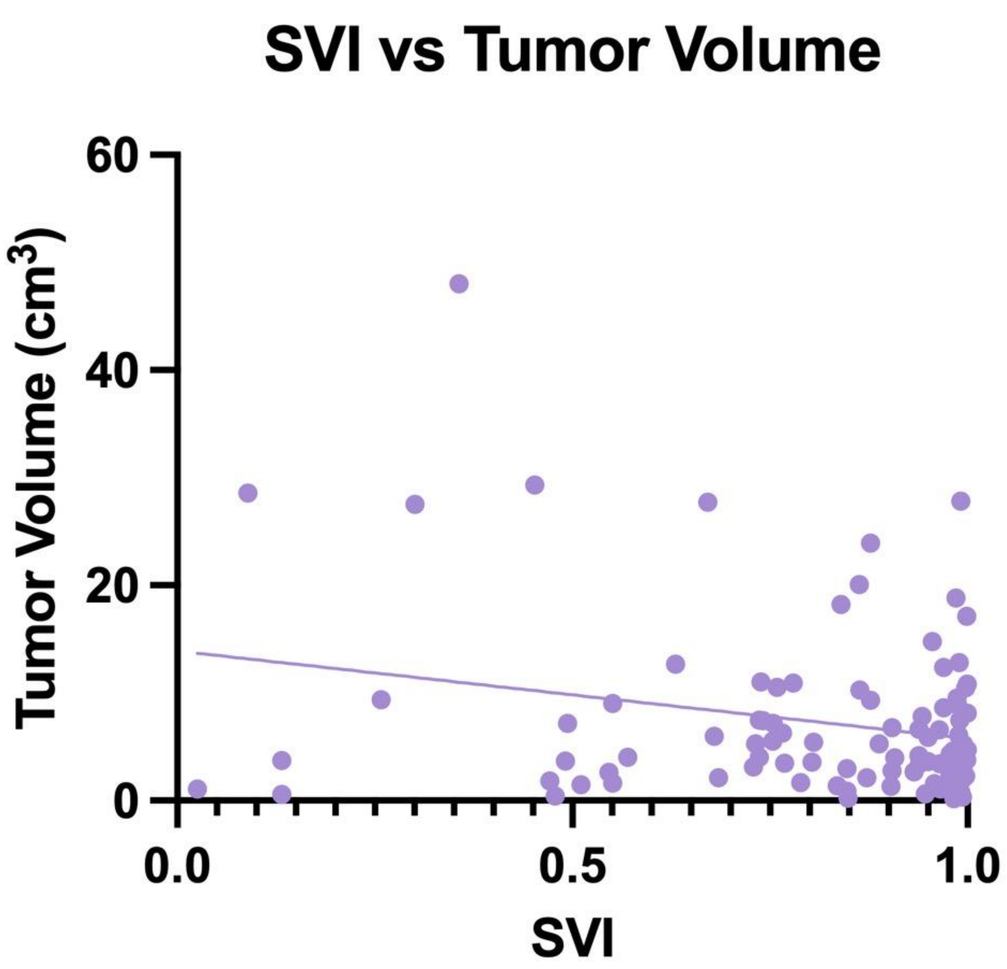

Figure 1. Simple Linear Regression comparing Social Vulnerability Index (SVI) to pituitary tumor volume (r^2 = 0.06, p = 0.02*).

Results

In our study population, the mean Social Vulnerability Index (SVI) was 0.8115 (95% CI [0.7749, 0.8480]; n=153), mean BMI was 31.91 kg/m² (95% CI [30.88, 32.95]; n=150), and mean tumor volume was 8.00 cm³ (95% CI [5.98, 10.03]; n=97).

Analysis using simple linear regression demonstrated a statistically significant association between increased social vulnerability and decreased tumor volume (r^2 = 0.06, p = 0.02*). Similarly, increased BMI was also significantly associated with decreased tumor volume (r^2 = 0.05, p = 0.03*). Additional subgroup analyses revealed that these relationships persisted across different demographic groups, though effect sizes varied.

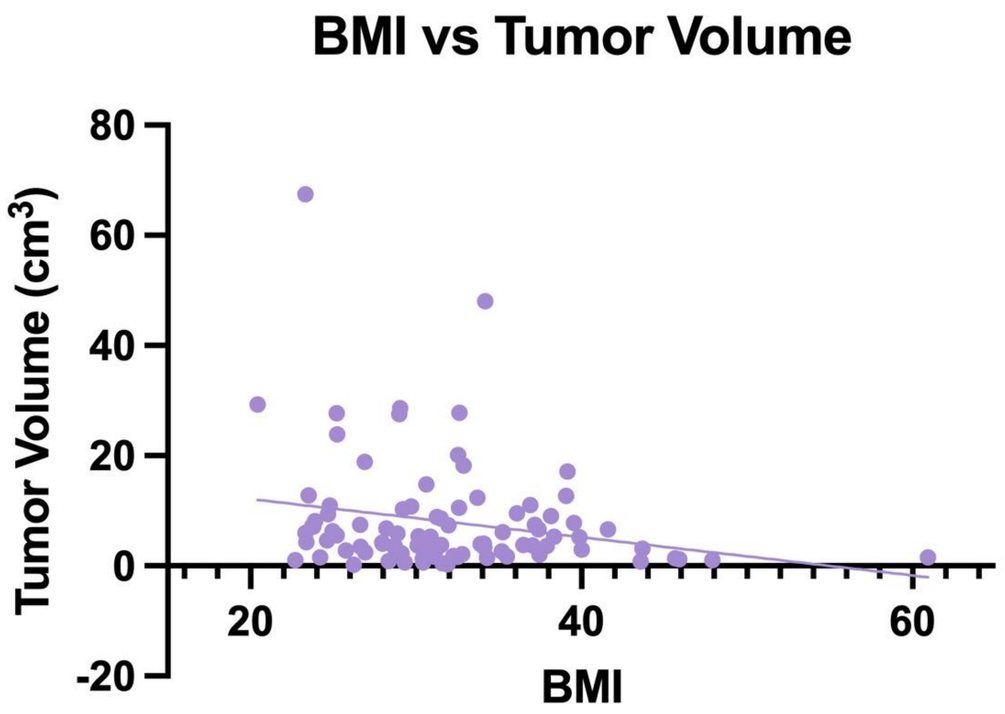

Figure 2. Simple Linear Regression comparing Body Mass Index (BMI) to pituitary tumor volume (r^2 = 0.05, p = 0.03*).

Discussion

In our study, we identified patient factors associated with variations in pituitary tumor volume, specifically social vulnerability and BMI. Interestingly, our findings demonstrated that increased social vulnerability was associated with decreased tumor volume at presentation. This result contrasts with the expectation that individuals with higher social vulnerability—who may experience barriers to healthcare access—would present with larger, more advanced tumors due to delayed diagnosis and treatment. This unexpected finding suggests that other factors may be influencing tumor detection and progression in socially vulnerable populations.

Additionally, our findings highlight the need for further investigation into the relationship between BMI and tumor volume, as increased BMI was also associated with smaller tumors. Future studies should aim to disentangle the effects of metabolic, hormonal, and inflammatory pathways that may influence tumor growth in patients with higher BMI. Understanding these mechanisms could help guide personalized treatment strategies and improve outcomes for patients with pituitary tumors.

References

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