Zero-echo-time

Recognizing the anatomical orientation surrounding the sella floor is crucial in endoscopic endonasal transsphenoidal surgery (ETSS). Zero-echo-time (ZTE) sequences were suggested for a new bone identification technique on magnetic resonance imaging (MRI). This study aimed to evaluate the clinical usefulness of three-dimensional (3D)-ZTE-based MRI models in providing anatomical guidance for ETSS.

ZTE-based MRI and magnetic resonance angiography (MRA) data from 15 consecutive patients with pituitary tumor treated between September 2018 and May 2019 were used to create 3D-MRI models. From these, the architecture surrounding the sellar floor, particularly anatomical relationships between tumors and internal carotid arteries (ICAs), was visualized to preoperatively plan surgical procedures. In addition, 3D-ZTE-based MRI models were compared to actual surgical views during ETSS to evaluate model applicability.

These 3D-ZTE-based MRI models clearly demonstrated the morphology of the sellar floor and matched well with intraoperative views, including pituitary tumor, by successively eliminating sphenoidal structures. The models also permitted determination of the maximum marginal line of the opening of the sellar floor by presenting vital structures such as ICAs and tumors. With such 3D-MRI models, the surgeon could access the intracranial area through the sellar floor more safely, and resect the pituitary tumor maximally without complications.

This 3D-MRI models based on ZTE sequences allowed distinct visualization of vital structures and pituitary tumor around the sellar floor. This new method using 3D-ZTE-based MRI models showed low invasiveness for patients and was useful in preoperative planning for ETSS, facilitating maximum tumor resection without complications [1)].

1)
Inoue A, Kohno S, Nishida N, Suehiro S, Matsumoto S, Nishikawa M, Ozaki S, Nakamura Y, Shigekawa S, Watanabe H, Senba H, Matsuura B, Ohnishi T, Kunieda T. Clinical utility of new three-dimensional model using a zero-echo-time sequence in endoscopic endonasal transsphenoidal surgery. Clin Neurol Neurosurg. 2020 Feb 21;190:105743. doi: 10.1016/j.clineuro.2020.105743. [Epub ahead of print] PubMed PMID: 32113079.