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## Introduction

Pituitary adenomas are the most common intracranial tumors, with a lifetime prevalence of approximately 16.7%, often identified incidentally at autopsy<sup>1,2</sup>. They are typically classified by size (microadenomas, macroadenomas, or giant adenomas) or newer systems based on immunohistochemistry and cell lineage<sup>3</sup>. Clinical presentations involve hormonal imbalances—such as hyperprolactinemia, acromegaly, or Cushing’s syndrome—or neurological symptoms, including headaches and visual disturbances due to mass effect on adjacent structures. Visual impairment often results from optic chiasm compression, with larger tumor volumes and age at diagnosis being potential contributing factors. Further research is needed to explore the correlation between these factors and visual outcomes.

In this single-center study, we aimed to determine if age at presentation was associated with rates of vision loss, and if this effect could be explained by tumor volume and cavernous sinus invasion.

## Methods and Materials

We conducted a retrospective chart review of patients treated for pituitary adenoma between 2017 and 2023 at single academic tertiary care center. A total of 123 patients were included in this study. By race, 64 (52%) patients were Black, 14 (11%) patients were White, 2 (2%) were Asian, and 43 (35%) were other or declined to respond. By ethnicity, 39 (32%) patients were Hispanic/Latino, 71 (58%) were non-Hispanic/Latino, and 13 (11%) declined to respond.

Vision loss was determined to be any presence of vision loss within one year prior to tumor resection. Tumor volume was calculated using the traditional formula:  $(AP \times CC \times TR)/2$ , where AP, CC, and TR refer to the three dimensions of the tumor in centimeters. Cavernous sinus invasion was determined by pre-operative radiology reports.

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

## Age vs Tumor Volume

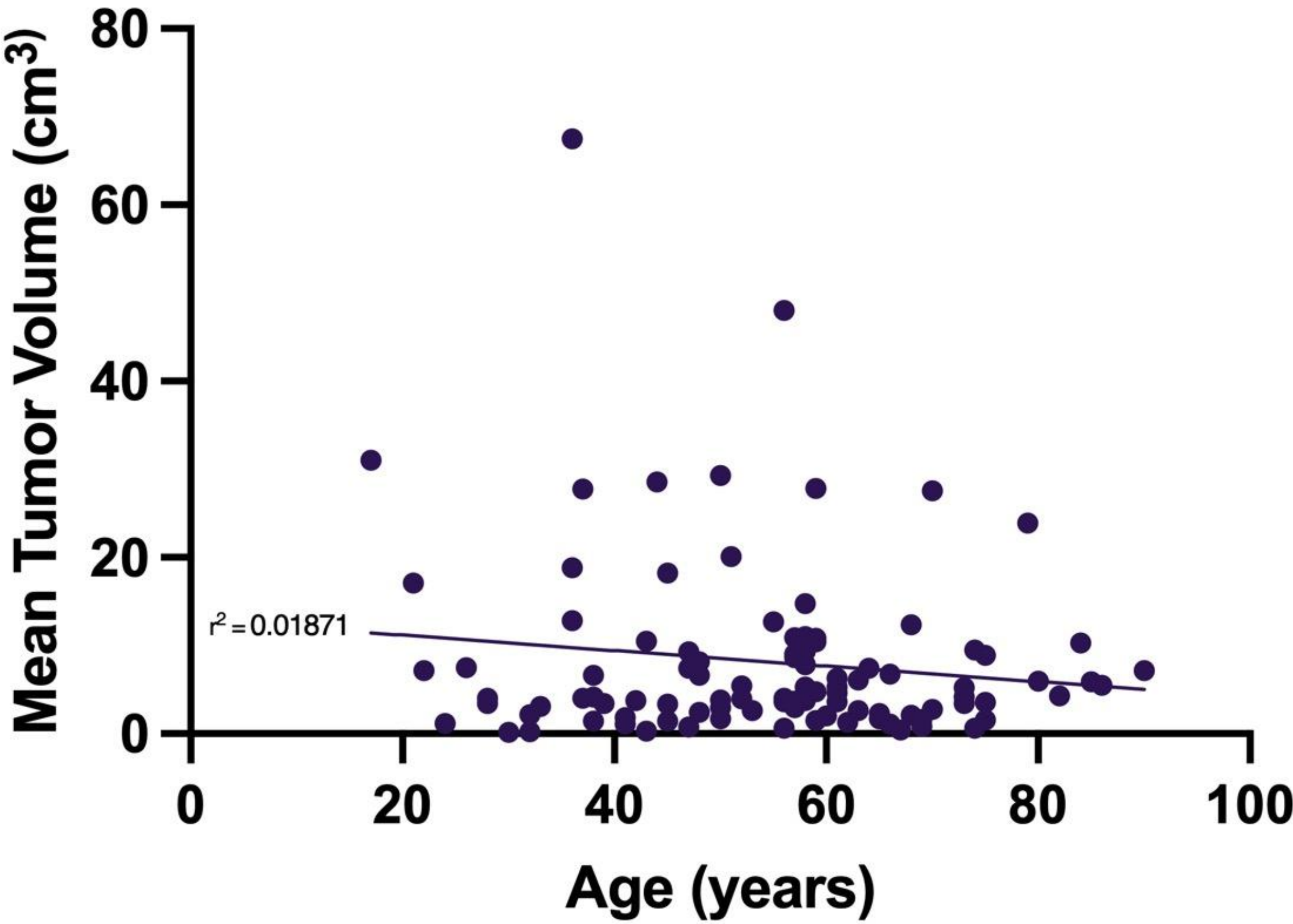


Figure 2: Simple Linear Regression comparing age at diagnosis to tumor volume ( $p = 0.18$ ).

## Vision Loss: Critical Age

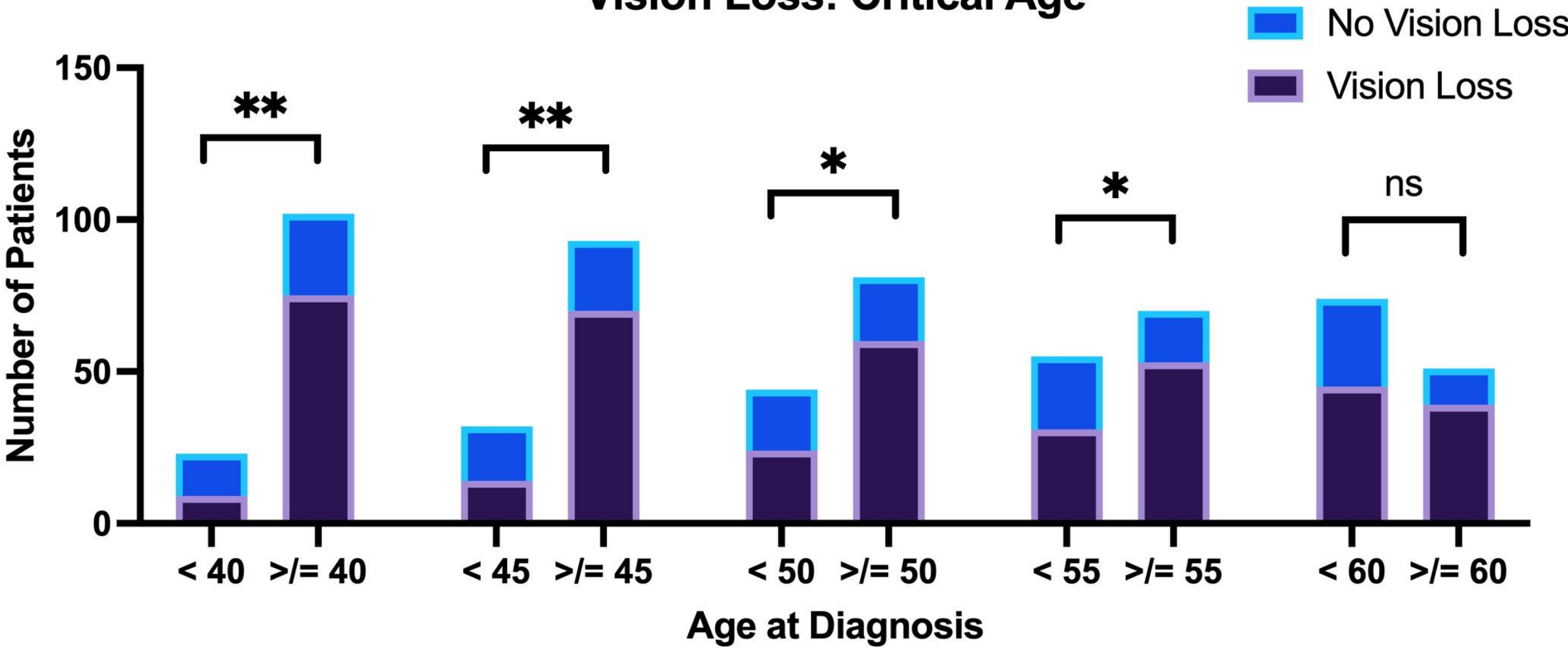
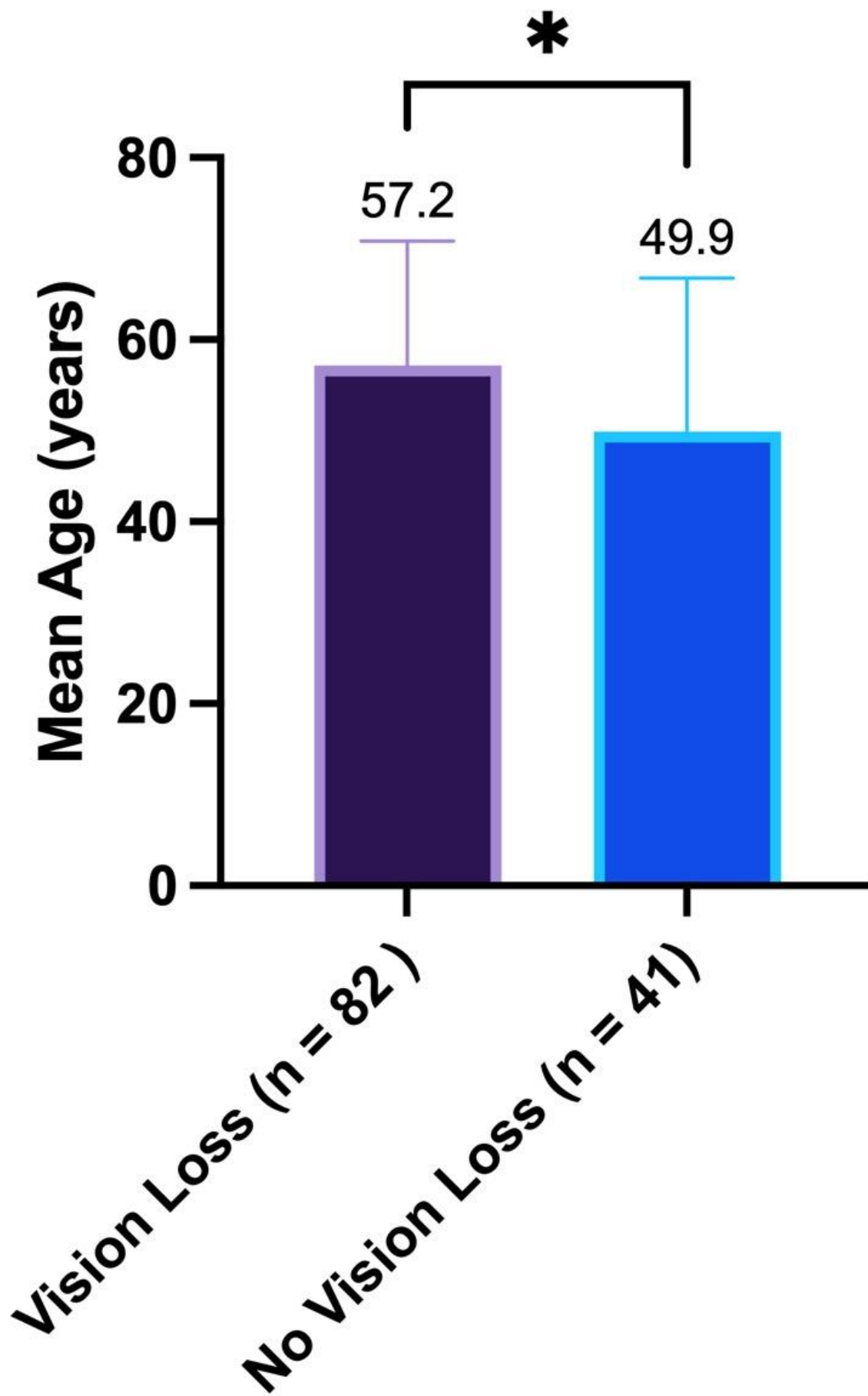


Figure 3: Multiple Fisher’s Exact Tests comparing presence of vision loss with various age cut-offs of 40, 45, 50, 55, and 60 ( $p = 0.003^{**}$ ,  $0.002^{**}$ ,  $0.03^{*}$ ,  $0.03^{*}$ , and  $0.08$ , respectively).

## Age vs. Vision Loss



## Age vs CS invasion

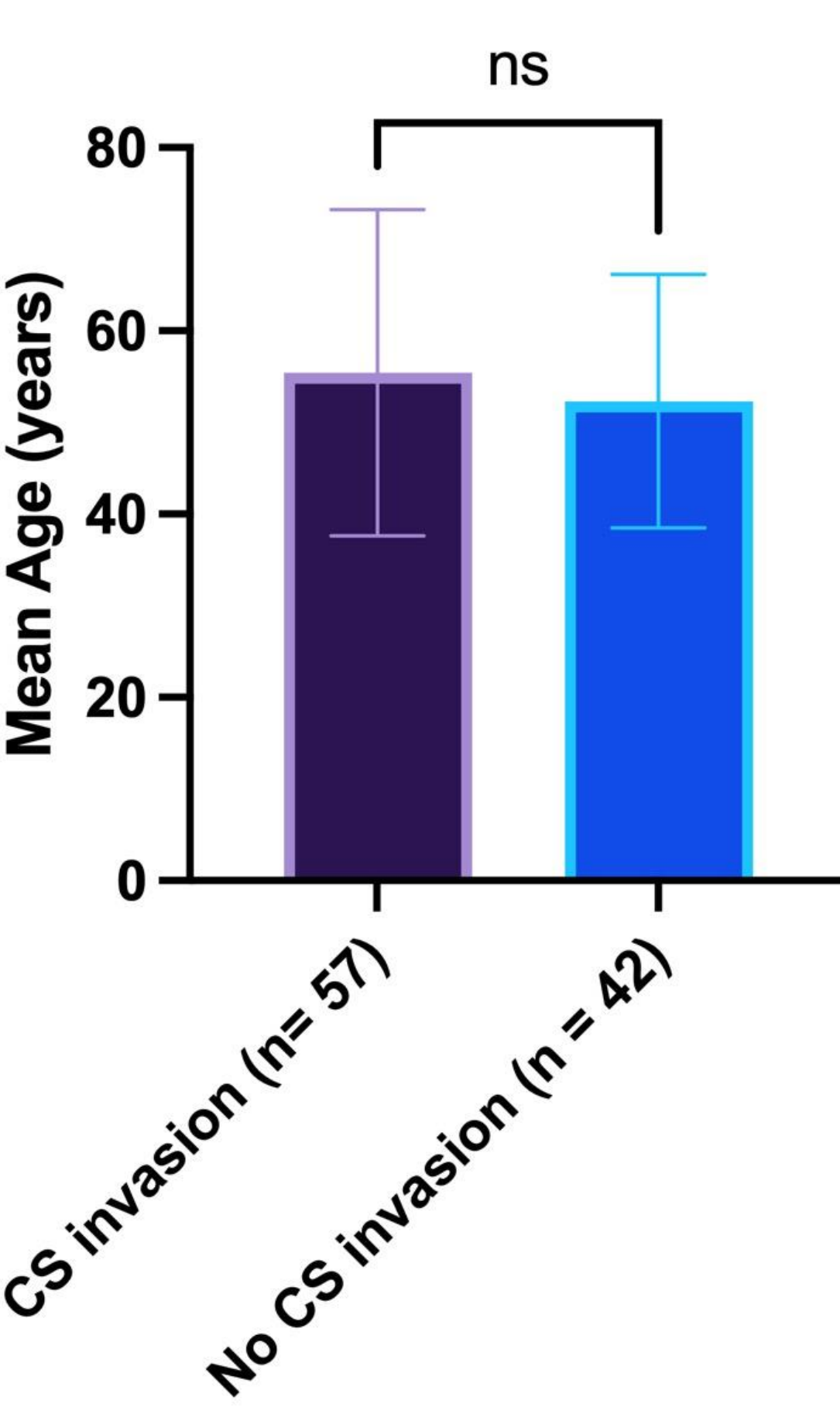


Figure 1. (A) Mann–Whitney U Test comparing age at diagnosis in patients presenting with and without vision loss ( $p = 0.02^{*}$ ); (B) Comparison of mean age at diagnosis in patients presenting with and without cavernous sinus (CS) invasion ( $p = 0.32$ ).

## Discussion

In conclusion, our study highlights a notable association between older age and increased likelihood of vision loss at presentation in patients with pituitary adenomas, independent of tumor volume and cavernous sinus invasion. We identified 55 years as a critical age threshold, beyond which patients show a statistically significant increase in the risk of vision loss. This finding suggests a possible age-related vulnerability of the visual apparatus to even non-invasive pituitary tumors. Although no direct correlation was found between tumor volume or cavernous sinus invasion and age, the pronounced effect of age on visual outcomes calls for a reassessment of current diagnostic and screening approaches, especially for older patients. Future research should aim to investigate the underlying mechanisms that contribute to this disparity and to develop targeted strategies to mitigate the higher risk of vision impairment in this population.

## References

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3. Molitch ME. Diagnosis and Treatment of Pituitary Adenomas: A Review. JAMA. 2017;317(5):516-524.