



Interventional MRI Percutaneous Procedures for Extended Relief and Cure of Thoracic Outlet Syndrome

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Introduction

Thoracic outlet syndrome is a general term for a collection of nerve and vessel impingements affecting the neck shoulder, arm and hand. Surgical treatments such as first rib resection and scalenectomy are promising but percutaneous treatment would be preferable. Scalene injections are difficult, widely offered, but generally of limited effectiveness. New MRI guided interventions were developed that have greatly increased the long term and permanent relief rate.

Methods

Fifty consecutive patient with symptomatic brachial plexus entrapment syndromes were evaluated by physical exam and MR Neurography. Patients then had percutaneous interventional MR procedures involving treatment of anterior scalene, middle scalene, levator scapula, and/or serratus anterior muscles or distal plexus, long thoracic nerve, axillary nerve or proximal plexus with marcaine, celestone, hyaluronidase and botulinum toxin type A. Pre-treatment and post-treatment analog pain scale, pain diagram and modified Oswestry data were evaluated.

Results

Among the 50 patients, 76% obtained relief of symptoms for more than 20 weeks constituting a sustained improvement of 3 points or more on the analog pain scale. 58% of the 50 patients obtained relief for greater than 3 months. 36% of the 50 patients obtained sustained relief greater than one year or permanently.

Open MRI Optiguide Interventional System



This configuration allows the surgeon to reach into the magnet and watch on an in-room monitor while maneuvering a titanium interventional device inside the patient. Good quality images can be obtained in 12 seconds using a FLASH (fast low angle shot) pulse sequence

Conclusions

Utilizing open MR guidance to assure adequacy of injection, including hyaluronidase and botox, and treating a variety of targets depending on individual patient symptoms resulted in outcomes that outperform the effectiveness of a variety of previously reported percutaneous and open interventions for this condition.

Learning Objectives

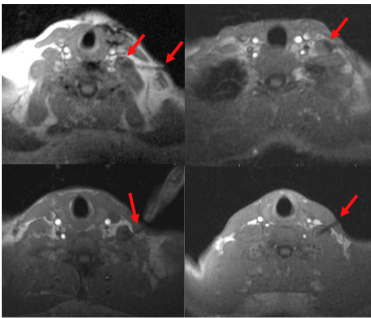
Interventional MRI can provide improved access and assure optimized treatment for percutaneous treatment of thoracic outlet syndrome.

MR Neurography Findings in Thoracic Outlet Syndrome



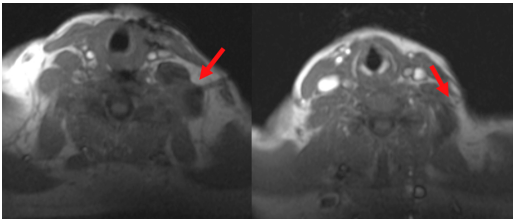
Multiple plexus elements demonstrate broadening, flattening and increase in image intensity at the level of the trunks as they pass between the anterior and middle scalene muscles. Arrows indicate area of abnormality.

Open MR Guided Treatment of Anterior Scalene



Under open MR guidance, the adjacent carotid artery, jugular veins, lung and neural elements can be safely avoided to allow accurate targeting of the anterior scalene muscle. A titanium Lufkin needle is being introduced (red arrows) and darkeing appears in the muscle as treatment agents are introduced

Open MR Guided Treatment of Middle Scalene



The middle scalene should be treated as well when it is also sensitive to palpation & when scapular related elements such - levator scapula, rhomboids, serratus anterior - muscles are involved. The dorsal scapular & long thoracic nerves traverse the middle scalene. Arrows: needle reaching into middle scalene muscle with injectate in the muscle.