Simpson Grading System

The Simpson grading scale [1], developed in 1957 by Donald Simpson, has been considered the gold standard for defining the surgical extent of resection World Health Organization grade 1 meningiomas. Since its introduction, the scale and its modifications have generated enormous controversy.

Technological (and also methodological) advances in neurosurgery and neuroimaging have prompted a reappraisal of Simpson's grading of the extent of meningioma resections. To the authors, the published evidence supports the tenets of this classification. Meningioma is an often surgically curable dura-based disease. An extent of meningioma resection classification needs to account for a clinically meaningful variation of the risk of recurrence depending on the aggressiveness of the management of the (dural) tumor origin. Nevertheless, the 1957 Simpson classification undoubtedly suffers from many limitations. Important issues include substantial problems with the applicability of the grading paradigm in different locations. Most notably, tumor location and growth pattern often determine the eventual extent of resection, i.e., the Simpson grading does not reflect what is surgically achievable. Another very significant problem is the inherent subjectivity of relying on individual intraoperative assessments. Neuroimaging advances such as the use of somatostatin receptor PET scanning may help to overcome this central problem. Tumor malignancy and biology in general certainly influence the role of the extent of resection but may not need to be incorporated in an actual extent of resection grading scheme as long as one does not aim at developing a prognostic score. Finally, all attempts at grading meningioma resections use tumor recurrence as the endpoint. However, especially given radiosurgery/radiotherapy options, the clinical significance of recurrent tumor growth varies greatly between cases. In summary, while the extent of resection certainly matters in meningioma surgery, grading resections remains controversial. Given the everyday clinical relevance of this issue, a multicenter prospective register or study effort is probably warranted (including a prominent focus on advanced neuroimaging) [2].

The Simpson grade is based on an intraoperative visual assessment of resection, which is subjective and notoriously inaccurate. The majority of studies in which the grading system was used were performed before routine postoperative MRI surveillance was employed, rendering assessments of extent of resection and the definition of recurrence inconsistent. The infiltration and proliferation potential of tumor components such as hyperostotic bone and dural tail vary widely based on tumor location, as does the molecular biology of the tumor, rendering a universal scale for all meningiomas unfeasible. While extent of resection is clearly important at reducing recurrence rates, achieving the highest Simpson grade resection should not always be the goal of surgery.Donald Simpson's name and his scale deserve to be recognized and preserved in the historical pantheon of pioneering and transformative neurosurgical concepts. Nevertheless, his eponymous scale is no longer relevant in modern meningioma surgery. While his message of maximizing extent of resection and minimizing morbidity is still germane, a single measure using subjective criteria cannot be applied universally to all meningiomas, regardless of location. Meningioma surgery should be performed with the goal of achieving maximal safe resection, ideally guided by molecularly tagged fluorescent labeling and assessed using objective criteria, including postoperative MRI as well as molecularly tagged scans such as 68Ga-DOTATATE PET [3].

Simpson Grading System for removal of meningiomas.

Simpson Grading System 1.

Simpson Grading System 2

III

Macroscopically complete removal of the intradural tumour, without resection or coagulation of its dural attachment or its extradural extensions.

IV

Partial removal, leaving intradural tumour in situ.

V

Simple decompression, with or without biopsy [4],

Relevance

The clinical significance of the Simpson grading system of extent of meningioma resection and its role as a predictor for recurrence of World Health Organization grade 1 meningiomas has been questioned in the past, as microsurgery and knowledge of pathological details have advanced.

The relevance of Simpson grading system grade I and II resection as a sole predictor of recurrence in meningiomas surgery was diminished in the work of Sughrue et al. [5].

When histological grade is fixed, Simpson's grading system is the prime predictor for recurrence of meningioma after resection. Grade 0-I resection is also beneficial to cut off anti-epileptic medication in patients with convexity meningiomas. Although complete tumor resection (grade 0-I) is the goal, surgical approach should be tailored to each patient depending on the risks and surgical morbidity [6].

A Simpson Grade II rather than Grade I resection more than doubled the risk of recurrence at 10 years in the overall series (18.8% vs 8.5%). The impact of aggressive resections was much stronger in higher grade meningiomas.

A policy of maximal safe resections for meningiomas prolongs progression free survival (PFS) and is not associated with increased morbidity [7].

[1], [4]
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