

Measuring Tongue Volumes and Visualizing the Chewing und Swallowing Process Using Real-Time TrueFISP Imaging in Patients With Acromegaly – Initial Clinical Experience

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Abstract

The examination of the chewing and swallowing process needs an imaging modality with high temporal resolution and adequate soft tissue visualization. The purpose of this study was to determine if real-time True-FISP MR imaging is able to document tongue volumes as well as the chewing and swallowing process in 50 healthy volunteers and in 10 patients with acromegaly. The study has shown that real-time True-FISP imaging can be used to visualize the chewing and swallowing process in volunteers as well as in patients with acromegaly and that the applied protocol is capable to detect several pathologies associated with acromegaly.

Introduction

Chewing and swallowing problems are fairly common. The prevalence ranges between 16-22% among individuals older than 50 years (1). Many diseases are associated with chewing and swallowing problems. They can occur primarily by structural aberrations such as oropharyngeal tumors, or secondarily due to functional disorders, which can be caused by different neurologic, metabolic or myopathic disorders. Soft tissue overgrowth at the upper airway region with an increase of the tongue volume is known to occur in patients with acromegaly (1,2,3). The purpose of this study was to assess real-time TrueFisp MR imaging for the evaluation of a) morphologic changes (tongue volume), and b) evaluation of functional disorders (chewing and swallowing) in patients with acromegaly. Data were compared with results obtained in healthy volunteers.

Material and Methods

All examinations were performed on a 1.5 T MR-scanner (Magnetom Sonata, Siemens Medical Systems, Erlangen/Germany). A head/neck phased-array surface coil was used for signal reception.

In fifty healthy volunteers (25 m, 25 f, mean age: 43.6 y) tongue volumes were measured by the use of a 2 D TrueFisp sequence. Additionally, a 3D FLASH sequence was used to evaluate the oro-pharyngeal space, and a real-time examination with TrueFISP to display the process of chewing and swallowing after ingestion of an oral contrast bolus. All ten patients (4m, 6f, mean age 58y) with proven acromegaly underwent the described MR protocol twice: prior to and three months after therapy with sandostatine analogues and transsphenoidal resection of the hypophysis.

Results

The obtained imaging data including the real-time TrueFISP sequence for visualizing chewing and swallowing were of diagnostic quality in all volunteers and patients. MR measurements of tongue volumes in volunteers showed an average volume of 140 ml in men and 90 ml in women. The oropharyngeal space and the chewing and swallowing process did not show any abnormalities. The average tongue volumes in the acromegalic patients were substantially increased with an average volume of 180 ml (male), and 145 ml (female), respectively. Two out of the ten acromegalic patients showed chewing and swallowing disorders: One female patient (53 y) showed involuntary swallowing while chewing (leaking). In a 63 year-old male patient the tongue involuntarily dropped backwards while swallowing. The follow-up examination three months after therapy showed a significant decrease in mean tongue volumes: 154 ml for male patients, and 125 ml for female patients.

Conclusion

In addition to providing morphologic information, real-time True-FISP imaging allows reliable visualization of chewing and swallowing. It may yield new insights into functional oropharyngeal disorders in acromegalic patients. The outlined MR-protocol appears suited to measure tongue volumes reliably, and could be used as a non-invasive imaging modality for follow-up studies in patients with acromegaly after drug or surgical therapy.

References

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