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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Laine FJ, Smoker WR. Anatomy of the cranial nerves. *Neuroimaging Clin N Am.* 1998;8(1):69-100.	Review/Other-Dx	N/A	Review anatomy of CN I and III through XII and correlate MRI and CT images with nerves. Also, review peripheral motor and sensory components.	No results stated.	4
2. Rubin M, Safdieh JE, Netter FH. Cranial nerves I-XII. *Netter's concise neuroanatomy*. Philadelphia, PA: Saunders Elsevier; 2007:215-263.	Review/Other-Dx	N/A	Book chapter.	N/A	4
3. Wilson-Pauwels L, Akesson EJ, Stewart PA. Introduction. *Cranial nerves: anatomy and clinical comments*. Toronto: B.C. Decker; 1988:vii-xiii.	Review/Other-Dx	N/A	Book chapter.	N/A	4
4. American College of Radiology. ACR Appropriateness Criteria®: Orbits, Vision and Visual Loss. Available at: https://acsearch.acr.org/docs/69486/Narrative/. Accessed March 1, 2017.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition.	N/A	4
5. American College of Radiology. ACR Appropriateness Criteria®: Hearing Loss and/or Vertigo. Available at: https://acsearch.acr.org/docs/69488/Narrative/. Accessed March 1, 2017.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for Hearing Loss and/or Vertigo.	N/A	4
6. Chen RC, Khorsandi AS, Shatzkes DR, Holliday RA. The radiology of referred otalgia. *AJNR Am J Neuroradiol.* 2009;30(10):1817-1823.	Review/Other-Dx	N/A	To outline the various sensorineural pathways that dually innervate the ear and other sites within the head and neck, as well as discuss various disease processes that are known to result in referred otalgia.	No results stated in abstract.	4
7. Casselman J, Mermuys K, Delanote J, Ghekiere J, Coenegrachts K. MRI of the cranial nerves--more than meets the eye: technical considerations and advanced anatomy. *Neuroimaging Clin N Am.* 2008;18(2):197-231, preceding x.	Review/Other-Dx	N/A	Review MRI of the CN with emphasis on less known or more advanced extra-axial anatomy illustrated with high-resolution MRI.	MRI is the recommended modality for cranial neuropathy. Nerves can be visualized in detail on MR.	4
8. Borges A, Casselman J. Imaging the cranial nerves: Part I: methodology, infectious and inflammatory, traumatic and congenital lesions. *Eur Radiol.* 2007;17(8):2112-2125.	Review/Other-Dx	N/A	Review role of imaging techniques in depicting normal anatomy and on infectious and inflammatory, traumatic and congenital pathology affecting the CN.	Volumetric CT, higher field MR, and higher resolution MR sequences have helped in the development of CN imaging. Surface coils and parallel imaging allows sub-millimetric visualization of nerve branches and volumetric 3D imaging. Multiplanar and curved reconstructions with CT and MR can follow the entire course of a CN or branch, improving the diagnostic yield of neural pathology.	4

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9. Casselman JW, Kuhweide R, Deimling M, Ampe W, Dehaene I, Meeus L. Constructive interference in steady state-3DFT MR imaging of the inner ear and cerebellopontine angle. *AJNR Am J Neuroradiol.* 1993;14(1):47-57.	Observational-Dx	60 patients; 50 normal and 10 pathologic inner ears	Studied normal and pathologic inner ears to assess the value of a 3D Fourier transformation MR technique "CISS" in imaging the inner ear.	CN VII and the cochlear, superior vestibular and inferior vestibular branch of CN VIII were identified in 90%, 94%, 80%, and 88% of the cases, respectively. Detailed study of the normal and pathologic inner ear is possible with CISS. CISS may be very useful in the demonstration of the vascular loop.	3
10. Ciftci E, Anik Y, Arslan A, Akansel G, Sarisoy T, Demirci A. Driven equilibrium (drive) MR imaging of the cranial nerves V-VIII: comparison with the T2-weighted 3D TSE sequence. *Eur J Radiol.* 2004;51(3):234-240.	Observational-Dx	45 patients	Comparative study to evaluate the value of the DRIVE on image quality and nerve detection when used in adjunction with T2-weighted 3D TSE sequence.	Addition of DRIVE pulse shortens the scan time by 25%. T2-weighted 3D TSE sequence with DRIVE performed slightly better than the T2-weighted 3D TSE sequence without DRIVE in identifying the individual nerves. The image quality was also slightly better with DRIVE.	2
11. Jung NY, Moon WJ, Lee MH, Chung EC. Magnetic resonance cisternography: comparison between 3-dimensional driven equilibrium with sensitivity encoding and 3-dimensional balanced fast-field echo sequences with sensitivity encoding. *J Comput Assist Tomogr.* 2007;31(4):588-591.	Review/Other-Dx	38 healthy volunteers	Comparative study using both 3D bFFE and 3D DRIVE sequences in conjunction with parallel imaging and compare the image quality of those sequences in order to assess efficacy in the detection of inner ear structures.	The relative contrast for the CN in 3D bFFE and 3D DRIVE was 4.31 +/- 1.53 and 5.73 +/- 4.60, respectively. The 2.5 turns of the cochlea, spiral lamina, and all 3 semicircular canals were better visualized using the 3D DRIVE. 3D DRIVE is better than 3D bFFE in evaluation of the structures of the inner ear.	4
12. Lane JI, Ward H, Witte RJ, Bernstein MA, Driscoll CL. 3-T imaging of the cochlear nerve and labyrinth in cochlear-implant candidates: 3D fast recovery fast spin-echo versus 3D constructive interference in the steady state techniques. *AJNR Am J Neuroradiol.* 2004;25(4):618-622.	Review/Other-Dx	8 patients	Evaluate high-resolution imaging of the internal auditory canal and labyrinth at 1.5 T performed with 3D fast spin-echo in cochlear implant patients.	Contrast-to-noise ratios for 3D CISS were twice those obtained with 3D fast recovery fast spin-echo. Both 3D fast recovery fast spin-echo and 3D CISS provide high-resolution images of the internal auditory canal and labyrinth at 3.0 T. Authors predict the contrast-to-noise ratios obtained with 3D CISS will prove advantageous as we move to smaller fields of view at higher field strength.	4
13. Tsuchiya K, Aoki C, Hachiya J. Evaluation of MR cisternography of the cerebellopontine angle using a balanced fast-field-echo sequence: preliminary findings. *Eur Radiol.* 2004;14(2):239-242.	Review/Other-Dx	44 patients	To evaluate the feasibility of MR cisternography by bFFE sequence, comparing with that by a TSE sequence, for cerebellopontine angle lesions on a 1.5-T imager.	The bFFE MR cisternograms showed target CNs with less cerebrospinal fluid pulsation artifacts than TSE cisternograms and visualized an acoustic schwannoma in 6/44 patients with suspicion and a causative vessel of hemifacial spasm in all of 3 patients in a short scanning time (1 min 53 s). The bFFE sequence can be promising for MR cisternography in the diagnosis of cerebellopontine angle lesions.	4

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14. Tsuchiya K, Yamakami N, Hachiya J, Kassai Y. MR cisternography using a three-dimensional half-fourier single-shot fast spin-echo sequence. *Eur Radiol.* 1998;8(3):424-426.	Review/Other-Dx	139 patients 12 volunteers 2 observers	To examine the value of MR cisternography with the 3D half-fourier single-shot fast spin-echo sequence in imaging the CNs in the skull base.	Technique is capable of showing normal CNs and useful in screening for acoustic neuroma as well as in the diagnosis of NVC.	4
15. Veillon F, Taboada LR, Eid MA, et al. Pathology of the facial nerve. *Neuroimaging Clin N Am.* 2008;18(2):309-320, x.	Review/Other-Dx	N/A	Review imaging of the facial nerve.	CT and MRI are helpful if symptoms are atypical or progressive. MRI gives very good information about the facial nerve inflammation.	4
16. Linn J, Peters F, Moriggl B, Naidich TP, Bruckmann H, Yousry I. The jugular foramen: imaging strategy and detailed anatomy at 3T. *AJNR Am J Neuroradiol.* 2009;30(1):34-41.	Observational-Dx	25 patients; 2 readers	To assess how well the anatomy of the jugular foramen could be displayed by 3T MRI by using a FIESTA acquisition sequence and a 3D CE-MRA. The readers analyzed the images with the following objectives: to score the success with which these sequences depicted the glossopharyngeal (CNIX) and vagus (CNX) nerves, their ganglia, and the spinal root of the accessory nerve (spCNXI) within the jugular foramen, and to determine the value of anatomic landmarks for the in vivo identification of these structures.	Contrast-enhanced FIESTA and CE-MRA displayed CNIX in 90% and 100% of cases, respectively, CNX in 94% and 100%, and spCNXI in 51% and 0% of cases. The superior ganglion of CNIX was discernible in 89.8% and 87.8%; the inferior ganglion of CNIX, in 73% and 100%; and the superior ganglion of CNX, in 98% and 100% of cases. Landmarks useful for identifying these structures were the inferior petrosal sinus and the external opening of the cochlear aqueduct. This study protocol is excellent for displaying the complex anatomy of the jugular foramen and related structures. It is expected to aid in detecting small pathologies affecting the jugular foramen and in planning the best surgical approach to lesions affecting the jugular foramen.	3
17. Erdogan N, Altay C, Akay E, et al. MRI assessment of internal acoustic canal variations using 3D-FIESTA sequences. *Eur Arch Otorhinolaryngol.* 2013;270(2):469-475.	Observational-Dx	187 patients; 374 temporal bones	To investigate the vascular variations and compression of the CNs VII and VIII at the cerebellopontine angle in patients with neuro-otologic symptoms using 3D FIESTA MRI. Contrast was administered to patients with cerebellopontine angle mass or thickness, signal abnormality or asymmetry of CNs causing doubt in terms of mass or inflammation.	Temporal MRI findings revealed that 2 patients had a unilateral acoustic neuroma (1.1 %), 1 had facial neuritis (0.5 %), and 108 had a vascular loop of the anterior inferior cerebellar artery in the PCA and/or internal acoustic canal (57.8 %). Among the patients with a vascular loop, 3D FIESTA images showed that 81 temporal bones had type I vascular loops (65.9 %), 33 had type II (26.8 %), and 9 had type III vascular loops (7.3 %). There was no statistically significant correlation between the grade of the anterior inferior cerebellar artery loop and presence of the ipsilateral clinical symptom (P=0.05).	3

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18. American College of Radiology. ACR Appropriateness Criteria®: Seizures and Epilepsy. Available at: https://acsearch.acr.org/docs/69479/Narrative/. Accessed March 1, 2017.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition.	N/A	4
19. Castillo M. Imaging of the upper cranial nerves I, III-VIII, and the cavernous sinuses. *Magn Reson Imaging Clin N Am.* 2002;10(3):415-431, v.	Review/Other-Dx	N/A	Review imaging of the upper CNs I, III-VIII, and the cavernous sinuses.	MRI is recommended in upper CNs. CT plays a limited but important role in the evaluation of intraosseous portions of some CNs.	4
20. Abolmaali N, Gudziol V, Hummel T. Pathology of the olfactory nerve. *Neuroimaging Clin N Am.* 2008;18(2):233-242, preceding x.	Review/Other-Dx	N/A	Review pathology of olfactory nerve and radiologic imaging of olfactory-eloquent structures.	Higher resolution techniques will provide better insights in the structural and functional organization of the olfactory system.	4
21. Madan R, Sawlani V, Gupta S, Phadke RV. MRI findings in Kallmann syndrome. *Neurol India.* 2004;52(4):501-503.	Review/Other-Dx	5 patients	Evaluate MR findings in Kallmann syndrome.	MRI findings in Kallmann syndrome are characteristic and MRI is a useful adjunct to Kallmann syndrome diagnosis.	4
22. Koenigkam-Santos M, Santos AC, Versiani BR, Diniz PR, Junior JE, de Castro M. Quantitative magnetic resonance imaging evaluation of the olfactory system in Kallmann syndrome: correlation with a clinical smell test. *Neuroendocrinology.* 2011;94(3):209-217.	Observational-Dx	21 patients with Kallmann syndrome and 16 healthy volunteers	To measure olfactory bulbs and sulci using dedicated MRI sequences and specific measurement tools in Kallmann syndrome patients with a well-established genotype and phenotype, as well as correlate MRI findings with a clinical smell test.	The Smell Identification Test (UPSIT), showed 14 patients with anosmia and 6 with moderate hyposmia. 18 patients (85%) presented altered rhinencephalon structures in the MRI. 16 patients (76%) presented olfactory bulb aplasia (14/16 bilaterally), and these patients presented a total of 16 aplastic sulci. There was moderate agreement between the MRI quantitative evaluation and the UPSIT (overall Kappa = 0.55), but when considering the presence of aplastic bulbs and anosmia, authors found almost perfect agreement (Kappa = 0.87). 3 patients had normal rhinencephalon structures, including 1 with a KAL1 gene mutation. Olfactory bulb and sulcus aplasia were the most common findings in Kallmann syndrome patients. Findings help ascertain MRI accuracy in the diagnosis of Kallmann syndrome, differentiating patients with hypogonadotropic hypogonadism with an apparently normal or difficult to evaluate sense of smell.	3

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23. Berendse HW, Booij J, Francot CM, et al. Subclinical dopaminergic dysfunction in asymptomatic Parkinson's disease patients' relatives with a decreased sense of smell. *Ann Neurol.* 2001;50(1):34-41.	Review/Other-Dx	25 hyposmic and 23 normosmic relatives	SPECT with [123I] beta-CIT as a dopamine transporter ligand was used to assess nigrostriatal dopaminergic function in 25 hyposmic and 23 normosmic relatives of Parkinson's disease patients.	An abnormal reduction in striatal dopamine transporter binding was found in 4/25 hyposmic relatives of Parkinson's disease patients. These observations show that subclinical reductions in dopamine transporter binding can be detected in asymptomatic relatives of sporadic Parkinson's disease patients by means of [123I] beta-CIT and SPECT. The results further show that olfactory deficits may precede clinical motor signs in Parkinson's disease.	4
24. Mueller A, Rodewald A, Reden J, Gerber J, von Kummer R, Hummel T. Reduced olfactory bulb volume in post-traumatic and post-infectious olfactory dysfunction. *Neuroreport.* 2005;16(5):475-478.	Review/Other-Dx	22 patients with post-infectious olfactory deficit; 9 patients with post-traumatic olfactory deficit; 17 healthy controls	Examine patients with post-infectious olfactory deficit, post-traumatic olfactory deficit, and healthy controls who underwent MR volumetry of the olfactory bulb.	Smell deficits leading to a reduced sensory input to the olfactory bulb result in structural changes at the level of the bulb. Reduced olfactory bulb volumes may also be considered to be characteristic of parosmia.	4
25. Rombaux P, Mouraux A, Bertrand B, Nicolas G, Duprez T, Hummel T. Olfactory function and olfactory bulb volume in patients with postinfectious olfactory loss. *Laryngoscope.* 2006;116(3):436-439.	Review/Other-Dx	26 patients	Retrospective study of patients with post-infectious olfactory loss to determine if the degree of post-infectious olfactory loss is reflected in volume of the olfactory bulb.	Olfactory bulb volume varies with regard to olfactory function. Olfactory bulb volume decreases with duration of olfactory loss. Patients with parosmia had smaller olfactory bulb volumes than patients who did not report such smell distortions. Study emphasizes that olfactory bulb volume is a gauge of olfactory function.	4
26. Negoias S, Croy I, Gerber J, et al. Reduced olfactory bulb volume and olfactory sensitivity in patients with acute major depression. *Neuroscience.* 2010;169(1):415-421.	Observational-Dx	21 patients; 21 healthy controls	To assess olfactory function and olfactory bulb volume in patients with acute major depression in comparison to a normal population.	Patients with acute major depressive disorder showed significantly lower olfactory sensitivity and smaller olfactory bulb volumes. Additionally, a significant negative correlation between olfactory bulb volume and depression scores was detected.	3

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27. Haruna S, Otori N, Moriyama H, Nakanishi M. Olfactory dysfunction in sinusitis with infiltration of numerous activated eosinophils. *Auris Nasus Larynx.* 2006;33(1):23-30.	Observational-Dx	84 patients	To compare the number of activated eosinophils in the ethmoidal sinus mucosa with the CT findings and degree of olfactory dysfunction, and examine the clinical characteristics of this disease.	For diagnosis of sinusitis accompanied by severe infiltration of activated eosinophils, emphasis must be on eosinophil counts in blood and tissues and clinical findings, such as the status of lesions in the ethmoidal sinus as seen in CT scans and the manifestation of olfactory dysfunction.	3
28. Trotier D, Bensimon JL, Herman P, Tran Ba Huy P, Doving KB, Eloit C. Inflammatory obstruction of the olfactory clefts and olfactory loss in humans: a new syndrome? *Chem Senses.* 2007;32(3):285-292.	Observational-Dx	73 normosmic patients; 34 patients with inflammatory obstruction of olfactory clefts; 1 congenital anosmic patients	To assess the impact of obstructed clefts upon detection and post-learning identification of 5 odorants. Endoscopy, CT, and MRI were used to assess location and extension of obstructions.	Study reveals olfactory clefts, in human, function as an entity that is different from other regions of the nasal cavity and is the target for local inflammatory events that are not responding to corticoid and antibiotic treatments.	3
29. Eftekhari M, Assadi M, Kazemi M, et al. Brain perfusion single photon emission computed tomography findings in patients with posttraumatic anosmia and comparison with radiological imaging. *Am J Rhinol.* 2006;20(6):577-581.	Observational-Dx	16 patients with head trauma and consequently anosmia; 2 nonanosmic groups, traumatic patients and nontraumatic healthy individuals as control groups	To examine the value of brain perfusion SPECT findings in patients with posttraumatic anosmia in comparison with MRI/CT imaging. 2 nonanosmic groups, traumatic patients and nontraumatic healthy individuals, were the control groups.	Semiquantitative SPECT method demonstrated remarkable orbital frontal hypoperfusion as compared with 2 control groups. 87.5% of anosmic patients showed orbital frontal hypoperfusion (-2 SD below the lowest level in healthy controls). Semiquantitative SPECT method also detected more orbitofrontal abnormality than the qualitative method or radiological imaging (MRI and/or CT). Brain perfusion SPECT can be used with other diagnostic techniques in the evaluation of olfactory function, although additional neurophysiological and imaging studies are needed.	3
30. Mainland JD, Johnson BN, Khan R, Ivry RB, Sobel N. Olfactory impairments in patients with unilateral cerebellar lesions are selective to inputs from the contralesional nostril. *J Neurosci.* 2005;25(27):6362-6371.	Observational-Dx	7 patients; 2 groups of healthy subjects (14 subjects)	To evaluate the olfactory and olfactomotor abilities of patients with unilateral cerebellar lesions, comparing performance within subjects across nostrils, as well as between subjects with age-matched and young controls.	Cerebellar lesions influenced olfactory and olfactomotor performance. Findings implicate an olfactocerebellar pathway prominent in odor identification and detection that functionally connects each nostril primarily to the contralateral cerebellum.	3

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31. Mann NM, Vento JA. A study comparing SPECT and MRI in patients with anosmia after traumatic brain injury. *Clin Nucl Med.* 2006;31(8):458-462.	Review/Other-Dx	6 patients	Comparative study to examine normal and nonspecific MRI findings in patients with known anosmia after traumatic brain injury with perfusion SPECT brain imaging.	MRI was negative in 3 cases. All 6 cases demonstrated lesions on SPECT involving the frontal, temporal, and temporoparietal cortex. Study identified altered blood perfusion pattern in otherwise normal anatomic structures on MRI.	4
32. Westermann B, Wattendorf E, Schwerdtfeger U, et al. Functional imaging of the cerebral olfactory system in patients with Parkinson's disease. *J Neurol Neurosurg Psychiatry.* 2008;79(1):19-24.	Review/Other-Dx	12 patients with hyposmic Parkinson's disease; 16 healthy controls	To establish the cortical basis of olfactory function in patients with Parkinson's disease by using fMRI to examine brain activity related to olfactory processing.	In both patients with Parkinson's disease and healthy controls, olfactory stimulation activated brain regions relevant for olfactory processing. In controls, a bilateral activation of the amygdala and hippocampus was observed, whereas patients with Parkinson's disease involved these structures in the left hemisphere only. Group comparison showed that regions of higher activation in patients with Parkinson's disease were located bilaterally in the inferior frontal gyrus (BA 44/45) and anterior cingulate gyrus (BA 24/32), and the left dorsal and right ventral striatum.	4
33. Wang J, Eslinger PJ, Doty RL, et al. Olfactory deficit detected by fMRI in early Alzheimer's disease. *Brain Res.* 2010;1357:184-194.	Observational-Dx	12 patients and 13 healthy controls	To determine whether Alzheimer's disease - related alterations in central olfactory system neural activity, as measured by fMRI, are detectable beyond those observed in healthy elderly. All participants were administered the University of Pennsylvania Smell Identification Test (UPSIT), the Mini-Mental State Examination (MMSE), the Mattis Dementia Rating Scale-2 (DRS-2), and the Clinical Dementia Rating Scale (CDR).	The blood oxygen level-dependent signal at primary olfactory cortex was weaker in Alzheimer's disease than in healthy control subjects. At the lowest odorant concentration, the blood oxygen level-dependent signals within primary olfactory cortex, hippocampus, and insula were significantly correlated with UPSIT, MMSE, DRS-2, and CDR scores. The blood oxygen level-dependent signal intensity and activation volume within the primary olfactory cortex increased significantly as a function of odorant concentration in the Alzheimer's disease group, but not in the control group. These findings demonstrate that olfactory fMRI is sensitive to the Alzheimer's disease -related olfactory and cognitive functional decline.	3

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34. Becker M, Kohler R, Vargas MI, Viallon M, Delavelle J. Pathology of the trigeminal nerve. *Neuroimaging Clin N Am.* 2008;18(2):283-307, x.	Review/Other-Dx	N/A	Review clinical, radiologic, and pathologic features of the common conditions causing trigeminal nerve dysfunction at each specific anatomic level.	CT plays a role in the assessment of skull base foramina and facial skeleton although MRI has almost completely replaced CT as the diagnostic modality of choice for examining trigeminal neuropathy. High-resolution MRI studies with tailored dedicated protocols allow recognition of a multitude of pathologic conditions and diffusion tensor MRI techniques also offer insights into the underlying pathophysiologic mechanisms of dysfunction.	4
35. Broggi G, Ferroli P, Franzini A, et al. Operative findings and outcomes of microvascular decompression for trigeminal neuralgia in 35 patients affected by multiple sclerosis. *Neurosurgery.* 2004;55(4):830-838; discussion 838-839.	Observational-Dx	35 patients	Describe MRI findings, surgical findings, and outcomes in multiple sclerosis patients who underwent MVD for medically intractable trigeminal neuralgia. Results were assessed by clinical follow-up and periodic phone surveys.	MRI revealed the presence of demyelinating lesions affecting the brainstem trigeminal pathways of the painful side in 26 (74%) of 35 patients. During surgery, severe NVC at the TREZ was found in 16 (46%) of 35 patients. The long-term outcome was excellent in 39%, good in 14%, fair in 8%, and poor in 39% of patients. Results of MVD in trigeminal neuralgia Multiple sclerosis patients are much less satisfactory than in the idiopathic group, indicating that central mechanisms play a major role in pain genesis.	3
36. da Silva CJ, da Rocha AJ, Mendes MF, Maia AC, Jr., Braga FT, Tilbery CP. Trigeminal involvement in multiple sclerosis: magnetic resonance imaging findings with clinical correlation in a series of patients. *Mult Scler.* 2005;11(3):282-285.	Observational-Dx	275 patients	Review the incidence of trigeminal involvement on MRI findings with clinical correlation in a series of patients with multiple sclerosis. MRI scans were reviewed for the presence of gadolinium enhancement on postcontrast T1-weighted images, anatomical and signal abnormalities on different sequences at the pontine TREZ and in the cisternal portion of the nerves.	Enhancement in the cisternal portion of the nerves and signal abnormalities at the pontine TREZ in 8 (2.9%) patients, and enhancement was bilateral in 6 (75%) of those. Despite the inflammatory activity, none of them had trigeminal neuralgia and 3 (37.5%) had only painless paraesthesias in the correspondent V3 distribution. We also found a marked trigeminal hypertrophy in 2 (25%) patients, both with a longer period of disease. Results confirm a high and clinically silent incidence of trigeminal involvement in Multiple sclerosis patients, and suggest a simultaneous role of the central and peripheral type of myelin in trigeminal demyelination.	3

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37. Ma X, Sun X, Yao J, et al. Clinical analysis of trigeminal neuralgia caused by vertebrobasilar dolichoectasia. *Neurosurg Rev.* 2013;36(4):573-577; discussion 577-578.	Review/Other-Tx	11 patients	To explore the clinical manifestations, imaging features, and therapy of trigeminal neuralgia caused by vertebrobasilar dolichoectasia. No intravenous contrast was administered.	Imaging findings revealed that the vertebrobasilar arteries were pathologically enlarged and tortuous. Facial pain disappeared or was relieved after the microvascular decompression in all 11 patients; no recrudescence was found with an average of 22-month follow-up.	4
38. Maarbjerg S, Wolfram F, Gozalov A, Olesen J, Bendtsen L. Significance of neurovascular contact in classical trigeminal neuralgia. *Brain.* 2015;138(Pt 2):311-319.	Observational-Dx	135 patients	To evaluate the presence, degree, localization and origin (arterial vs venous) of the neurovascular contact in classical trigeminal neuralgia. No intravenous contrast was administered.	Neurovascular contact was prevalent both on the symptomatic and asymptomatic side [89% vs 78%, P=0.014, odds ratio = 2.4 (1.2–4.8), P=0.017], while severe neurovascular contact was highly prevalent on the symptomatic compared to the asymptomatic side [53% vs 13%, P<0.001, odds ratio = 11.6 (4.7–28.9), P<0.001]. Severe neurovascular contact was caused by arteries in 98%.	2
39. Kress B, Rasche D, Fiebach J, Tronnier V, Sartor K, Stippich C. [MR volumetry of the trigeminal nerve in patients with unilateral facial pain]. *Rofo.* 2004;176(5):719-723.	Observational-Dx	39 patients 25 volunteers	Prospective study to determine if MRI can detect atrophy of the trigeminal nerve in patients with trigeminal neuralgia.	Volume of compromised trigeminal nerve in patients with trigeminal neuralgia was lower than on the contralateral healthy side, with the difference between healthy and compromised side statistically significant (P<0.05) MRI can detect atrophy of the trigeminal nerve caused by a nerve-vessel conflict. Only patients with trigeminal neuralgia show this unilateral atrophy.	3
40. Kato K, Tomura N, Takahashi S, Watarai J. Motor denervation of tumors of the head and neck: changes in MR appearance. *Magn Reson Med Sci.* 2002;1(3):157-164.	Review/Other-Dx	6 patients	To retrospectively evaluate MR appearance of motor denervation of the third (mandibular) division of the trigeminal nerve (V3) and of the hypoglossal nerve.	The denervated muscles appeared hyperintense in the T2-weighted images and contrast enhancement in postcontrast T1-weighted images before fatty infiltration and volume loss were apparent up to 3 months after onset. Familiarity with the MR appearance of denervated muscles accompanying tumors of the head and neck is important to avoid confusion with inflammatory or neoplastic processes.	4

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41. Anderson VC, Berryhill PC, Sandquist MA, Ciaverella DP, Nesbit GM, Burchiel KJ. High-resolution three-dimensional magnetic resonance angiography and three-dimensional spoiled gradient-recalled imaging in the evaluation of neurovascular compression in patients with trigeminal neuralgia: a double-blind pilot study. *Neurosurgery.* 2006;58(4):666-673; discussion 666-673.	Observational-Dx	48 patients	Double-blinded pilot study to assess the value of high-resolution 3D-TOF MRA and Gd-enhanced 3D spoiled gradient-recalled imaging in the visualization of NVC in patients with trigeminal neuralgia. Results from neuroradiological studies were compared with findings on operative videotapes.	MRA combined with 3D Gd imaging identified surgically verified neurovascular contact in 42/46 (91%) symptomatic nerves. The offending vessel (artery, vein) was correctly identified in 31/41 cases (sensitivity 76%; specificity 75%). NVC was observed in 71% of asymptomatic nerves with a trend toward greater compression severity on the symptomatic nerve ($P<0.09$). Agreement between the direction of neurovascular contact defined by 3D-TOF MRA and 3D Gd and findings at surgery was good (kappa=0.78; 95% CI: 0.61-0.94).	2
42. Chang JW, Chang JH, Park YG, Chung SS. Microvascular decompression in trigeminal neuralgia: a correlation of three-dimensional time-of-flight magnetic resonance angiography and surgical findings. *Stereotact Funct Neurosurg.* 2000;74(3-4):167-174.	Observational-Dx	104 patients	Analysis of patients with trigeminal neuralgia who had MVD. 3D-TOF MRA was correlated with surgical findings.	3D-TOF MRA helped in treatment planning and in predicting surgical outcome by demonstrating CN compression and excluding other etiologies like tumor or vascular lesions. Initial pain relief was complete in 89 patients (85.6%) and partial in 12 patients (11.5%). 3 primary failures (2.9%) occurred. The acceptable pain relief rate (complete relief: 79.8%, partial relief: 11.5%) was determined in the long-term follow-up of surgical results. Pain recurred in 6 patients (5.8%). The mean time to recurrence was 48 months (36-93 months). There were no serious or annoying complications such as anesthesia dolorosa.	3
43. Gorgulho A, De Salles AA, McArthur D, et al. Brainstem and trigeminal nerve changes after radiosurgery for trigeminal pain. *Surg Neurol.* 2006;66(2):127-135; discussion 135.	Review/Other-Dx	37 patients	To examine the importance of radiological changes on follow-up MRIs after radiosurgery for trigeminal pain.	Enhancement on MRIs was observed in 21 cases (56.75%) with nerve enhancement in 9, pons enhancement in 4, pons-nerve enhancement in 4, and tumor enhancement in 4. Pons enhancement seems to be prognostic for pain relief without higher incidence of complications. Pons volume irradiated did not predict enhancement occurrence. Radiation delivery to the brainstem-REZ interface seems to improve pain outcome, although more paresthesias should be expected.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
44. Kress B, Schindler M, Rasche D, et al. MRI volumetry for the preoperative diagnosis of trigeminal neuralgia. *Eur Radiol.* 2005;15(7):1344-1348.	Observational-Dx	62 patients with unilateral facial pain; 50 healthy subjects	Prospective study to determine if quantitative measuring methods can improve the reliability of MRI-based evaluations of the pathological role of a neurovascular conflict between an artery and the trigeminal nerve.	Quantitative MRI measurements allow a pathological neurovascular conflict to be distinguished from a nonpathological condition where an artery is close to the trigeminal nerve. The measured volume difference between the healthy and the affected nerve in patients with neuralgia is indicative of trigeminal nerve atrophy resulting from damage to the nerve.	2
45. Kuncz A, Voros E, Barzo P, Tajti J, Milassin P, Bodosi M. [The role of MR angiography in predicting operative results of microvascular decompression in patients with trigeminal neuralgia]. *Orv Hetil.* 2005;146(51):2595-2602.	Observational-Dx	310 consecutive patients	To compare preoperative 3D MRA results with surgical findings during MVD to determine role of MRA in predicting operative results of MVD in patients with trigeminal neuralgia.	Clinical symptoms and preoperative MRA carry considerable information, which can predict the outcome of the MVD and the rate of recurrent symptoms. Atypical trigeminal neuralgia and venous compression are bad prognostic factors.	3
46. Kuncz A, Voros E, Barzo P, et al. Comparison of clinical symptoms and magnetic resonance angiographic (MRA) results in patients with trigeminal neuralgia and persistent idiopathic facial pain. Medium-term outcome after microvascular decompression of cases with positive MRA findings. *Cephalalgia.* 2006;26(3):266-276.	Observational-Dx	287 consecutive patients	Compare clinical symptoms with MRA to evaluate whether NVC could be demonstrated preoperatively in patients with trigeminal neuragia and persistent idiopathic facial pain.	MRA image was positive in 161 (56%) of the 287 cases. Surgical findings corresponded with the MRA images. The clinical symptoms and preoperative MRA performed by at least a 1-T MR unit provide considerable information, which can play a role in the planning of the treatment of trigeminal neuragia.	3
47. Miller J, Acar F, Hamilton B, Burchiel K. Preoperative visualization of neurovascular anatomy in trigeminal neuralgia. *J Neurosurg.* 2008;108(3):477-482.	Review/Other-Dx	18 patients	To evaluate role of 3D reconstructed high-resolution bFFE images fused with 3D-TOF MRA and Gd-enhanced 3D spoiled gradient recalled sequence in the visualization of neurovascular anatomy in trigeminal neuralgia.	A combination of bFFE with MRA and Gd-enhanced MR images capitalizes on the advantages of techniques, enabling MRA and contrast-enhanced MRI discrimination of vascular structures at bFFE resolution. This results in an unambiguous 3D image that can be used to identify the NVC and plan the surgical approach.	4
48. Ogiwara M, Shimizu T. Surface rendered three-dimensional MR imaging for the evaluation of trigeminal neuralgia and hemifacial spasm. *J Clin Neurosci.* 2004;11(8):840-844.	Observational-Dx	31 patients	Surface rendered 3D MRI was used to visualize the cerebellopontine angle nerves, blood vessels and brain stem and compared with the operative view in patients undergoing MVD. Preoperative MRI and MRA were performed in all patients.	Surface rendered 3D MR image and the operative view correlated in 30 of 31 patients. Surface rendered 3D MRI can clearly demonstrate the 3D relationship between the nerves and the offending vessel, and is recommended for the preoperative planning of MVD.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
49. Satoh T, Omi M, Ohsako C, Nabeshima M, Onoda K, Date I. [Novel 3D MR angiographic findings of neurovascular compressive sites in patients with trigeminal neuralgia]. *No Shinkei Geka.* 2007;35(3):259-265.	Review/Other-Dx	25 patients	To examine value of fine 3D MRA, obtained by a 3D-TOF, spoiled gradient-recalled sequence in neurovascular compressive sites at the REZ of the trigeminal nerve.	Abnormal 3D MRA findings were mostly observed at the site of NVC in conjunction with moderate degree (grade II) and severe degree (grade III) in 19/20 (95%) of the actual nerve compression by the offending vessels. Abnormal findings may provide information to suggest NVC upon the trigeminal nerve by the offending vessels. 3D MRA findings may be useful for the diagnosis and decision-making process in MVD surgery.	4
50. Satoh T, Onoda K, Date I. Preoperative simulation for microvascular decompression in patients with idiopathic trigeminal neuralgia: visualization with three-dimensional magnetic resonance cisternogram and angiogram fusion imaging. *Neurosurgery.* 2007;60(1):104-113; discussion 113-104.	Review/Other-Dx	12 consecutive patients	To study idiopathic trigeminal neuralgia patients with fusion 3D MR cisternogram and MRA in the preoperative assessment for the MVD of the affected trigeminal nerve.	Fusion 3D MR cisternogram and MRA revealed the complex anatomical relationship of the offending vessels to the trigeminal nerve REZ. Fusion 3D MR cisternogram and MRA may be a useful adjunct for the diagnosis and decision-making process to execute the MVD.	4
51. Tanaka T, Morimoto Y, Shiiba S, et al. Utility of magnetic resonance cisternography using three-dimensional fast asymmetric spin-echo sequences with multiplanar reconstruction: the evaluation of sites of neurovascular compression of the trigeminal nerve. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2005;100(2):215-225.	Observational-Dx	150 patients	Performed MR cisternography with 3D-fast asymmetric spin-echo sequences and MRA to evaluate the value for detection of the sites of NVC in patients with trigeminal neuralgia.	89/150 patients had NVC. Correlation between clinically manifested regions and NVC sites was significantly detectable using both 3D-fast asymmetric spin-echo sequences images and MRA in 89 patients with detectable NVC. The correlation coefficient using 3D-fast asymmetric spin-echo imaging was a little higher than that using MRA. The technique of MR cisternography using 3D-fast asymmetric spin-echo sequences with multiplanar reconstruction is more accurate and useful than MRA for detection of the site of NVC in patients with trigeminal neuralgia.	2
52. Voros E, Palko A, Horvath K, Barzo P, Kardos L, Kuncz A. Three-dimensional time-of-flight MR angiography in trigeminal neuralgia on a 0.5-T system. *Eur Radiol.* 2001;11(4):642-647.	Observational-Dx	172 patients	To analyze the diagnostic value of 3D-TOF MRA performed on a 0.5-T system in the detection of NVC in patients with trigeminal neuralgia. MRA results were compared with clinical data and to result of surgery in the surgically treated cases.	3D-TOF MRA had sensitivity of 97.6%, specificity of 92.5%, accuracy of 95%, PPV of 93%, NPV of 97.4%. 3D-TOF MRA performed on a 0.5-T system appears to be not less effective than similar examinations by higher field strength devices in the detection of neurovascular contact. This sequence accurately demonstrates the presence of NVC, and in this way valuable information may be achieved for the planning of surgical therapy of patients with trigeminal neuralgia.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
53. Yamakami I, Kobayashi E, Hirai S, Yamaura A. Preoperative assessment of trigeminal neuralgia and hemifacial spasm using constructive interference in steady state-three-dimensional Fourier transformation magnetic resonance imaging. *Neurol Med Chir (Tokyo).* 2000;40(11):545-555; discussion 555-546.	Observational-Dx	14 patients with trigeminal neuralgia and 8 patients with hemifacial spasm; 2 blinded observers	To evaluate the value of CISS-3D Fourier transformation MRI for visualizing the neurovascular relationships at the REZ in patients with trigeminal neuralgia and hemifacial spasm, as a method for indicating MVD.	CISS MRI provided excellent contrast between the CNs, small vessels, and cerebrospinal fluid in the cerebellopontine angle. Preoperative CISS MRI showed the neurovascular relationships at the REZ and identified the offending artery in all patients undergoing MVD. CISS MRI has high resolution and excellent contrast between CNs, small vessels, and cerebrospinal fluid, so can precisely and accurately delineate normal and abnormal neurovascular relationships at the REZ in the cerebellopontine angle, and is a valuable preoperative examination for MVD.	3
54. Borges A, Casselman J. Imaging the trigeminal nerve. *Eur J Radiol.* 2010;74(2):323-340.	Review/Other-Dx	N/A	Review most recent advances on MRI technique and a segmental imaging approach to the most common pathologic processes affecting the trigeminal nerve.	Imaging of patients with trigeminal neuropathy requires thorough understanding of the anatomy and physiology of this CN. The rapid development of cross-sectional imaging in the past decades led to an increasing proportion of recognizable causes of trigeminal dysfunction amenable to specific treatment and functional recovery.	4
55. Shimizu M, Imai H, Kagoshima K, Umezawa E, Shimizu T, Yoshimoto Y. Detection of compression vessels in trigeminal neuralgia by surface-rendering three-dimensional reconstruction of 1.5- and 3.0-T magnetic resonance imaging. *World Neurosurg.* 2013;80(3-4):378-385.	Observational-Dx	100 patients	To evaluate reconstructed 3D images obtained with 3D TOF MRA, phase contrast MR venography, and MRI using the TSE sequence with driven equilibrium pulse using both 1.5- and 3.0-T MRI systems to assess the specificity and sensitivity for detection of the compression vessels causing trigeminal neuralgia. No intravenous contrast was administered.	The agreement between MRI and surgical findings depended on the compression vessels. For superior cerebellar artery, 1.5- and 3.0-T MRI had 84.4% and 82.7% sensitivity and 100% and 100% specificity, respectively. For anterior inferior cerebellar artery, 1.5- and 3.0-T MRI had 33.3% and 50% sensitivity and 92.9% and 95% specificity, respectively. For the petrosal vein, 1.5- and 3.0-T MRI had 75% and 64.3% sensitivity and 79.2% and 78.1% specificity, respectively. Complete pain relief was obtained in 36 of 40 and 55 of 60 patients undergoing 1.5- and 3.0-T MRI, respectively.	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
56. Zeng Q, Zhou Q, Liu Z, Li C, Ni S, Xue F. Preoperative detection of the neurovascular relationship in trigeminal neuralgia using three-dimensional fast imaging employing steady-state acquisition (FIESTA) and magnetic resonance angiography (MRA). *J Clin Neurosci.* 2013;20(1):107-111.	Observational-Dx	37 Patients	To evaluate the ability of 3D FIESTA sequence in combination with 3D TOF MRA to detect NVC and differentiate vein from artery in patients with trigeminal neuralgia. No intravenous contrast was administered.	The use of 3D FIESTA in combination with MRA identified surgically verified neurovascular contact in 35 of 36 symptomatic nerves. The offending vessel (artery or vein) was correctly identified in 94.4% of patients, and agreement between preoperative MRI visualization and surgical findings was excellent (k = 0.92; 95% confidence interval, 0.67–1.00).	2
57. Garcia M, Naraghi R, Zumbrunn T, Rosch J, Hastreiter P, Dorfler A. High-resolution 3D-constructive interference in steady-state MR imaging and 3D time-of-flight MR angiography in neurovascular compression: a comparison between 3T and 1.5T. *AJNR Am J Neuroradiol.* 2012;33(7):1251-1256.	Observational-Dx	47 Patients	To determine the diagnostic performance of high-resolution 3D-CISS and 3D-TOF MRA at 3T compared with 1.5T MRI in NVC, both quantitatively and qualitatively. No intravenous contrast was administered.	Signal-to-noise ratio and contrast to noise ratio were significantly higher at 3T (P<.001). Significantly better anatomic conspicuity, including delineation of CNs, nerve branches, and assessment of small vessels, was obtained at 3T (P<.02). Severity of artifacts was significantly lower at 3T (P<.001). Consequently, overall image quality was significantly higher at 3T. NVC was significantly better delineated at 3T (P<.001). Six patients in whom NVC was not with certainty identifiable at 1.5T were correctly diagnosed at 3T.	2
58. Leal PR, Hermier M, Souza MA, Cristino-Filho G, Froment JC, Sindou M. Visualization of vascular compression of the trigeminal nerve with high-resolution 3T MRI: a prospective study comparing preoperative imaging analysis to surgical findings in 40 consecutive patients who underwent microvascular decompression for trigeminal neuralgia. *Neurosurgery.* 2011;69(1):15-25; discussion 26.	Observational-Dx	40 patients	To address the predictive value of 3T MRI in detecting and assessing features of NVC, particularly regarding the degree of compression exerted on the root, in patients who underwent MVD for classic primary trigeminal neuralgia.	For prediction of NVC, image analysis corresponded with surgical findings in 39 cases. Of the 3 patients in whom image analysis did not show NVC, 2 did not have NVC at the time of intraoperative observation. MRI sensitivity was 97.4% (37/38), and specificity was 100% (2/2). The kappa coefficients (kappa) for predicting the offending vessel, its location, and the site of compression were 0.882, 0.813, and 0.942, respectively. Image analysis correctly defined the severity of the compression in 31 of the 37 cases. The kappa coefficients predicting the degree of compression were 0.813, 0.833, and 0.852, respectively, for Grades 1 (simple contact), 2 (distortion), and 3 (marked indentation).	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
59. Alberico RA, Fenstermaker RA, Lobel J. Focal enhancement of cranial nerve V after radiosurgery with the Leksell gamma knife: experience in 15 patients with medically refractory trigeminal neuralgia. *AJNR Am J Neuroradiol.* 2001;22(10):1944-1948.	Observational-Dx	15 patients	Retrospective review of MR images to define MRI characteristics in CN V after GKRS.	Data suggested a correlation between enhancement with radiation dose (*P*=.06). No correlation of enhancement with treatment response or time to follow-up existed (*P*>.05). Study concludes that the trigeminal nerve often enhances at the target site after radiosurgery. Lack of trigeminal nerve enhancement occurred only with lower doses (35 Gy at 50%). MRI may be useful to confirm the presence and location of the treatment site after GKRS for trigeminal neuralgia.	3
60. Erbay SH, Bhadelia RA, O'Callaghan M, et al. Nerve atrophy in severe trigeminal neuralgia: noninvasive confirmation at MR imaging--initial experience. *Radiology.* 2006;238(2):689-692.	Observational-Dx	31 patients; 2 blinded observers	Retrospective study to examine the size of the trigeminal nerve on MR images of patients with unilateral trigeminal neuralgia.	Mean diameter of the trigeminal nerve on the symptomatic side was significantly smaller than the mean diameter on the asymptomatic side in 30/31 patients (2.11 mm +/- 0.40 [standard deviation] and 2.62 mm +/- 0.56, *P*<.001, 95% CI: -0.35, -0.67 mm).The mean cross-sectional area on the symptomatic side was significantly smaller than the area on the asymptomatic side in 27/31 patients (4.50 mm(2) +/- 1.75 and 6.28 mm(2) +/- 2.19, *P*<.001, 95% CI: -2.41, -1.16 mm(2)). Trigeminal nerve atrophy can be depicted noninvasively.	4
61. Erbay SH, Bhadelia RA, Riesenburger R, et al. Association between neurovascular contact on MRI and response to gamma knife radiosurgery in trigeminal neuralgia. *Neuroradiology.* 2006;48(1):26-30.	Observational-Dx	40 patients; 2 blinded observers	To evaluate whether the presence of NVC at the REZ of the trigeminal nerve on pre-gamma knife MRI predicts an increased likelihood of an adequate response to GKRS.	Patients with NVC were 7 times more likely to have an adequate response to GKRS than those without NVC (odds ratio =7.5).The presence of NVC on pretreatment MRI predicts an increased likelihood of an adequate response to GKRS.	2
62. Flickinger JC, Pollock BE, Kondziolka D, et al. Does increased nerve length within the treatment volume improve trigeminal neuralgia radiosurgery? A prospective double-blind, randomized study. *Int J Radiat Oncol Biol Phys.* 2001;51(2):449-454.	Experimental-Dx	87 patients	Prospective, double-blind, randomized study to determine whether increased nerve length within the treatment volume improve trigeminal neuralgia radiosurgery. Patients were randomized to undergo retrogasserian GKRS (75 Gy maximal dose with 4 mm diameter collimators) using either 1 (n=44) or 2 (n=43) isocenters.	Improved pain relief correlated with younger age (*P*=0.025) and fewer prior procedures (*P*=0.039) and complications (numbness or paresthesias) correlated with the nerve length irradiated (*P*=0.018). Increase of treatment volume to include a longer nerve length for trigeminal neuralgia radiosurgery may increase complications but not significantly improve pain relief.	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
63. Lang E, Naraghi R, Tanrikulu L, et al. Neurovascular relationship at the trigeminal root entry zone in persistent idiopathic facial pain: findings from MRI 3D visualisation. *J Neurol Neurosurg Psychiatry.* 2005;76(11):1506-1509.	Observational-Dx	12 patients	To examine the frequency of vessel–TREZ contact on the symptomatic and asymptomatic sides in patients with unilateral persistent idiopathic facial pain by means of a 3D MRI visualization technique.	The frequency of artery-TREZ, vein-TREZ, or vessel (artery/vein)-TREZ contacts on the symptomatic and asymptomatic sides did not differ significantly. On the symptomatic side, vessel-TREZ contact was found in 58% of patients (sensitivity). On the asymptomatic side, vessel-TREZ contact was absent in 33% of patients (specificity).	1
64. Lim M, Cotrutz C, Romanelli P, et al. Stereotactic radiosurgery using CT cisternography and non-isocentric planning for the treatment of trigeminal neuralgia. *Comput Aided Surg.* 2006;11(1):11-20.	Observational-Dx	29 patients	To assess the role of frameless CyberKnife using X-ray image-guided targeting, a novel CT method for target definition, and non-isocentric planning in patients with trigeminal neuralgia.	Image-guided robotic radiosurgery can effectively lesion the trigeminal nerve. Further follow-up is needed to determine efficacy of method.	3
65. Liu M, Wu CY, Liu YG, Wang HW, Meng FG. Three-dimensional computed tomography-guided radiofrequency trigeminal rhizotomy for treatment of idiopathic trigeminal neuralgia. *Chin Med Sci J.* 2005;20(3):206-209.	Observational-Dx	18 patients	To examine the efficacy of 3D-CT guided radiofrequency trigeminal rhizotomy in treatment of idiopathic trigeminal neuralgia.	3D-CT foramen ovale locations can raise the successful rate of puncture, enhance the safety, and reduce the incidence rate of complication.	4
66. Lorenzoni JG, Massager N, David P, et al. Neurovascular compression anatomy and pain outcome in patients with classic trigeminal neuralgia treated by radiosurgery. *Neurosurgery.* 2008;62(2):368-375; discussion 375-366.	Observational-Dx	89 consecutive patients	View MRI images to examine the influence of the anatomy of NVC on pain outcome in patients with classic trigeminal neuralgia treated by radiosurgery.	Visualization of NVC, nerve atrophy, and nerve dislocation on MRI was not associated with pain outcome. A large vessel compressing the nerve and deforming the brainstem and proximal NVC were associated with a lesser pain control.	3
67. Massager N, Abeloos L, Devriendt D, Op de Beeck M, Levivier M. Clinical evaluation of targeting accuracy of gamma knife radiosurgery in trigeminal neuralgia. *Int J Radiat Oncol Biol Phys.* 2007;69(5):1514-1520.	Observational-Dx	65 patients	Review data of patients to examine clinically the targeting accuracy of radiosurgical treatment with the Leksell Gamma Knife for trigeminal neuralgia. Study also evaluates the applied radiation dose within the area of focal contrast enhancement on the trigeminal nerve root following radiosurgery.	The median deviation found in clinical assessment of gamma knife treatment for trigeminal neuralgia is low and compatible with its high-rate of efficiency. Focal enhancement of the trigeminal nerve after radiosurgery occurred in 83% of patients and was not associated with clinical outcome. Focal enhancement borders along the nerve root fit with a median dose of 77 +/- 8.7 Gy.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
68. Peker S, Bayrakli F, Kilic T, Pamir MN. Gamma-knife radiosurgery in the treatment of trigeminal schwannomas. *Acta Neurochir (Wien).* 2007;149(11):1133-1137; discussion 1137.	Observational-Dx	15 patients	To analyze the long-term results of patients with newly diagnosed or residual/recurrent trigeminal schwannoma who were treated with gamma-knife.	MRI revealed reduction of tumor size in 13 and no size change in 2 patients. The tumor growth control rate was 100% and only 1 patient had transient facial numbness and diplopia. Gamma-knife radiosurgery is associated with good tumor control and a minimal risk of adverse radiation effects in patients with small to moderate size trigeminal schwannomas.	4
69. Sekimoto K, Koizuka S, Saito S, Goto F. Thermogangliolysis of the Gasserian ganglion under computed tomography fluoroscopy. *J Anesth.* 2005;19(2):177-179.	Review/Other-Dx	2 patients	To examine value of CT fluoroscopy-guided Gasserian ganglion thermolysis.	CT fluoroscopy-guided Gasserian ganglion thermolysis is a safe, quick, and effective treatment for trigeminal neuralgia.	4
70. Shaya M, Jawahar A, Caldito G, Sin A, Willis BK, Nanda A. Gamma knife radiosurgery for trigeminal neuralgia: a study of predictors of success, efficacy, safety, and outcome at LSUHSC. *Surg Neurol.* 2004;61(6):529-534; discussion 534-525.	Observational-Dx	40 patients; 2 blinded observers	Retrospectively review the outcome of patients to determine whether gamma-knife surgery is an effective treatment for medically intractable trigeminal neuralgia.	Gamma-knife surgery is recommended for treating trigeminal neuralgia. Vascular compression of the nerve at the REZ was not a predictor of the outcome of gamma surgery for trigeminal neuralgia. The outcome improves with marginal prescription dose of 80 Gy or higher.	2
71. Zhang WJ, Wang Y, Chen MJ. [Research of the puncture depth in treatment of trigeminal neuralgia (TN) by radiofrequency thermocoagulation(RFT) under CT location]. *Shanghai Kou Qiang Yi Xue.* 2003;12(2):94-95.	Review/Other-Dx	121 patients	To control the puncture depth properly and avoid the complications, CT scan was used to measure the depth as the puncture needle perforated through the foramen ovale.	The puncture depth can be manipulated correctly by CT location, the second and third branches can be avoided to be damaged within 0.8 cm, and the first branch can be avoided to be injured between 1.2 cm and 1.5 cm.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
72. Park KJ, Kano H, Berkowitz O, et al. Computed tomography-guided gamma knife stereotactic radiosurgery for trigeminal neuralgia. *Acta Neurochir (Wien)*. 2011;153(8):1601-1609.	Observational-Tx	21 patients	To evaluate management outcomes in trigeminal neuralgia patient's ineligible for MRI and who instead underwent GKRS using CT. Authors reviewed their experience with CT-guided GKRS in 21 patients. Treatment outcomes were compared to 459 patients who underwent MRI-guided GKRS for trigeminal neuralgia at the institute in the same time interval.	Targeting of the trigeminal nerve guided by CT scan was feasible in all patients. Stereotactic frame titanium pin-related artifacts that interfered with full visualization of the trigeminal nerve were found in 1 patient who had the ipsilateral posterior pin placed near the inion. After GKRS, 90% of patients achieved initial pain relief that was adequate or better, with or without medication (Barrow Neurological Institute pain scores I-IIIb). Median time to pain relief was 2.6 weeks. Pain relief was maintained in 81% at 1 year, 66% at 2 years, and 46% at 5 years. 8 (42%) of 19 patients who achieved initial pain relief reported some recurrent pain at a median of 18 months after GKRS. Some degree of facial sensory dysfunction occurred in 19% of patients within 24 months of GKRS. CT-guided GKRS provides a similar rate of pain relief as MRI-guided radiosurgery. The posterior pins should be placed at least 1 cm away from the inion to reduce pin and frame-related artifacts on the targeting CT scan. Study indicates that GKRS using CT targeting is appropriate for patients with medically refractory trigeminal neuralgia who are unsuitable for MRI.	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
73. Sheehan JP, Ray DK, Monteith S, et al. Gamma Knife radiosurgery for trigeminal neuralgia: the impact of magnetic resonance imaging-detected vascular impingement of the affected nerve. *J Neurosurg.* 2010;113(1):53-58.	Observational-Dx	106 patients	Retrospective study to explore the rate of occurrence of MRI-demonstrated vascular impingement of the affected nerve and the extent to which vascular impingement affects pain relief in a population of trigeminal neuralgia patients undergoing GKRS.	Vessel impingement was seen in 63 patients (59%). There was no significant difference in pain relief between those with and without vascular impingement following GKRS ($P>0.05$). In those with vascular impingement on MRI, the median fraction of vessel impingement was 0.3 (range 0.04-0.59). The median dose to the site of maximum impingement was 42 Gy (range 2.9-79 Gy). Increased dose ($P=0.019$) and closer proximity of the isocenter to the site of maximum vessel impingement ($P=0.012$) correlated in a statistically significant fashion with improved Barrow Neurological Institute (BNI) scores in those demonstrating vascular impingement on the GKRS planning MRI. Vascular impingement of the affected nerve was seen in the majority of patients with trigeminal neuralgia. Overall pain relief following GKRS was comparable in those with and without evidence of vascular compression on MRI. In subgroup analysis of those with MRI evidence of vessel impingement of the affected trigeminal nerve, pain relief correlated with a higher dose to the point of contact between the impinging vessel and the trigeminal nerve. Such a finding may point to vascular changes affording at least some degree of relief following GKRS for trigeminal neuralgia.	3
74. Herweh C, Kress B, Rasche D, et al. Loss of anisotropy in trigeminal neuralgia revealed by diffusion tensor imaging. *Neurology.* 2007;68(10):776-778.	Review/Other-Dx	6 patients with trigeminal neuralgia; 7 healthy volunteers	Study the trigeminal nerve in healthy volunteers and patients with trigeminal neuralgia with the use of diffusion tensor imaging derived parameter fractional anisotropy.	Reduction of fractional anisotropy in the affected nerve in 3/6 patients with accompanying nerve-vessel conflict and atrophy. Reversibility of abnormally low fractional anisotropy values was demonstrated in 1 patient successfully treated with MVD.	4
75. Oishi M, Fukuda M, Takao T, Ishida G, Sato M, Fujii Y. [The utility of presurgical simulation of microvascular decompression by MR virtual endoscopy]. *No Shinkei Geka.* 2007;35(11):1087-1095.	Review/Other-Dx	12 patients	To assess the value of virtual endoscopy created by volume rendering of MR images in presurgical simulation for trigeminal neuralgia and hemifacial spasm.	Presurgical simulation by virtual endoscopy provides excellent visualization of the 3D relations of neurovascular structures in the cerebellopontine angle region and helps achieve a safe surgery.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
76. Lutz J, Linn J, Mehrkens JH, et al. Trigeminal neuralgia due to neurovascular compression: high-spatial-resolution diffusion-tensor imaging reveals microstructural neural changes. *Radiology.* 2011;258(2):524-530.	Observational-Dx	20 consecutive patients	To preoperatively detect, by using diffusion-tensor imaging coregistered with anatomic MRI, suspected microstructural tissue changes of the trigeminal nerves in patients with trigeminal neuralgia resulting from NVC.	Fractional anisotropy was significantly lower (*P*=.004) on the trigeminal neuralgia-affected side (mean Fractional anisotropy, 0.203) than on the contralateral side (mean Fractional anisotropy, 0.239). Apparent diffusion coefficient was nearly identical between the normal and trigeminal neuralgia affected nerve tissues. These findings suggest that diffusion-tensor imaging enables the identification and quantification of anisotropic changes between normal nerve tissue and trigeminal neuralgia -affected trigeminal nerves. Coregistration of anatomic FIESTA imaging and diffusion-tensor imaging facilitates excellent delineation of the cisternal segments of the trigeminal nerves.	2
77. Laine FJ, Underhill T. Imaging of the lower cranial nerves. *Neuroimaging Clin N Am.* 2004;14(4):595-609.	Review/Other-Dx	N/A	Review the normal anatomy and pathologic entities of the lower CNs and correlate with line diagrams and MR images.	MRI allows detailed evaluation of CN anatomy and pathology. Newer MR sequences allow more sensitive methods of detecting pathology and determining the cause of cranial neuropathy. Correlation of clinical findings with MRI will improve evaluation.	4
78. Toulgoat F, Sarrazin JL, Benoudiba F, et al. Facial nerve: from anatomy to pathology. *Diagn Interv Imaging.* 2013;94(10):1033-1042.	Review/Other-Dx	N/A	To provide education on the anatomy of facial nerves.	No results stated.	4
79. Jemec B, Grobbelaar AO, Harrison DH. The abnormal nucleus as a cause of congenital facial palsy. *Arch Dis Child.* 2000;83(3):256-258.	Observational-Dx	21 patients	Performed MRI on patients with unilateral congenital facial palsy to examine the role of a neuroanatomical abnormality as a cause of unilateral congenital facial palsy.	Of 15 patients with unilateral congenital facial palsy, 4 (27%) had an abnormal nucleus or an abnormal weighting of this area on the MRI scan, compared to 1 (17%) of the remaining 6 patients.	4
80. Kinoshita T, Ishii K, Okitsu T, Ogawa T, Okudera T. High-intensity facial nerve lesions on T2-weighted images in chronic persistent facial nerve palsy. *Neuroradiology.* 2001;43(5):388-392.	Review/Other-Dx	95 patients	To estimate the value of MRI in detecting irreversibly paralyzed facial nerves.	The geniculate ganglion and tympanic segment gave high signal on T2-weighted images in the chronic stage of persistent palsy. The enhancement pattern of the facial nerve in the chronic persistent facial nerve palsy is similar to that in the acute palsy with good recovery. Findings suggest T2-weighted MRI can be used to show severely damaged facial nerves.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
81. Park SU, Kim HJ, Cho YK, et al. The usefulness of MR imaging of the temporal bone in the evaluation of patients with facial and audiovestibular dysfunction. *Korean J Radiol.* 2002;3(1):16-23.	Observational-Dx	179 patients; 2 observers	Retrospective review of MRI to evaluate the value of MRI of the temporal bone in patients with facial and audiovestibular dysfunction with emphasis on the importance of contrast enhancement.	MRI demonstrated positive findings in 78 (44%) of 179 patients. 30 (38%) of 78 had lesions that could be recognized only at contrast-enhanced MRI. Recommends use of contrast-enhanced MRI.	3
82. Shinohara Y, Kinoshita T, Sugihara S, et al. [MR imaging for evaluation of severe facial nerve damage in patients with facial nerve palsy]. *Nihon Igaku Hoshasen Gakkai Zasshi.* 2005;65(4):353-358.	Review/Other-Dx	26 consecutive patients	Retrospective review of patients with facial nerve palsy to evaluate the value of MRI for the detection of severe facial nerve damage.	The geniculate ganglion, labyrinthine segment, and tympanic segment or mastoid segment showed high signal intensity on T2-weighted images in 9/13 non-responders. High signal intensity area on T2-weighted images is a marker of severe facial nerve damage. FLAIR imaging is useful for identification of T2-prolongation in the distal intrameatal segment.	4
83. Raghavan P, Mukherjee S, Phillips CD. Imaging of the facial nerve. *Neuroimaging Clin N Am.* 2009;19(3):407-425.	Review/Other-Dx	N/A	Review the anatomy of the facial nerve and relevant, current clinical evaluation and imaging strategies.	No results stated.	4
84. Bodenez C, Darrouzet V, Rouanet-Larriviere M, et al. [Facial paralysis after temporal bone trauma]. *Ann Otolaryngol Chir Cervicofac.* 2006;123(1):9-16.	Observational-Dx	64 patients	To evaluate functional outcome in cases of facial paralysis following temporal bone fracture and review arguments leading either to treatment. Electrophysiological testing and CT results were the main points of the decision algorithm.	The most accurate exploration for guiding treatment is electroneuromyography. Good results (grades I to II on the House and Brackmann scale) were obtained in 63% of cases after medical management and in 39% of cases after surgical treatment. Grades III or IV were obtained in 13% of medically-treated patients and 42% of surgically-treated patients. Electrophysiological testing combined with CT enabled accurate indications for surgical treatment.	3
85. Kim IS, Shin SH, Kim J, Lee WS, Lee HK. Correlation between MRI and operative findings in Bell's palsy and Ramsay Hunt syndrome. *Yonsei Med J.* 2007;48(6):963-968.	Observational-Dx	13 patients	Retrospective study to examine the correlation between Gd-enhanced MRI results and surgical findings of facial nerves in Bell's palsy and Ramsay Hunt syndrome.	MRI enhancement of facial nerves in Bell's palsy and Ramsay Hunt syndrome correlated with the extent of intratemporal lesions of facial nerves, especially in the labyrinthine segment.	3
86. Kinoshita T, Ishii K, Okitsu T, Okudera T, Ogawa T. Facial nerve palsy: evaluation by contrast-enhanced MR imaging. *Clin Radiol.* 2001;56(11):926-932.	Observational-Dx	147 patients 300 control subjects; 2 blinded observers	To examine the value of contrast-enhanced MRI in patients with peripheral facial nerve palsy.	Enhancement of the distal intrameatal segment and the labyrinthine segment was respectively found in 67% and 43% of patients with Bell's palsy. The geniculate ganglion or the tympanic-mastoid segment was enhanced in 21% of normal controls vs 91% of patients with Bell's palsy. Contrast-enhanced MRI can reveal inflammatory facial nerve lesions and traumatic nerve injury.	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
87. Seok JI, Lee DK, Kim KJ. The usefulness of clinical findings in localising lesions in Bell's palsy: comparison with MRI. *J Neurol Neurosurg Psychiatry.* 2008;79(4):418-420.	Observational-Dx	57 patients	Compare MRI with clinical findings to determine the value of clinical findings in determining lesion sites.	Lesion sites determined from clinical findings were: the infrageniculate-suprastapedial segment, 13 (23%); the infrastapedial-suprachordal segment, 9 (16%); and the mastoid segment, 35 (61%).On MRI, 51 (89%) of 57 patients showed abnormal enhancement of the facial nerve. Clinical history is not helpful in determining the site of a lesion in Bell's palsy. The segment most frequently involved in Bell's palsy is the suprageniculate segment.	3
88. Yetiser S, Kazkayas M, Altinok D, Karadeniz Y. Magnetic resonance imaging of the intratemporal facial nerve in idiopathic peripheral facial palsy. *Clin Imaging.* 2003;27(2):77-81.	Observational-Dx	13 patients; 10 control	To examine the prevalence of facial nerve involvement with Gd-enhanced MRI in patients with idiopathic peripheral facial palsy, and to review the localization and pattern of enhancement.	Correlation existed between the enhancement of the facial nerve and the time for recovery. Contrast enhancement of the paralytic facial nerve can be a radiological sign of a neural inflammation and may indicate a prolonged recovery.	3
89. Hong HS, Yi BH, Cha JG, et al. Enhancement pattern of the normal facial nerve at 3.0 T temporal MRI. *Br J Radiol.* 2010;83(986):118-121.	Observational-Dx	20 patients	To evaluate the enhancement pattern of the normal facial nerve at 3.0 T temporal MRI.	40 nerves (100%) were visibly enhanced along at least 1 segment of the facial nerve. The enhanced segments included the geniculate ganglion (77.5%), tympanic segment (37.5%) and mastoid segment (100%). Even the facial nerve in the internal auditory canal (15%) and labyrinthine segments (5%) showed mild enhancement. The use of high-resolution, high signal-to-noise ratio (with 3 T MRI), thin-section contrast-enhanced 3D SPGR sequences showed enhancement of the normal facial nerve along the whole course of the nerve; however, only mild enhancement was observed in areas associated with acute neuritis, namely the canalicular and labyrinthine segment.	4
90. Belveze P, Guichard C, Gabrillargues J, Mom T, Gilain L. [Magnetic Resonance Imaging in Facial Bell's Palsy]. *Ann Otolaryngol Chir Cervicofac.* 2002;119(2):81-88.	Observational-Dx	34 patients	Prospective study to define MRI data in facial Bell's palsy and correlate them with clinical data.	Facial nerve enhancement was noted in 71.5% on first MRI and in 30% on second MRI. Gd-enhancement was mostly seen on the Fundus. No patients with facial nerve enhancement persisting at 3 months were clinically normalized at 1 month.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
91. Kaylie DM, Wax MK, Weissman JL. Preoperative facial muscle imaging predicts final facial function after facial nerve grafting. *AJNR Am J Neuroradiol.* 2003;24(3):326-330.	Observational-Dx	26 patients	Retrospective review to determine whether preoperative MRI of facial muscles predicts facial function after facial nerve grafting.	No or mild asymmetry had 86% PPV for good to excellent functional outcome. 80% of patients with pronounced asymmetry experienced poor functional outcomes. 6/8 patients with malignant and perineural tumors at surgery had asymmetrical facial muscles revealed by preoperative MRI.	2
92. Kress B, Griesbeck F, Stippich C, Bahren W, Sartor K. Bell palsy: quantitative analysis of MR imaging data as a method of predicting outcome. *Radiology.* 2004;230(2):504-509.	Observational-Dx	39 patients	Prospective, single-blinded study to assess the prognostic value of quantitative analyses of region-of-interest MRI data in patients with acute facial nerve palsy. Signal intensity increases and MRI indexes were compared with clinical findings and electrophysiologic data.	MRI index was higher in patients with poor outcomes than in patients with favorable outcomes (specificity 97%; sensitivity 75%; $P<.01$). The signal intensity increases in the internal auditory canal were significantly different between patients who progressed to full recovery (mean increase 45.7%) and patients who developed chronic facial paralysis (mean increase 156.5%) (Sensitivity 100%; specificity 97%; $P<.001$). Results of differentiating between patients with good and those with poor outcomes on the basis of signal intensity measurements in the internal auditory canal were found to be in complete agreement with electrophysiologic data.	2
93. Kress BP, Griesbeck F, Efinger K, et al. [The prognostic value of quantified MRI at an early stage of Bell's palsy]. *Rofo.* 2002;174(4):426-432.	Observational-Dx	30 patients	Prospective, blinded study to assess whether MRI has a prognostic value at an early stage of Bell's palsy. Compared results with clinical outcome and electrophysiology.	MRI has a prognostic value at an early stage of the illness. In the clinical setting this measurement is easy to perform, so that it is possible to obtain prognostic information at a stage when causal treatment is still possible.	2
94. Yla-Kotola TM, Kauhanen MS, Koskinen SK, Asko-Seljavaara SL. Magnetic resonance imaging of microneurovascular free muscle flaps in facial reanimation. *Br J Plast Surg.* 2005;58(1):22-27.	Observational-Dx	15 patients	To describe the survival and volume of microneurovascular muscle flaps at different times after two-stage facial reanimation procedure by using MRI and to compare the functional outcome with MRI findings.	MRI can be used to assess the muscle structure of free microneurovascular flaps. Normal findings in MRI correlate with good clinical outcome in facial reanimation. A good functional result correlates with a shorter follow-up time and normal muscle structure in MRI.	3
95. Jun BC, Chang KH, Lee SJ, Park YS. Clinical feasibility of temporal bone magnetic resonance imaging as a prognostic tool in idiopathic acute facial palsy. *J Laryngol Otol.* 2012;126(9):893-896.	Observational-Dx	44 patients	To assess the feasibility of temporal bone MRI for evaluating the severity and prognosis of idiopathic acute facial nerve palsy. With contrast.	The visually determined degree of facial nerve enhancement did not correlate significantly with the House-Brackmann grade at either the early or late stages ($P>0.05$). Results using the region-of-interest system were similar ($P>0.05$).	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
96. Ulug T, Arif Ulubil S. Management of facial paralysis in temporal bone fractures: a prospective study analyzing 11 operated fractures. *Am J Otolaryngol.* 2005;26(4):230-238.	Observational-Dx	10 patients; 11 bone fractures	Prospective study and literature review to evaluate patients operated on for traumatic facial paralysis.	High-resolution CT, with the contribution of electromyography and clinical judgment, has the greatest impact in decision making in patients seen late. In the prospective study, the recovery of satisfactory facial nerve function could be achieved, regardless of timing of surgery performed, within the first 3 months after the onset of paralysis. Study demonstrates that unless there is a disruption of the main trunk, necessitating primary end-to-end anastomosis or grafting, the type of injury does not have any clear effect on the facial outcome, as long as appropriate surgical management is applied.	3
97. Yu Z, Han D, Dai H, Zhao S, Zheng Y. Diagnosis of the pathological exposure of the mastoid portion of the facial nerve by CT scanning. *Acta Otolaryngol.* 2007;127(3):323-327.	Review/Other-Dx	6 patients with suppurative otitis media; 3 patients with auditory canal cholesteatoma	To examine the value of high resolution CT of pathological exposure of the mastoid portion of facial nerve and provide valuable information for otologic surgery, and analyze the cause of facial nerve paralysis after operation.	Through routine CT scan, patients with chronic suppurative otitis media and those with external auditory canal cholesteatoma were found to have pathological exposure of the mastoid portion of the facial nerve. Coronal views could clearly show the size and the position of the exposure; the corresponding surgical findings (pathological exposure) for the facial nerve could be confirmed in all 9 patients. CT demonstrated that the patient who had suffered postoperative facial nerve paralysis have pre-existing pathological exposure of the mastoid portion of the facial nerve.	4
98. Vianna M, Adams M, Schachern P, Lazarini PR, Paparella MM, Cureoglu S. Differences in the diameter of facial nerve and facial canal in bell's palsy--a 3-dimensional temporal bone study. *Otol Neurotol.* 2014;35(3):514-518.	Review/Other-Dx	22 temporal bones	To compare both the facial nerve and facial canal diameters between patients with and without a history of Bell's palsy to determine if there may be an anatomic predisposition for this disease. No intravenous contrast was administered.	The mean diameter of the facial canal and facial nerve was significantly smaller in the tympanic and mastoid segments (P=0.01) in the Bell's palsy group than in the controls. The facial nerve to facial canal diameter ratio (facial nerve/facial canal) was significantly bigger in the mastoid segment of Bell's palsy group, when compared with the controls. When comparing the Bell's palsy and control groups, the narrowest part of facial canal was the labyrinthine segment in control group and the tympanic segment in the Bell's palsy.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
99. Policeni BA, Smoker WR. Pathologic conditions of the lower cranial nerves IX, X, XI, and XII. *Neuroimaging Clin N Am.* 2008;18(2):347-368, xi.	Review/Other-Dx	N/A	Review pathologic conditions that cause lower CN IX, X, XI, and XII symptoms.	Being aware of nerve pathways and relations to surrounding structures is important when evaluating patients who have lower CN symptoms. A systematic "segment-based" approach helps to narrow the differential diagnosis.	4
100. Hiwatashi A, Matsushima T, Yoshiura T, et al. MRI of glossopharyngeal neuralgia caused by neurovascular compression. *AJR Am J Roentgenol.* 2008;191(2):578-581.	Observational-Dx	10 patients	Retrospectively study preoperative MR images of patients with glossopharyngeal neuralgia caused by NVC.	MRI may benefit patients with glossopharyngeal neuralgia and an offending compressing artery. If the offending vessel was the posterior inferior cerebellar artery, a loop formation at the supraolivary fossette was always seen, while if it was the anterior inferior cerebellar artery, glossopharyngeal neuralgia was difficult to diagnose before surgery.	3
101. Tanrikulu L, Hastreiter P, Troescher-Weber R, Buchfelder M, Naraghi R. Intraoperative three-dimensional visualization in microvascular decompression. *J Neurosurg.* 2007;107(6):1137-1143.	Review/Other-Dx	50 patients	To analyze 3D visualization of NVC syndromes in the operating room during MVD.	Interactive 3D visualization by direct volume rendering of high-resolution MRI data offered the opportunity for noninvasive virtual exploration of the neurovascular structures during surgery.	4
102. Gaul C, Hastreiter P, Duncker A, Naraghi R. Diagnosis and neurosurgical treatment of glossopharyngeal neuralgia: clinical findings and 3-D visualization of neurovascular compression in 19 consecutive patients. *J Headache Pain.* 2011;12(5):527-534.	Observational-Dx	19 consecutive patients	To report clinical data and MRI findings in a case series of 19 patients, of whom 18 underwent surgery.	MVD is a second-line treatment after failure of standard medical treatment with high success in glossopharyngeal neuralgia. High-resolution MRI and 3D visualization of the brainstem and accompanying vessels as well as the CNs is helpful in identifying NVC before MVD procedure.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
103. Linn J, Moriggl B, Schwarz F, et al. Cisternal segments of the glossopharyngeal, vagus, and accessory nerves: detailed magnetic resonance imaging-demonstrated anatomy and neurovascular relationships. *J Neurosurg.* 2009;110(5):1026-1041.	Observational-Dx	25 patients	To determine whether high-resolution MRI is suitable for identifying and differentiating among the nerve root bundles of the glossopharyngeal (CN IX), vagus (CN X), and accessory nerves (CN XI) as well as any adjacent vessels. Patients underwent MRI using the 3D CISS sequence, as well as noncontrast and contrast-enhanced 3D-TOF MRA.	The 3D CISS sequence successfully depicted CNs IX and X in 100% of the sides. Nerve root bundles of the cranial segment of CN XI were identified in 88% of the sides and those of the spinal segment of CN XI were noted in 93% of the sides. Landmarks useful in identifying the lower CNs included the vagal trigone, the choroid plexus of the lateral recess, the glossopharyngeal and vagal meatus, the inferior petrosal sinus, and the vertebral artery. The combined use of 3D CISS and 3D-TOF sequences demonstrated neurovascular contacts at the nerve root entry or exit zones in 19% of all nerves visualized. The combined use of 3D CISS MRI and 3D-TOF MRA (with or without contrast) successfully displays the detailed anatomy of the lower CNs and adjacent structures in vivo. These imaging sequences have the potential to aid the preoperative diagnosis of and the presurgical planning for pathology in this anatomical area.	3
104. Larson TC, 3rd, Aulino JM, Laine FJ. Imaging of the glossopharyngeal, vagus, and accessory nerves. *Semin Ultrasound CT MR.* 2002;23(3):238-255.	Review/Other-Dx	N/A	Review imaging of glossopharyngeal, vagus, and accessory nerves.	MRI with and without contrast is the mainstay of imaging of CNs IX, X and XI pathology, but CT provides substantial information as well.	4
105. Robinson S, Pitkaranta A. Radiology findings in adult patients with vocal fold paralysis. *Clin Radiol.* 2006;61(10):863-867.	Observational-Dx	100 consecutive patients	Retrospective analysis of charts to assess role of radiology in identifying the cause of VFP.	Paralysis was related to previous surgery in 66% of patients. 34% of cases were labeled idiopathic after clinical examination. Thorough radiological workup helps to reduce the amount of idiopathic cases of VFP and guides appropriate therapy.	3
106. El Badawey MR, Punekar S, Zammit-Maempel I. Prospective study to assess vocal cord palsy investigations. *Otolaryngol Head Neck Surg.* 2008;138(6):788-790.	Observational-Dx	86 patients	Prospective cohort study to assess the investigation and clinical outcome of patients with unexplained vocal cord palsy.	24 (36%) patients had positive findings on CT. 21 (24%) cases showed mediastinal adenopathy +/- pulmonary mass. CT neck +/- chest plays an important role in the evaluation of vocal cord palsy patients. The majority of pertinent radiologic findings involve malignant neoplasm.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
107. Bando H, Nishio T, Bamba H, Uno T, Hisa Y. Vocal fold paralysis as a sign of chest diseases: a 15-year retrospective study. *World J Surg.* 2006;30(3):293-298.	Review/Other-Dx	42 patients	Retrospective analysis of patients to examine the diagnostic procedure for VFP.	For diagnosis of VFP, chest radiograph was useful but not always enough for detecting the primary lesion. Necessity of further exams including contrast-enhanced chest CT must be considered in cases with negative chest radiographs.	4
108. Infante-Velazquez EJ, Gomez-Fernandez L, Perez del Campo YH, Diaz-Perez MJ, Vergara-Consuegra O. [Brainstem lesions: clinicoradiological electrophysiological correlation when chronic]. *Rev Neurol.* 2002;34(4):317-321.	Observational-Dx	28 patients	Retrospective study to define the clinical, imaging and electrophysiological correlation in patients with chronic brainstem lesions.	Lesions were detected on MR in 86.6% of the cases and on CT scans in 27.3%. The brainstem auditory evoked potentials were abnormal in 75% of the patients. There was close correlation between the clinical topography and results of MR ($P<0.05$) but little correlation with the CT scans. Study recommends MR in patients.	3
109. Saglitz SA, Gaab MR. Investigations using magnetic resonance imaging: is neurovascular compression present in patients with essential hypertension? *J Neurosurg.* 2002;96(6):1006-1012.	Observational-Dx	25 patients with essential hypertension, 30 normotensive volunteers; 10 patients with renal hypertension	To examine a possible relationship between NVC of the rostral ventrolateral medulla oblongata and essential hypertension using a specifically designed MRI method.	Neurovascular contacts on either side of the rostral ventrolateral medulla were documented in 68% of patients with essential hypertension, 53% of normotensive volunteers, and 50% of patients with renal hypertension. Results do not support the theory of NVC in cases of essential hypertension. Findings of neurovascular contacts on MR images do not indicate decompression surgery.	4
110. Chin SC, Edelstein S, Chen CY, Som PM. Using CT to localize side and level of vocal cord paralysis. *AJR Am J Roentgenol.* 2003;180(4):1165-1170.	Observational-Dx	40 patients	Retrospective study to assess the relative accuracy of imaging findings related to peripheral recurrent nerve paralysis on axial CT studies of the neck. Study also assessed imaging findings of central vagal neuropathy.	3 reliable imaging findings associated with vocal cord paralysis were identified on routine axial CT studies: ipsilateral pyriform sinus dilatation, medial positioning and thickening of the ipsilateral aryepiglottic fold, and ipsilateral laryngeal ventricle dilatation. Coronal reformatted images of the larynx may be helpful, but they are not necessary in 95% of patients. Ipsilateral pharyngeal constrictor muscle atrophy is a helpful imaging finding to localize a more central vagal neuropathy.	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
111. Kumar VA, Lewin JS, Ginsberg LE. CT assessment of vocal cord medialization. *AJNR Am J Neuroradiol.* 2006;27(8):1643-1646.	Review/Other-Dx	12 patients	Retrospective analysis to demonstrate the CT appearance of implants used for the treatment of UVCP.	CT can differentiate different types of vocal cord augmentation. Silastic implants are recognized by their characteristic triangular configuration. The Gore-Tex implants had unique heterogeneous attenuation with lobulated medial margins. Fat and Teflon injections both appear ovoid/masslike. High-resolution CT of the larynx is useful for localization of extruded implants before revision thyroplasty.	4
112. Rubin AD, Hawkshaw MJ, Moyer CA, Dean CM, Sataloff RT. Arytenoid cartilage dislocation: a 20-year experience. *J Voice.* 2005;19(4):687-701.	Observational-Dx	63 patients	Report on arytenoid cartilage dislocation based on a 20-year experience. Patient charts, CT reports, laryngeal electromyography reports, operative reports, and strobovideolaryngoscopic examinations were retrospectively reviewed.	Strobovideolaryngoscopy, laryngeal electromyography, and laryngeal CT imaging are helpful for distinguishing arytenoid cartilage dislocation from VFP. Familiarity with signs and symptoms of arytenoid cartilage dislocation and current treatment techniques improves the chances for optimal therapeutic results.	3
113. Jun BC, Kim HT, Kim HS, Cho SH. Clinical feasibility of the new technique of functional 3D laryngeal CT. *Acta Otolaryngol.* 2005;125(7):774-778.	Review/Other-Dx	4 patients with unilateral VFP; 4 controls	To examine the clinical feasibility of functional 3D laryngeal CT.	Dynamic vocal fold 3D image during phonation could visualize that the thickness and volume were decreased in relativity to the pitch increase.	4
114. Kim BS, Ahn KJ, Park YH, Hahn ST. Usefulness of laryngeal phonation CT in the diagnosis of vocal cord paralysis. *AJR Am J Roentgenol.* 2008;190(5):1376-1379.	Observational-Dx	28 patients with UVCP; 3 controls	To determine the value of laryngeal phonation CT in the diagnosis of vocal cord paralysis by examining the physiologic and functional changes in the larynx during vowel phonation in patients with vocal cord paralysis. In qualitative analysis, laryngeal phonation CT was compared with conventional CT.	For qualitative analysis, 2 observers found the coronal reconstructions of the laryngeal phonation CT scans yielded a higher detection rate than did conventional axial CT. Laryngeal phonation CT was more useful for evaluating vocal cord paralysis than did conventional CT and can be used as a primary diagnostic tool when vocal cord paralysis is suspected.	1
115. Oyamada Y, Yumoto E, Nakano K, Goto H. Asymmetry of the vocal folds in patients with vocal fold immobility. *Arch Otolaryngol Head Neck Surg.* 2005;131(5):399-406.	Observational-Dx	30 patients	Prospective study to measure the vocal fold length during inspiration and phonation and to determine the vertical difference of the vocal folds during phonation in patients with unilateral vocal fold immobility.	Multislice helical CT is the recommended method to measure the vocal fold length and the vertical level difference between the vocal folds. Use of CT might help to better understand laryngeal behavior in patients with unilateral vocal fold immobility.	2
116. Yumoto E, Nakano K, Oyamada Y. Relationship between 3D behavior of the unilaterally paralyzed larynx and aerodynamic vocal function. *Acta Otolaryngol.* 2003;123(2):274-278.	Observational-Dx	37 patients	Multislice helical CT was used to evaluate the 3D characteristics of the laryngeal structures in patients with unilateral VFP during phonation, and results were compared with those obtained from aerodynamic vocal function test.	Combination of multislice CT endoscopic and coronal reconstruction images enabled the 3D characteristics to be visualized during phonation, and some of these characteristics are significantly correlated with vocal function in patients with unilateral VFP.	2

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
117. Yumoto E, Oyamada Y, Nakano K, Nakayama Y, Yamashita Y. Three-dimensional characteristics of the larynx with immobile vocal fold. *Arch Otolaryngol Head Neck Surg.* 2004;130(8):967-974.	Observational-Dx	37 patients	Retrospective study to evaluate the 3D characteristics of the laryngeal lumen in patients with unilateral vocal fold immobility during phonation with the aid of multislice helical CT.	Combination of 3D endoscopy with coronal multiplanar reconstruction images enables description of the 3D characteristics of the unilaterally immobile larynx and supplements videostroboscopic findings.	2
118. Heller MT, Meltzer CC, Fukui MB, et al. Superphysiologic FDG Uptake in the Non-Paralyzed Vocal Cord. Resolution of a False-Positive PET Result with Combined PET-CT Imaging. *Clin Positron Imaging.* 2000;3(5):207-211.	Review/Other-Dx	1 patient	Present a case of asymmetric, superphysiologic FDG uptake in the contralateral vocal cord of a patient with a UVCP secondary to sacrifice of the recurrent laryngeal nerve during pneumonectomy for lung cancer.	Combined PET/CT imaging provides better anatomic correlation for increased areas of FDG uptake than PET alone.	4
119. Kamel EM, Goerres GW, Burger C, von Schulthess GK, Steinert HC. Recurrent laryngeal nerve palsy in patients with lung cancer: detection with PET-CT image fusion -- report of six cases. *Radiology.* 2002;224(1):153-156.	Observational-Dx	6 patients; 3 observers	To determine a pattern of focal FDG accumulation in the lower anterior neck in patients with lung cancer. PET/CT findings were compared with those of clinical history, routine clinical laboratory tests, physical exam of the neck, and laryngoscopy.	Fusion of PET and CT showed the focal FDG uptake was localized in the internal laryngeal muscles. This finding was a result of compensatory laryngeal muscle activation caused by contralateral recurrent laryngeal nerve palsy due to direct nerve invasion by lung cancer of the left mediastinum or lung apices. Knowledge of this is essential in avoiding false-positive PET results.	3
120. Bronstein Y, Tummala S, Rohren E. F-18 FDG PET/CT for detection of malignant involvement of peripheral nerves: case series and literature review. *Clin Nucl Med.* 2011;36(2):96-100.	Review/Other-Dx	26 patients	Retrospective study to evaluate the role of PET plus CT scans in detecting malignant involvement of the peripheral nerves.	Of 26 patients, 12 had lymphoma, 10 had breast cancer, 2 had lung cancer, 1 had colon cancer, and 1 had melanoma. In 21 patients, MRI was performed, either for follow-up of the PET/CT finding or to find an explanation for symptoms. MRI confirmed the presence of disease in only 9 patients, was interpreted as normal in 7 patients, and was inconclusive in 5 patients. FDG-PET/CT was able to differentiate an active tumor from post-treatment fibrosis and could assess response to therapy with a high degree of confidence. Results indicate that FDG-PET/CT is helpful in diagnosing malignant involvement of the PNs, especially when findings from anatomic imaging (MRI or CT) are negative. In cases of known treated malignancy involving the PNs, follow-up by PET/CT has the advantage of high sensitivity for local recurrence.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
121. Fukui MB, Blodgett TM, Snyderman CH, et al. Combined PET-CT in the head and neck: part 2. Diagnostic uses and pitfalls of oncologic imaging. *Radiographics*. 2005;25(4):913-930.	Review/Other-Dx	N/A	Review PET/CT technique in patients with head and neck cancer. Authors also discuss indications for PET/CT in this patient population. In addition, various limitations of PET/CT relating to physiologic FDG uptake, inadequate scanner resolution, recent surgery or radiation therapy–chemotherapy, inflammatory tissue, and low FDG avidity, and outline strategies for avoiding misdiagnosis due to these limitations are discussed.	Combined PET/CT optimizes the interpretation of FDG-PET findings in head and neck cancer.	4
122. Kim JH, Jang JH, Koh SB. A case of neurolymphomatosis involving cranial nerves: MRI and fusion PET-CT findings. *J Neurooncol.* 2006;80(2):209-210.	Review/Other-Dx	1 patient	A report on a patient with neurolymphomatosis of crania l neuropathy in whom FDG-PET/CT aided in establishing diagnosis of neurolymphomatosis.	Patient's MRI revealed enlargement and enhancement of the trigeminal nerves, suggesting direct lymphomatous infiltration. However, MRI findings are not specific for perineural spread of neoplastic diseases but can also be seen in various infections and inflammatory processes. PET revealed increased FDG uptake in the trigeminal nerves and Meckel's case.	4
123. Komissarova M, Wong KK, Piert M, Mukherji SK, Fig LM. Spectrum of 18F-FDG PET/CT findings in oncology-related recurrent laryngeal nerve palsy. AJR Am J Roentgenol. 2009;192(1):288-294.	Review/Other-Dx	N/A	To review recurrent laryngeal nerve anatomy and describe the typical FDG-PET/CT appearance of vocal cord paresis due to oncology-related neurolymphomatosis injury including a spectrum of presentations, causes, and sites of nerve injury.	Oncology-related neurolymphomatosis palsy may be caused by direct tumor invasion or its therapy. FDG-PET/CT findings should be recognized to avoid misdiagnosis. Laryngoscopy confirms the suspected diagnosis and excludes primary vocal cord neoplasm.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
124. Matsue K, Hayama BY, Iwama K, et al. High frequency of neurolymphomatosis as a relapse disease of intravascular large B-cell lymphoma. Cancer. 2011;117(19):4512-4521.	Review/Other-Dx	11 patients with intravascular large B-cell lymphoma	To describe peripheral nerve involvement (neurolymphomatosis). Intravascular large B-cell lymphoma is characterized by lymphoma cell proliferation in the lumina of small vessels in various organs.	4 patients with neurolymphomatosis were identified among 11 patients who had intravascular large B-cell lymphoma. All cases of neurolymphomatosis occurred as relapsed disease during or shortly after the completion of chemotherapy. Although MRI studies of the brains and whole spines revealed nerve infiltration by gadolinium enhancement in 2 patients, the technology was not sensitive enough to detect such infiltration in the remaining 2 patients. In contrast, FDG-PET/CT successfully revealed cranial or peripheral nerve lesions in all 4 patients and was useful for evaluating therapeutic response. Patients received treatment with high-dose methotrexate with or without other systemic chemotherapy, which achieved varied success. Considering the rarity of intravascular large B-cell lymphoma and neurolymphomatosis, the current observations suggested that intravascular large B-cell lymphoma may have a predilection not only for the vessels but also for both the central and peripheral nervous systems.	4
125. Yousry I, Moriggl B, Schmid UD, et al. Detailed anatomy of the intracranial segment of the hypoglossal nerve: neurovascular relationships and landmarks on magnetic resonance imaging sequences. *J Neurosurg.* 2002;96(6):1113-1122.	Observational-Dx	34 volunteers 68 nerves; 2 observers	Combination of sequences was used to increase the reliability of MRI in its demonstration of the 12th CN as well as to assess the course of the nerve, display its relationships to adjacent vessels, and provide landmarks for evaluating the nerve in daily practice.	3D CISS sequence successfully demonstrated the hypoglossal trigone (100% of images), 12th nerve root bundles (100% of images), and 12th nerve sleeves (88.2% of images). Canalicular segment was exhibited with the aid of plain 3D CISS sequences in 74% of images and by using contrast-enhanced 3D CISS sequences and contrast-enhanced magnetization-prepared rapid-acquisition gradient-echo sequences in 100% of images.	3
126. Gandhi D, Gujar S, Mukherji SK. Magnetic resonance imaging of perineural spread of head and neck malignancies. *Top Magn Reson Imaging.* 2004;15(2):79-85.	Review/Other-Dx	N/A	To examine role of MRI in perineural spread of head and neck malignancies.	Understanding of neural pathway anatomy allows accurate detection of perineural spread. High level of suspicion by radiologist, awareness of common imaging signs of perineural spread and careful attention to imaging technique help in early detection.	4

Cranial Neuropathy
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
127. Jungehuelsing M, Sittel C, Fischbach R, Wagner M, Stennert E. Limitations of magnetic resonance imaging in the evaluation of perineural tumor spread causing facial nerve paralysis. *Arch Otolaryngol Head Neck Surg.* 2000;126(4):506-510.	Review/Other-Dx	486 patients	Case series to examine the clinical presentation and treatment of patients with long-duration unilateral facial paralysis and normal MRI findings.	Malignant parotid gland tumors were proved in 8 patients. MRI studies may prove but never can exclude neoplastic lesions. Bell palsy is a diagnosis of exclusion. Electrophysiological findings and regular follow-up visits is the most important aspects in the management of patients with unilateral, peripheral facial paralysis.	4
128. Smoker WR, Reede DL. Denervation atrophy of motor cranial nerves. *Neuroimaging Clin N Am.* 2008;18(2):387-411, xi.	Review/Other-Dx	N/A	To review the stages of denervation and explain changes identified on MRI.	Muscles undergoing denervation show different imaging appearances in the various stages. The radiologist needs to be aware of these changes in order not to interpret these muscles as harboring a tumor or being involved by an inflammatory process.	4
129. Blandino A, Gaeta M, Minutoli F, Pandolfo I. CT and MR findings in neoplastic perineural spread along the vidian nerve. *Eur Radiol.* 2000;10(3):521-526.	Observational-Dx	98 consecutive patients	Retrospective review to describe the findings of perividian tumor spread and to compare the accuracy of MRI and CT in diagnosing perineural metastasis along the vidian nerve.	CT showed unilateral involvement of the vidian nerve in 9 patients. MRI showed 13 perineural metastases. In 3 patients MR demonstrated involvement of 4 vidian nerves that appeared normal on CT. MR finding of a significant enhancement of the nerve could be considered very suggestive of metastatic spreading, particularly if associated with simultaneous involvement of the neighboring structures.	3
130. Bowyer JD, Sullivan TJ, Whitehead KJ, Kelly LE, Allison RW. The management of perineural spread of squamous cell carcinoma to the ocular adnexae. *Ophthal Plast Reconstr Surg.* 2003;19(4):275-281.	Review/Other-Dx	17 patients	Retrospective study to analyze series of patients with periorbital perineural spread of squamous cell carcinoma and propose treatment guidelines.	Most common symptoms were numbness and pain while ophthalmoplegia, ptosis, and facial palsy were the most frequent signs. All cases received wide-field radiotherapy to at least 50 Gy. Chemotherapy and surgery (biopsy, debulking, and exenteration) were used in selected cases. Disease progression occurred in 6 patients, 4 of whom died.	4
131. Chang PC, Fischbein NJ, McCalmont TH, et al. Perineural spread of malignant melanoma of the head and neck: clinical and imaging features. *AJNR Am J Neuroradiol.* 2004;25(1):5-11.	Review/Other-Dx	8 patients	Retrospective study to describe the clinical and MRI findings of perineural spread of malignant melanoma to CNs at 2 institutions.	MRI showed post-Gd enhancement of at least 1 branch of the trigeminal nerve in all cases and of at least 1 other CN in 5 cases. Malignant melanoma must be included in differential diagnosis although perineural spread of disease occurs most commonly with squamous cell carcinoma and adenoid cystic carcinoma.	4

Cranial Neuropathy
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
132. Galloway TJ, Morris CG, Mancuso AA, Amdur RJ, Mendenhall WM. Impact of radiographic findings on prognosis for skin carcinoma with clinical perineural invasion. *Cancer.* 2005;103(6):1254-1257.	Observational-Dx	45 patients	To correlate pretreatment CT and MRI studies with outcomes for patients with squamous or basal cell carcinoma of the skin and clinical perineural invasion.	5-year local control rates were: imaging negative, 76%; minimal or moderate peripheral disease, 57%; and central and/or macroscopic disease, 25%. 5-year absolute and cause-specific survival rates were: imaging negative, 90% and 100%, respectively; minimal or moderate peripheral disease, 50% and 56%, respectively; and central and/or macroscopic disease, 58% and 61%, respectively.	3
133. Lee KJ, Abemayor E, Sayre J, Bhuta S, Kirsch C. Determination of perineural invasion preoperatively on radiographic images. *Otolaryngol Head Neck Surg.* 2008;139(2):275-280.	Observational-Dx	38 patients	Retrospective review of the radiographic studies of patients with perineural spread from head and neck cancer and comparison with preoperative reports. To analyze the frequency of preoperative diagnosis, radiographic features, and importance of the preoperative diagnosis in treatment planning. Histopathological findings were used as gold standard.	Preoperative agreement was >10% for all nerves, and retrospectively was 56% for the trigeminal nerve and 40% for the facial nerve. Radiographic features included neural thickening and enhancement, and foraminal widening. Study concludes that preoperative radiographic determination is necessary because diagnosis impacts management and prognosis.	3
134. Maroldi R, Farina D, Borghesi A, Marconi A, Gatti E. Perineural tumor spread. *Neuroimaging Clin N Am.* 2008;18(2):413-429, xi.	Review/Other-Dx	N/A	Review incidence, neural pathways and imaging findings of perineural tumor.	MRI is more sensitive than CT for detecting segmental nerve enhancement.	4
135. Conrad GR, Sinha P, Holzhauer M. Perineural spread of skin carcinoma to the base of the skull: detection with FDG PET and CT fusion. *Clin Nucl Med.* 2004;29(11):717-719.	Review/Other-Dx	1 patient	A case report on the detection of perineural spread of skin carcinoma to the base of the skull with FDG-PET and CT fusion.	PET showed FDG hypermetabolism in the floor of the mouth near the site of the mandibular resection. PET also showed hypermetabolism tracking in the lateral face to the skull base. Fusion of PET with CT showed this hypermetabolism to follow the course of the mandibular division of the trigeminal nerve (V3).	4
136. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: http://www.acr.org/~/media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf. Accessed March 1, 2017.	Review/Other-Dx	N/A	Guidance document on exposure of patients to ionizing radiation.	N/A	4

Evidence Table Key

Study Quality Category Definitions

- *Category 1* The study is well-designed and accounts for common biases.
- *Category 2* The study is moderately well-designed and accounts for most common biases.
- *Category 3* There are important study design limitations.
- *Category 4* The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
  a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
  b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
  c) the study is an expert opinion or consensus document.
- M = Meta-analysis

Dx = Diagnostic

Tx = Treatment

Abbreviations Key

bFFE = Balanced fast-field echo

CE-MRA = Contrast-enhanced magnetic resonance angiography

CISS = Constructive interference in steady state

CN = Cranial nerve

CT = Computed tomography

DRIVE = Driven equilibrium radio frequency reset pulse

FDG-PET = Fluorine-18-2-fluoro-2-deoxy-D-glucose-positron emission tomography

FIESTA = Fast imaging employing steady-state acquisition

fMRI = Functional magnetic resonance imaging

GKRS = Gamma knife radiosurgery

MRA = Magnetic resonance angiography

MRI = Magnetic resonance imaging

MVD = Microvascular decompression

NPV = Negative predictive value

NVC = Neurovascular compression

PET = Positron emission tomography

PPV = Positive predictive value

REZ = Root entry zone

SPECT = Single-photon emission tomography

TOF = Time-of-flight

TREZ = Trigeminal root entry zone

TSE = Turbo spin-echo

UVCP = Unilateral vocal cord paralysis

VFP = Vocal fold paralysis