and could be easily fixated with mini-plates and screws, although in one case a reoperation was necessary for additional resection, as well as drilling and repositioning of the implant. The postoperative CT scans showed an accurate reconstruction of the orbital wall. After surgery, exophthalmos was substantially reduced and a satisfying cosmetic result was achieved in all patients. CONCLUSIONS: The concept of preoperative 3D virtual treatment planning and single-step orbital reconstruction with CAD/CAM-implants after tumor resection involving the orbit is well feasible and can lead to good cosmetic results.

MNGI-20. LARGE PERITUMORAL EDEMA RELATIVE TO TUMOR VOLUME PREDICTS SECRETORY SUBTYPE IN MENINGIOMAS

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BACKGROUND: Secretory meningiomas represent a benign subtype of meningiomas (WHO I°), but show a high prevalence of serious perioperative adverse events. Preoperative identification of a secretory subtype could facilitate risk stratification, and selection of pre- and perioperative medical treatment. OBJECTIVE: To evaluate the relationship of preoperative MRI features and secretory subtypes in meningioma patients. METHODS: All meningioma patients with available preoperative MRI that underwent tumor resection between 2013 and 2018 were reviewed. Different imaging characteristics were collected (i.e. tumor surface, arachnoid plane, T2 intensity) as well as the volume of tumor and peritumoral edema (PTE), using a semiautomatic image-processing software. In addition, the edema index (EI) (ratio of PTE to tumor volume) was calculated and all factors were correlated with histological subtypes. Receiver operating characteristic (ROC) curve analysis was performed to identify cut-off EI values to predict histological subtypes. RESULTS: We identified 163 patients, whereof seven (4.3%) presented with secretory meningiomas. EI ($p< .005$), as well as PTE ($p< .05$) proved to be the only parameters significantly associated with secretory meningioma. In ROC curve analysis, EI was the most sensitive and specific parameter to predict a secretory subtype. The optimal cut-off value at > 4.39 provided a sensitivity of 85.71% and a specificity of 95.57%. CONCLUSION: EI can be used as a highly specific and sensitive parameter to predict a secretory meningioma subtype, providing a useful tool for improvement of pre- and perioperative medical management.

MNGI-21. OPTIMISING PATIENT SELECTION FOR ANTIEPILEPTIC DRUG THERAPY IN MENINGIOMA SURGERY

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BACKGROUND: Epilepsy is a major cause of morbidity and mortality in meningioma patients. The aims of this study were to determine which factors predispose meningioma patients to developing perioperative seizures and to understand the impact of antiepileptic drugs. METHODS: Patients treated for a histologically-confirmed intracranial meningioma at the authors institution between 2010 and 2015 were retrospectively examined. Clinical and imaging data were assessed. Multivariate analysis was performed using binary logistic regression. The effect of antiepileptic treatment was assessed using survival analysis. RESULTS: Two hundred and eighty-three patients met the selection criteria; seizures were present in 68 (24%) preoperatively and in 48 patients (17%) following surgery. Of the 68 with preoperative seizures, 19 continued to have them, whereas de-novo seizures arose postoperatively in 29 seizure-naïve patients. Risk factors of postoperative seizures were convexity location (OR=2.05 [95% CI=1.07–3.98], $p=0.030$), frontoparietal location (OR=4.42 [95% CI= 1.49–13.16], $p=0.007$) and preoperative seizures (OR=2.65 [95% CI=1.37–5.24], $p=0.005$). The two locations, in addition to the presence of midline shift on preoperative imaging (OR=4.15 [95% CI=1.54–11.24], $p=0.005$), were significantly correlated with postoperative seizures in seizure-naïve patients. Antiepileptic treatment in patients with those risk factors reduced the possibility of seizures at any time point within the 1st year postoperatively by approximately 40%, although this did not meet statistical significance. CONCLUSION: Prophylactic antiepileptic treatment might be warranted in seizure-naïve meningioma patients with 1 risk factor. High-quality randomised controlled trials are required to verify those factors and to define the role of antiepileptics in meningioma practice.

MNGI-22. A PROGNOSTIC INDEX TO PREDICT THE RISK OF ACTIVE MONITORING FAILURE FOR INCIDENTALLY-FOUND ASYMPTOMATIC MENINGIOMAS

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BACKGROUND: 30% of meningiomas are incidental findings. There is no consensus on the optimal management (active monitoring, surgery, radiosurgery). OBJECTIVE: Develop a prognostic index to identify patients at risk of active monitoring failure. METHODS: Active monitoring failure was defined as: new symptoms, MRI progression (absolute growth rate 2 cm3/year or absolute growth rate 1 cm3/year + relative growth rate 30%/year) or loss of treatment options. A prognostic model was developed using MRI and patient co-morbidity (Charlson-Index) in a retrospective cohort (2007–2015). RESULTS: 385 patients (403 meningiomas) were studied; mean age was 62.6 years (SD=12.0); 301 (78.2%) were female. Over a median of 36.0 months (range: 3–120), 1688 MRI were performed (mean=4 scans/patient). 44 (10.9%) meningiomas failed active monitoring. Median time to failure was 33.0 months (range: 5–102). Model parameters were based on statistical and clinical considerations and included: increasing tumour volume (HR=2.17 [95% CI=1.53–3.09], $p<0.001$), peritumoural signal change (HR=1.58 [95% CI=0.65–3.85], $p=0.313$), FLAIR/T2 hyperintense meningiomas (HR=10.6 [95% CI=5.39–21.0], $p<0.001$) and proximity to neurovascular structures (HR=1.38 [95% CI=0.74–2.56], $p=0.314$). Discriminatory power of the model was excellent (Harrells C statistic=0.89). Patients were stratified into low, medium and high-risk groups and rates of failed active monitoring at 5-years were 3%, 28% and 75% respectively. Low-risk patients had non-oedematous, small iso/hypointense meningiomas, distant from neurovascular structures. After 5-years of follow-up, the probability of failed active monitoring plateaued in all risk groups. Older patients with co-morbidities (Charlson-Index 6) were 15-times more likely to die than to receive intervention at 5-years following diagnosis, regardless of risk-group. CONCLUSION: Most meningiomas remain clinically and radiologically stable. Patients with Charlson-Index 6 do not require active monitoring. Low-risk patients require less frequent MRI monitoring. Follow-up beyond 5-years may not be required for all patients. Stratifying follow-up according to risk-group has the potential to reduce the cost of healthcare.

MNGI-23. PREOPERATIVE QUANTITATIVE IMAGING FEATURES ARE PROGNOSTIC FOR MENINGIOMA OUTCOMES

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OBJECTIVES: Quantitative radiologic and radiomic features can identify brain tumors at risk for poor outcomes. Here, we investigate prognostic models for meningioma grade, local failure (LF) and overall survival (OS) based on demographic, radiologic, radiomic and therapeutic data. METHODS: We developed a database that was enriched for high grade meningiomas from 219 patients who underwent surgery for 229 meningiomas from 1990 to 2015 who had comprehensive clinical, pathologic and radiologic information available for retrospective review. The median imaging follow up was 4.3 years, and there were 112 WHO grade I (49%), 93 grade II (41%) and 24 grade III (10%) meningiomas. Two neuro-radiologists independently annotated 17 radiologic features, and 154 radiomic features were extracted from preoperative post-contrast 3D SPGR MR images for each meningioma. Random forest models were trained using nested resampling, and the performance of each model was assessed by calculating feature importance, mean balanced accuracy (BA) and area under the curve (AUC). RESULTS: Models restricted to preoperative demographic information and quantitative imaging features had superior BA (0.60–0.67) and AUC (0.60–0.76) for LF or OS as compared to models based on meningioma grade and extent of resection (BA 0.65, AUC 0.64). Integrated models incorporating all available data provided the most accurate estimates of LF and OS (BA 0.67, AUC 0.76). Radiomic features alone or in combination with other variables showed moderate and marginal predictive value for grade (BA 0.63, AUC 0.72) and LF (BA 0.61, AUC 0.65), respectively. Among radiologic features, meningioma diffusion characteristics significantly strengthened prognostication of grade and LF (RR 25.6, $P = 0.001$). Recursive partitioning analysis identified tumor size, primary versus recurrent presentation, grade, sphericity, apparent diffusion coefficient, location, extent of resection and T2 signal as the most important features for LF. CONCLUSIONS: Mod-