fiducials (AFIDs) was recently developed and validated to provide quantitative measures of image registration. We applied the AFIDs protocol to magnetic resonance images (MRIs) obtained from patients with Parkinson's Disease (PD). **Methods:** Two expert and three novice raters placed AFIDs on MRIs of 39 PD patients. Localization and registration errors were calculated. To investigate for unique morphometric features, pairwise distances between AFIDs were calculated and compared to 30 controls who previously had AFIDs placed. Wilcoxon rank-sum tests with Bonferroni corrections were used. **Results:** 6240 AFIDs were placed with a mean localization error (±SD) of 1.57mm±1.16mm and mean registration error of 3.34mm±1.94mm. Out of the 496 pairwise distances, 40 were statistically significant ($p<0.05/496$). PD patients had a decreased pairwise distance between the left temporal horn, brainstem and pineal gland. **Conclusions:** AFIDs can be successfully applied with millimetric accuracy in a clinical setting and utilized to provide localized and quantitative measures of registration error. AFIDs provide clinicians and researchers with a common, open framework for quality control and validation of spatial correspondence, facilitating accurate aggregation of imaging datasets and comparisons between various neurological conditions.

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Prediction of Pituitary Adenoma Recurrence using the SIPAP Classification

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doi: 10.1017/cjn.2021.444

Background: Pituitary tumor recurrence following endoscopic endonasal transsphenoidal surgery (EETS) has been reported widely. We evaluated a modified score using the SIPAP classification system, combining the suprasellar and paraseller extension scores of the pituitary tumor, to determine its impact on adenoma recurrence. **Methods:** A retrospective cohort study design with patient characteristics, tumor type, endocrine, operation, imaging data collected. Preoperative MRI images were reviewed and SIPAP classification applied. Postoperative data were extracted for the follow-up period available for each patient.The suprasellar score and the highest parasellar scoring from both sides were numerically summed in a bilateral suprasellar and parasellar (SaP) score and combined to make 4 grades. **Results:** 276 patients were identified, 56.5% of the cohort was male. The mean cohort age was 54 years old.The mean follow up period was 32 months. Patient perioperative tumor grade according to SaP classification and recurrence rate was: Grade 1: 11%: Grade 2: 10%; Grade 3: 15%; Grade 4: 22%. The results followed a pattern of logarithmic curve. **Conclusions:** The SaP classification was useful in determining the pituitary tumor expected recurrence following EETS. The advanced tumors had the highest recurrence rates. Use of the SaP score may allow for more accurate preoperative counselling of patients with pituitary adenoma.

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Reduced radiation CT imaging for augmented reality spinal surgery applications

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doi: 10.1017/cjn.2021.445

Background: There is growing evidence for the use of augmented reality (AR) in pedicle screw placement in spinal surgery to increase surgical accuracy, improve clinical outcomes and reduce the radiation exposure required for intraoperative navigation. Auto-segmentation is the cornerstone of AR applications because it correlates patient-specific anatomy to structures segmented from preoperative computed tomography (pCT) images. These AR techniques allow for a reduction in the radiation dose required to acquire CT images while maintaining accurate segmentation. **Methods:** In this study, we methodically increase the noise that is introduced into CT images to determine the image quality threshold that is required for auto-segmentation on pCT. We then enhance the images with denoising algorithms to evaluate the effect on the segmentation. **Results:** The pCT radiation dose is decreased to below the current lowest clinical threshold and the resulting images still produce segmentations that are appropriate for input into AR applications. The application of denoising algorithms to the images resulted in increased artifacts and decreased bone density. **Conclusions:** The CT image quality that is required for successful AR auto-segmentation is lower than that which is currently employed in spine surgery. Future research is required to identify the specific, clinically relevant radiation dose thresholds.

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Primary motor cortex metabolite levels correlate with dexterity following spinal surgery for degenerative cervical myelopathy

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doi: 10.1017/cjn.2021.447

Background: Spinal cord compression from degenerative cervical myelopathy is characterized by progressive loss of hand dexterity, alongside changes in the metabolite profiles in the brain and spinal cord. Correlating the changing metabolite profile with measures of dexterity following decompression surgery may assist in identifying which patients may benefit most from surgery. **Methods:** Thirty operative myelopathy patients consented to receive spectroscopy and GRASSP-M dexterity assessments both preoperatively and 6-weeks postoperatively. Magnetic resonance spectroscopy (TE=135) was performed in the motor cortex using a 3 Tesla Siemens MRI scanner at Robarts Research Institute. Spearman correlations were used to evaluate associations between metabolite levels and dexterity ($p<0.05$ was