Meningiomas are the most frequently reported brain tumors. This thesis covers radiologic and surgical aspects of meningioma surgery.

A general introduction is provided in Chapter 1, in which the epidemiology, radiologic aspects (i.a. the dural tail sign), World Health Organization (WHO) grading system, prognosis and treatment options for meningiomas are described. Also the 60-year-old Simpson grade to assess extent of resection is explained.

In Chapter 2 we describe a study in which we used a magnetic resonance (MR)-based grading system for the radiologic extent of resection, and assessed agreement of the extent of resection between the surgical Simpson grade and the MR-based scale. We found agreement between the resection according to the neurosurgeon (Simpson grade) and the extent of resection on postoperative MRI to be generally good. From the results of this study comparing the resection according to the neurosurgeon (Simpson grade) and the extent of resection on postoperative MRI, we concluded that surgeons do overrate the extent of resection. On the other hand, the difficulty in distinguishing early postoperative changes on MRI may overestimate residual tumor instead of normal dural enhancement. The relevance of residual tumor after surgery and its influence on recurrence rates and prognosis needs to be determined further.

In Chapter 3 we show a biopsy study of the dural tail and radiologically normal dura surrounding meningiomas. Biopsy specimens of the dural tail showed tumor invasion in 38%, whereas biopsy specimens of the radiologically normal dura mater showed tumor invasion in 13% of WHO grade I tumors. For WHO II tumors, we found tumor cells in all biopsies of dural tail and radiologically seemingly normal dura. Thus, in atypical meningiomas, the tumor cells may infiltrate into the dura more extensively than we would expect based on the preoperative MRI. If a surgeon overestimates the extent of resection (Chapter 2), and a postoperative MRI is not performed, postoperative radiotherapy would not be initiated in WHO II meningiomas, resulting in a significantly higher risk of local recurrences.

Whether resection of a meningioma has been successful, depends on extent of resection and clinical outcome in terms of complications, morbidity and mortality. Due to increasing life expectancy, the number of older patients harboring a meningioma will increase. It has been shown that the incidence of nonmalignant meningiomas doubled from adults age 65-69 years to adults over age 85 years. In Chapter 4 we determined whether preoperative variables and postoperative clinical outcome differ between younger (< 65 years) and older (≥ 65 years) adults. We did not find a significant difference in mortality, complication rate and long-term outcome between younger and older adults after surgery for a meningioma.

In the short term (6-12 months after surgery) clinical outcome was poorer for 65+ than for younger adults, but in patients with a follow-up between 12 and 18 months, this difference was no longer present. We also found that most of the older subjects could not go home straight after surgery, but could go home when minor home care was organized. This emphasizes that age alone need not be a contraindication for surgery, but caregivers should carefully inform patients and their relatives about the prolonged time to recover after surgery.

Another important aspect for patients undergoing meningioma surgery is the postoperative cognitive functioning and health-related quality of life (HRQOL). In Chapter 5 we studied the association
between preoperative cerebral edema and postoperative cognitive functioning and HRQOL at least five months following surgery in patients with a WHO grade I meningioma. We found that WHO grade I meningioma patients with larger volumes of preoperative cerebral edema were more at risk of experiencing limitations in longer-term cognitive functioning than patients with no or less edema preoperatively. There was no difference in HRQOL between both patient groups.

In Chapter 6 we performed a systematic review and meta-analysis to assess whether Positron Emission Tomography (PET) can preoperatively predict the WHO grade of a meningioma. Preoperative information about the risk of malignancy will help in decision making regarding indication and timing for surgery. Moreover, it will influence surgical strategy in terms of extent of resection and risks taken to achieve a total resection. After pooling the data, we found glucose consumption of meningiomas assessed with 18F-FDG PET to be useful to non-invasively differentiate benign from malignant meningiomas.

In Chapter 7 we discuss several relevant issues and provide an outline for future research.