May 2018

Simpson grading as predictor of meningioma recurrence.

Ayesha Quddusi
Aga Khan University, ayeshaquddusi@hotmail.com

Muhammad Shahzad Shamim
Aga Khan University, shahzad.shamim@aku.edu

Simpson grading as predictor of meningioma recurrence

Ayesha Quddusi, Muhammad Shahzad Shamim

Abstract

Meningimas are one of the commonest primary brain tumours and the commonest extra-axial primary brain tumour. Despite better understanding of the molecular pathogenesis of the tumours, surgical excision remains the treatment of choice, and in a large proportion of cases, complete excision is curative. Simpson grading for the extent of resection of meningiomas, was introduced more than six decades ago, and has stood the test of time. With modern technological advancements, however, the relevance of Simpson grading has been questioned. Herein we review the recent literature on the relevance of Simpson grading more than sixty years after its introduction.

Keywords: Meningioma, Brain tumour, Recurrence.

Introduction

Meningiomas are primary brain tumours that are known to have a substantial risk of recurrence after resection.[1] In 1957, Donald Simpson published his landmark study describing extent of resection as a predictor of recurrence.[2] The paper advocated the notion that the more complete the resection, the less likelihood of recurrence of meningioma. Simpson classified extent of resection into different grades, each subsequent grade representing less aggressive resection and hence, associated with higher chances of recurrence.[2] Since then, Simpson grading has been widely accepted. However, this grading was introduced at a time when imaging modalities such as CT and MRI were not available, modern surgical techniques such as neuro-navigation, stereotactic radiosurgery, etc. has not been developed and WHO meningioma classification was yet to be described. Keeping in mind the evolution of modern neurosurgical practice, we address the question that how relevant is Simpson grade in prediction of meningioma recurrence in modern neurosurgical era.
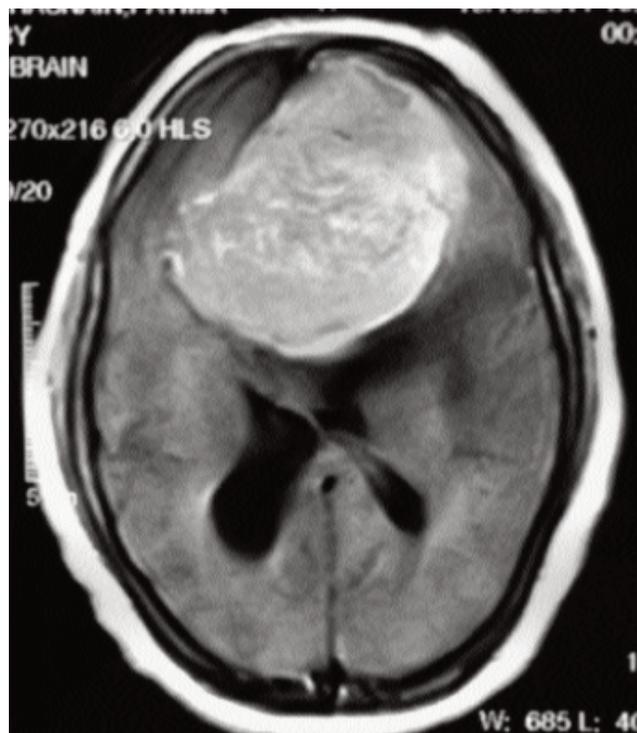
Review of Evidence

Investigators from around the world have looked at their outcomes of meningioma resection and

••

Aga Khan University Hospital, Karachi, Pakistan.
**Correspondence:** Muhammad Shahzad Shamim.
Email: shahzad.shamim@aku.edu

Figure-1: MRI brain T1WI axial views with contrast showing a large falcine meningioma.

recurrence with reference to Simpson grading. We reviewed articles on PubMed describing outcomes of meningioma resection with the primary objective of assessing recurrence and/or progression free survival (RPFS) in relation to Simpson grades.

Sughrue et al., in 2010 reported no significant difference in RPFS for Simpson grade I, II, III and IV. This was the same for convexity, falx/parasagittal and skull base meningiomas. They also analyzed the usefulness of pre-operative embolization in some cases and reported only a small beneficial effect.[3] Oya et al., in 2012 did not find any significant difference in RPFS for Simpson Grade I, II, III resections of WHO grade I meningiomas. This was similar to the findings in the study by Sughrue et al.[3] although they reported that RPFS was significantly lower for Simpson grade IV resection as compared to the rest.[4] In another series of
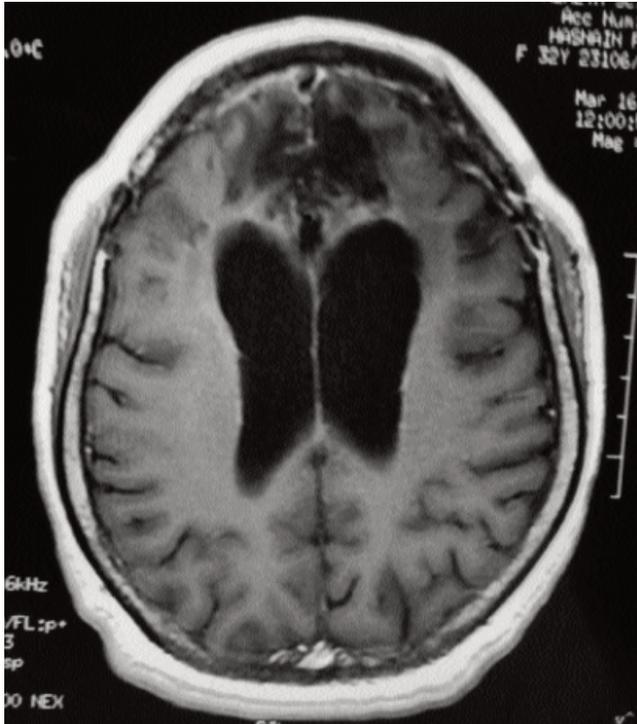
Figure-2: Three-years follow up MRI scan after Simpson grade I resection, showing no tumor recurrence.

WHO grade I meningiomas, Voß et al.,[5] reported decreasing progression free interval with increasing Simpson grade, but only grade IV resection was significantly associated with predicting recurrence. They also found that Simpson grading was not associated with progression free interval in falx/parasagittal meningiomas.[5] Oter Rodriguez et al., drew similar conclusions in a series of WHO grade I meningiomas, and found no significant difference in RPFS for patients with Simpson grade I, II and III resection.[6]

On the contrary, Gousias et al., found that Simpson grade II resection versus grade I resection doubled the risk of meningioma recurrence at 10 years. In their series published in 2016, they analyzed data for WHO grade I, II and III meningiomas and found Simpson grade to be a significant predictor of tumour recurrence for each histological grade. They also reported a stronger impact of more aggressive resection in higher grade meningiomas.[7] Gallagher et al., in their series of WHO grade I meningiomas also found Simpson grade to be a significant predictor of tumour recurrence.[8] Nanda et al., in 2016 published their series of WHO grade II meningiomas where Simpson grade was a significant predictor RPFS. They

described gross total (Simpson grade I and II) compared to subtotal (Simpson grade III and IV) resection as a significant predictor.[9] In another series of WHO grade I meningiomas, Nanda et al., also found that gross total versus subtotal resection was significantly associated with tumour recurrence.[10] In a series for convexity WHO grade I meningiomas, the same authors ascertained that when WHO grade is fixed, Simpson grade is a significant predictor for tumour recurrence.[11] Heald et al., also found that gross total resection versus subtotal resection was a significant predictor of recurrence, when they compared Grade I and II resections with grade IV.[12] Winther et al., and Hasseleid et al., also reported a significant association between Simpson grade and RPFS.[13,14]

Conclusion

Simpson grading remains relevant in the modern neurosurgical era as a predictor of meningioma recurrence. Some studies have reported no significant difference in either the RPFS between Simpson grade I, II and III resections, or between RPFS for gross resection compared to subtotal resection, suggesting that grade II (and in some cases grade III) resection may be as beneficial as grade I resection. The association between grade IV resection however with decreased RPFS is quite clear in most studies.

References

1. Roser F, Samii M, Ostertag H, Bellinzona M. The Ki-67 proliferation antigen in meningiomas. Experience in 600 cases. Acta Neurochir. 2004; 146: 37-44.
2. Simpson D. The recurrence of intracranial meningiomas after surgical treatment. J Neurol Neurosurg Psychiatry 1957; 20: 22-39.
3. Sughrue ME, Kane AJ, Shangari G, Rutkowski MJ, McDermott MW, Berger MS, et al. The relevance of Simpson grade I and II resection in modern neurosurgical treatment of World Health Organization grade I meningiomas. J Neurosurg. 2010; 113: 1029-35.
4. Oya S, Kawai K, Nakatomi H, Saito N. Significance of Simpson grading system in modern meningioma surgery: integration of the grade with MIB-1 labeling index as a key to predict the recurrence of WHO grade I meningiomas. J Neurosurg. 2012; 117: 121-8.
5. Voß KM, Spille DC, Sauerland C, Suero Molina E, Brokinkel C, Paulus W, et al. The Simpson grading in meningioma surgery: does the tumor location influence the prognostic value? J Neurooncol. 2017; 133: 641-51.
6. Otero-Rodriguez A, Tabernero MD, Munoz-Martin MC, Sousa P, Orfao A, Pascual-Argente D, et al. Re-evaluating Simpson grade I, II, and III resections in neurosurgical treatment of World Health Organization grade I meningiomas. World Neurosurg. 2016; 96: 483-8.
7. Gousias K, Schramm J, Simon M. The Simpson grading revisited: aggressive surgery and its place in modern meningioma management. J Neurosurg. 2016; 125: 551-60.

8. Gallagher MJ, Jenkinson MD, Brodbelt AR, Mills SJ, Chavredakis E. WHO grade 1 meningioma recurrence: Are location and Simpson grade still relevant? Clin Neurol Neurosurg. 2016; 141: 117-21.

9. Nanda A, Bir SC, Konar S, Maiti T, Kalakoti P, Jacobsohn JA, et al. Outcome of resection of WHO grade II meningioma and correlation of pathological and radiological predictive factors for recurrence. J ClinNeurosci. 2016; 31: 112-21.

10. Nanda A, Bir SC, Maiti TK, Konar SK, Missios S, Guthikonda B. Relevance of Simpson grading system and recurrence-free survival after surgery for World Health Organization Grade I meningioma. J Neurosurg. 2017; 126: 201-11.

11. Nanda A, Bir SC, Konar S, Maiti TK, Bollam P. World Health Organization grade I convexity meningiomas: study on outcomes, complications and recurrence rates. World Neurosurg. 2016; 89: 620-627.e2.

12. Heald JB, Carroll TA, Mair RJ. Simpson grade: an opportunity to reassess the need for complete resection of meningiomas. Acta Neurochir (Wien). 2014; 156: 383-8.

13. Winther TL, Torp SH. Significance of the extent of resection in modern neurosurgical practice of World Health Organization grade I meningiomas. World Neurosurg. 2017; 99: 104-10.

14. Hasseleid BF, Meling TR, Rønning P, Scheie D, Helseth E. Surgery for convexity meningioma: Simpson grade I resection as the goal: clinical article. J Neurosurg. 2012 ; 117: 999-1006.