SMRT Student Scope Submission

Title & Author

Title: MRI in the Detection and Diagnosis of Acoustic Neuroma

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Patient History

The patient is a 57 year old female who was referred for an MRI by her otolaryngologist. The written order requested an IAC scan to evaluate sudden right-sided hearing loss.

During the patient interview, the patient stated that the hearing loss had occurred suddenly exactly one month previous to this MR scan. Patient also reports constant tinnitus. Her primary care physician had referred her to an otolaryngologist who

diagnosed viral labyrinthitis and treated her with Prednisone. Patient stated that her symptoms continued. MD then ordered a CT scan which was negative.

Patient stated that she had no personal history of cancer, seizures or MS.

Patient Preparation and Scan Set-up

Patient was screened for ferromagnetic implants or objects, prior allergic reactions to contrast, and other known MR contraindicated conditions. Patient denied any history of kidney disease or renal failure. NSF (nephrogenic systemic fibrosis) risk profile did not indicate requirement of blood work prior to receiving gadolinium based contrast agent for the study.

During the patient interview, the procedure was described to the patient and any questions she had were addressed. She was then taken to a changing room to change into a hospital gown and lock up her personal possessions.

Patient was placed supine on the table and she was given final instructions to remain as still as possible and how to contact the technologist with the squeeze ball if necessary. She was then given earplugs to protect her hearing, and her head was placed in to the 8 channel head coil. A pillow was placed under her knees for comfort and a blanket was offered. Patient was landmarked at her glabella and placed in to the bore of the GE 1.5T Signa 9.1 scanner.

MR Imaging Parameters

IAC protocol was performed with the following sequences and parameters:

3P Localizer	FOV=26	Freq=256
	sl- th=5.0	Phase=128
	space=1.0	NEX=1.0

DWI	TE=20	FOV=26	Freq=128
	TR=10000	sl-th=5.5	Phase=128
	Shots=1	space=0.0	NEX=1.0
		slices=24	
Axial FSE T2	TE=85	FOV=22	Freq=384
	TR=5000	sl-th=5.0	Phase=224
	ETL=24	space=1.0	NEX=2.0
	RBW=41.67	slices=21	
Axial FLAIR	TE=150	FOV=22	Freq=256
	TR=8000	sl-th=5.0	Phase=224
	TI=2000	space=1.0	NEX=1.0
	RBW=31.25	slices=21	
3D Fiesta			
Hi Res	TE=20	FOV=18	Freq=448
	Flip=65	sl-th=1.0	Phase=256
	RBW=62.50	overlap=0	NEX=4.0
		slices=1	

Administer Gadolinium

Coronal T1 Post	TE=20	FOV=18	Freq=256
	TR=500	sl-th=3.0	Phase=224
	RBW=8.06	space=0.0	NEX=1.50
		slices=11	
Axial T1 Post	TE=20	FOV=18	Freq=256
	TR=500.0	sl-th=3.0	Phase=224
	RBW=8.06	Space=0.0	NEX=1.50
		slices=11	
3D SPGR Post	TE=20	FOV=24	Freq=256
	TR=41.0	sl-th=2.4	Phase=192
	Flip=45	overlap=2	NEX=1.0

	RBW=15.63	slices=fat	
Axial T2			
Hi Res	TE=85	FOV=18	Freq=384
	TR=5000	sl-th=3.0	Phase=256
	ETL=22	space=0	NEX=4.0
	RBW=15.63	slices=12	
Coronal T2			
Hi Res	TE=85	FOV=18	Freq=384
	TR=5000	sl-th=3.0	Phase=256
	ETL=22	space=0.0	NEX=4.0
	RBW=15.63	slices=12	

Findings and Discussions

A more accurate name for the acoustic neuroma is vestibular schwannoma as they arise from perineural schwann cells to form a benign intracanalicular tumor within the internal auditory canal (IAC). The 8th cranial nerve (also known as the vestibulocochlear nerve) is comprised of two branches, the vestibular and cochlear, which cross through the IAC and connect the ear to the brain. Vestibular schwannomas arise most often from the vestibular division of the 8th cranial nerve.

Symptoms may include loss of hearing (sensorineural), tinnitus and/or vertigo. Less common symptoms are headaches, vomiting, loss of balance and numbness or pain in one side of the face. The 7th cranial nerve (facial) is just medial to the 8th cranial nerve and is responsible for the muscles of the face, salivation, taste and tearing. If the tumor becomes large enough, it may exert pressure on the 7th nerve causing additional symptoms to present. A very large mass may also impinge on the 5th cranial nerve (trigeminal).

Vestibular schwannomas are the most common tumors of the CPA (cerebellopontine angle), occur within the IAC, and account for about 8% of intracranial tumors. They develop in one per 100,000 individuals annually. It is interesting to note that there is an increase in the incidence of acoustic neuromas based on advances in MRI scanning both on incidental scans and for patients experiencing symptoms. The tumors are slow-growing so symptoms may not arise until after 30. Neurofibromatosis is an inherited condition that can lead to acoustic neuroma; however, acoustic neuroma is not otherwise hereditary.

Hearing loss can be either conductive or sensineural (or a combination of both). CT can be used to identify conductive hearing loss and can identify a larger schwannoma, however MRI is necessary to definitively diagnose sensineural hearing loss as it can visualize the nerve and identify a tumor only a few millimeters in size. Gadolinium based contrast agent is useful in defining the tumor.

The MR sequences used in this case are a standard neurological protocol with the addition of a high matrix, high resolution, 3D steady state free precession sequence (FIESTA) that allows for visual imaging of the cranial nerves.

Conclusions

There is evidence of an 11mm x 4.4 mm enhancing lesion in the right internal auditory canal consistent with a small intracalicular acoustic neuroma. This lesion causes slight expansion of the canal. No other enhancing lesions are visualized within the brain. The ventricles are normal in size with no evidence of hydrocephalus. The paranasal sinuses are clear.

References

ANA. (n.d.). *What is Acoustic Neuroma*. Retrieved December 20, 2007, from Acoustic Neuroma Association (ANAUSA): http://www.anausa.org/index.html

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