The use of dynamic MRI to investigate post radiotherapy dysphagia: A proof of principle study.

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Introduction

Dysphagia is common following radiotherapy for head and neck cancer with 5-10% of patients requiring long-term gastrostomy feeding. The pathophysiological mechanisms underlying post irradiation dysphagia poorly understood. Whilst video flurosocpy can provide useful information with regards to the passage of a bolus in the lateral and anterior posterior view, it does not provide an axial view of constrictor function and provides poor definition on the movement of specific muscle groups. It is also not possible to draw metrics on all of the dynamic movements involved in swallowing due to a limited resolution of soft tissues. We investigated whether the use of dynamic "cine" MRI (dMRI) could overcome these limitations in an early proof of principle study.

Methods

Five patients who were gastrostomy dependant following radiotherapy for head and neck cancer were compared to five healthy volunteers with no swallowing dysfunction. Image acquisition occurred at the start of dry swallowing in the supine position. Roughly 7 images per second were captured in the sagittal (one midline and two paramedian with the aim to image both pyriform fossae), axial (tongue base and cricoid cartilage) and coronal directions. Frames were manually selected from the MRI data to contain a single swallow and then image registration was performed which allows a diameter measurement to be made on one of the frames and tracked through time to the rest of the frames in the single swallow dataset.

Results

All patients and healthy volunteers tolerated the imaging sequence and dry swallow technique. Images provided an accurate representation of swallowing in both subject groups in all the sagittal, coronal and axial directions. From the dynamic images, metrics on all components of the swallowing mechanism could be derived. An assessment of the surrounding musculature and extent of coexisting fibrosis was possible using the captured images.

Conclusion

This method shows great promise in providing a novel investigative tool for dysphagia and may in the future be used to better understand complex swallowing disorders and in turn inform on new treatment targets. Further scans are required to draw meaningful comparisons of the swallowing mechanisms between irradiated patients with dysphagia and healthy volunteers and compare validity with video fluoroscopy.