Petrinous apex lesions may remain undetected for extended periods because patients often complain of vague or indistinct symptoms that delay diagnosis. Headaches, atypical facial pain, mixed hearing loss, vertigo, eustachian tube dysfunction, and middle ear effusion, while common otoneurologic complaints, may be the initial manifestations of an extensive petrous apex lesion. Clinical manifestations can be well explained by involvement of the structures contained within or adjacent to the apex. Compression or irritation of the gasserian ganglion of the trigeminal nerve will cause deep aural and retro-orbital pain. Diplopia will result from similar compromise of the abducens nerve. Facial nerve dysfunction is less common, except in advanced lesions. Hearing loss and vestibular complaints may be caused by eighth nerve involvement in the internal auditory canal or by direct extension of the process into the bony labyrinth.

Although the carotid artery is often compressed, vascular symptoms are uncommon, except in the presence of an aneurysm. These lesions, especially benign cystic ones, frequently achieve significant size with marked bony erosion before diagnosis is made. Petrous apex lesions pose several diagnostic and therapeutic dilemmas. The relative inaccessibility of this location associated with surrounding bony, neural, and vascular structures often precludes traditional diagnostic techniques such as a simple biopsy. Since vital structures here are encased in bone, thin section CT has been the method of choice in imaging this complex area. MRI plays an instrumental role in further evaluating the apex. The combination of these two radiologic modalities along with the history and physical examination are the primary methods used to base the differential diagnosis.

Once recognized, the differential diagnosis of petrous apex lesions includes congenital or primary cholesteatoma, cholesterol granuloma, primary mucocele, schwannoma, meningioma, chondroma, chondrosarcoma, or metastatic neoplasms. The most frequent cause of petrous apex destruction is a secondary process from either contiguous lesions or metastases. Primary lesions
intrinsic to the petrous apex are less common, but are not rare. Discernment of pathologic processes in this area and evaluation of their extent is critical in diagnosis and preoperative planning. Surgical approaches to the petrous apex evolved from purulence drainage procedures. Multiple clinical and radiologic findings such as residual hearing, facial nerve function, pathology, and extent of disease must be used in combination to formulate a surgical plan. The following approaches can be employed: translabyrinthine-transcochlear, middle cranial fossa, transcanal infracochlear, subtotal petrosectomy, transsphenoidal, and suboccipital. Some represent a compromise between optimal access and preservation of cochlear function, and all attempt to preserve associated brain stem, cranial nerve, cerebellar, and vascular structures found in close proximity to the petrous apex.

**Petrosus Apex Anatomy**

The petrous apex is a truncated pyramid which makes up the medial part of the temporal bone. Its base is the bony labyrinth including the semicircular canals and cochlea. Anteriorly, the base of this pyramid is partly the semicanal of the tensor tympani muscle and the internal carotid artery. The superior surface makes up the major part of the middle cranial fossa floor from the arcuate eminence of the superior semicircular canal to the beginning of the ascending portion of the internal carotid artery and the gasserian ganglion fossa (Meckle's cave). This surface extends from the superior petrosal sinus posteriorly to the petrosphenoid suture line anteriorly.

The posterior surface of the petrous apex is the anterolateral wall of the posterior cranial fossa and extends medially from the posterior semicircular canal and the endolymphatic sac to the petroclinoid ligament and the canal for the abducens nerve (Dorello's canal). This surface extends from the petro-occipital suture line inferiorly to the superior petrosal sinus superiorly. Inferiorly, the petrous pyramid is bounded by the jugular bulb and the inferior petrosal sinus. The inferior surface also has a foramen for the entry of the internal carotid artery. Medial to the jugular fossa is a depression which is associated with the cochlear aqueduct (perilymphatic duct). The petrous bone articulates with the greater wing of the sphenoid anteriorly. The foramen lacerum is found between the apex of the petrous bone and the sphenoid bone and contains but does not transmit the internal carotid artery.

The posteroinferior margin of the temporal bone articulates with the occipital bone. Laterally, the bone is fused with the squamous portion of the temporal bone at the petrosquamous fissure. The internal carotid artery (transverse portion) and the internal auditory canal traverse the petrous pyramid. The petrous apex can be conveniently divided into anterior and posterior areas by a vertical plane through the modiolus of the cochlea and the internal auditory canal. The posterior portion, located between the internal auditory canal and the semicircular canals, is usually composed of compact bone and is rarely involved by disease processes. The petrous bone may be pneumatic, diploic (marrow-filled), or sclerotic. About 10% of the population has pneumatization of the petrous. Primary petrous apex lesions are those that arise from the anatomic boundaries of the region. Secondary lesions are those that impinge on the petrous from an outside source. This may be from invasion from an bordering region or from a metastatic lesion. Primary lesions account for approximately 36% of petrous apex lesions.
Cholesterol Granuloma

Cholesterol granuloma of the petrous apex forms as a result of foreign body giant cell reaction to cholesterol crystals. The poor ventilation, interference with drainage and hemorrhage in a usually pneumatized space are predisposing factors leading to the formation of the cyst. Negative pressure from air resorption lead to the degradation of the blood and formation of cholesterol crystals. These crystals initiate a foreign body reaction that results in granuloma or cyst formation. The cyst wall is made up of fibrous connective tissue and lacks the keratinizing squamous epithelium seen cholesteatoma. Foreign body giant cells, hemosiderin laden macrophages and cholesterol crystals are seen on pathologic evaluation.

A characteristic finding on CT of a cholesterol granuloma is a sharply marginated expansile lesion. The lesions are avascular and therefore do not enhance with contrast. They are isodense with brain tissue. A thin, peripheral calcified rim may be noted as well as pneumatization of the contralateral petrous apex. The MRI findings of cholesterol granuloma are unique. The lesions demonstrate high signal intensity on both the T1 and T2 weighted images. The unique increased signal intensity on the T1 weighted image may be due to the combination of cholesterol crystals, chronic hemorrhage and proteinaceous crystals. Occasionally it may be difficult to distinguish a small cholesterol granuloma from normal marrow because both may demonstrate increased signal intensity on T1 weighted images. They may be differentiated by examining the T2 weighted images. Marrow fat will exhibit a progressive decrease in signal intensity with increase T2 weighting. Cholesterol granulomas maintain their high signal intensity on T2 weighted images.

Specialized MR pulse sequences may sometimes be needed to evaluate these lesions. Partial saturation gradient recalled echo (GRE) sequences may be read out instead the usual spin-echo sequences. GRE imaging demonstrates an enlarging peripheral ring of decreased signal intensity as the TE is lengthened. This indicates a peripheral magnetic susceptibility effect suggesting that hemosiderin laden macrophages are present in the wall of the lesion. While this pattern may be possible in a thrombosed aneurysm it is unlikely in acoustic neuromas, cholesteatomas or mucoceles. Protein chemical shift imaging may also be used to evaluate these lesion. The mixed population of aliphatic (CH2) and water protons produce a cyclic pattern of signal intensity in the center of the lesion. A cholesteatoma may produce this pattern but a thrombosed aneurysm, acoustic or mucocele would not. Because of this unique ability to evaluate cholesterol granulomas, MRI is now used both for preoperative evaluation and to follow the patient postoperatively for recurrence.

Treatment of cholesterol granulomas is based on surgical drainage and aeration. Complete surgical removal is rarely indicated because the lesion lacks an epithelial lining. Multiple surgical approaches have been described for treating these lesions including: infralabyrinthine, transcanal infracochlear, transsphenoidal, middle cranial fossa, and retrosigmoid. The approach taken depends on the patients hearing and the site and extent of the lesion.

The retrosigmoid and middle cranial fossa approaches are designed for hearing preservation but do not provide for permanent drainage or aeration. Chemical meningitis from subarachnoid space contamination by the contents of the cholesterol granuloma is also a risk. Drainage,
aeration and hearing preservation are the goals of the infralabyrinthine, transcanal infracochlear, and transsphenoidal approaches. Detailed analysis of the pre-operative CT scan to define the jugular bulb, facial nerve, sigmoid sinus, bony labyrinth and posterior wall of the sphenoid is mandatory before surgery. If the lesion does make a significant impression on the sphenoid, a transsphenoidal approach may be used. The approach has limited exposure and risks the optic nerve and internal carotid artery. Another drawback is the high rate of recurrence for this lesion. The timing reported six patients who underwent this procedure for cholesterol granuloma. Five patients needed revision surgery for recurrence. Of those five patients, two needed multiple procedures. Hearing results for this procedure have been described by Gianoli. He reported on six patients, two showed hearing improvement and four remained the same. He did not report on recurrence.

The infralabyrinthine approach shares the same goals as the transsphenoid approach. The timing reported on three patients who had this approach for cholesterol granuloma. Two required surgery for recurrence. In contrast, Goldofsky reported on nine patients followed from one to ten years who had this approach and only one recurred. Hearing results from fourteen patients showed seven improved and seven remained the same. The infralabyrinthine approach involves a simple mastoidectomy then removing the air cells in Trautmann's triangle. The sigmoid sinus is followed until the jugular bulb is identified. This represents the inferior margin of the approach. The semicircular canals are skeletonized and the infralabyrinthine air cell tract is developed anteriorly. Once the lesion is identified it is evacuated and the opening is enlarged. A stent may be placed to prevent stenosis of the opening. This approach is limited if the patient has a high jugular bulb limiting access to the infralabyrinthine air cell tract.

The transcanal infracochlear approach involves a postauricular incision and reflecting the ear anteriorly. Typanomeatal flaps are developed and the external auditory canal is enlarged anteriorly and inferiorly to expose the hypotympanum. The chorda tympani is followed inferoposteriorly to define the extent of posterior dissection possible without injury to the facial nerve. The air cell tract below the cochlea is developed in the hypotympanum to expose the course of the carotid artery and the jugular bulb. The round window provides the superior line of dissection, and Jacobson's nerve leads to the "crutch" of the carotid and jugular bulb. In a study of ten cadaveric temporal bones, the average cross sectional area of this region was 25.6 mm². The area ranged from 67.2 mm² to 7.4 mm². If the plane of dissection remains below the round window, the internal auditory canal structures will not be at risk. Once the lesion is entered is drained and a catheter may be placed. A high jugular bulb does not block access via this route as it does with the infralabyrinthine approach and it provides more dependent drainage for the cyst.

The transsphenoidal approach is useful only when a cyst forms a large surface area against the posterior wall of the sphenoid sinus. Multiple approaches may be used to approach the sphenoid including: external ethmoidectomy sphenoidotomy, intranasal sphenoidectomy, intranasal sphenoidotomy, trans-septal sphenoidotomy, or transpalatal approaches. The lateral and superior walls of the sphenoid sinus must be closely examined to locate indentations of the pituitary gland, optic nerve, maxillary nerve, carotid artery, and cavernous sinus. Once the wall of the cyst is identified it can be opened and drained. A large opening should be created to decrease the chance of postoperative stenosis. Once the landmarks are identified the roof of the petrous apex is opened and the lesion is drained or removed.
The retrosigmoid approach is performed through a craniotomy posterior to the sigmoid sinus. The cerebellum is retracted posteriorly, allowing for access to the cerebellopontine angle. This procedure has been of limited usefulness because of the location of most petrous apex cholesteatomas anterior of the internal auditory canal. The interposition of the cerebellum, as well as brainstem and cranial nerves, makes total extirpation of these tumors extremely difficult. This approach may be useful for removal of petrous apex cholesteatomas with significant intracranial extension or for those epidermoid lesions arising primarily within the cerebellopontine angle.

**Cholesteatoma**

Cholesteatomas may involve the petrous apex as a congenital cholesteatoma or secondary to an acquired cholesteatoma. Congenital cholesteatomas are rare and can be found in a number of locations in the temporal bone. They differ from an acquired cholesteatoma in that they develop behind an intact tympanic membrane. Both cholesteatomas are characterized pathologically by keratin filled epithelial lined cysts. Acquired cholesteatomas which involve the petrous apex are aggressive and may extensively erode the petrous bone. Primary cholesteatomas of the petrous apex present with symptoms produced from the mass effect of the lesion. This includes headaches, and aural fullness. Most patients will present with hearing loss with poor speech discrimination out of proportion to the hearing loss and elevated or absent acoustic reflexes consistent with a retrocochlear lesion. ABR results will also be in line with a retrocochlear lesion.

Large lesions may cause dysfunction of cranial nerves X, XI, and XII if the lesion extends posterior or cranial nerves III, IV and V if it extends anteromedially. Acquired cholesteatoma usually presents with headache, mixed conductive hearing loss, cranial nerve VII paralysis and otorrhea. Persistent otorrhea following previous mastoid surgery is a strong indication persistent disease may exist in the petrous apex. Electronystagmogram abnormalities and sensorineural hearing loss may also be seen if the labyrinth is invaded by the cholesteatoma. Facial nerve dysfunction is present in approximately half of patients with petrous apex involvement.

Cholesteatomas appear on CT scans as low density lesion that does not enhance with intravenous contrast. Preoperative CT is important in evaluating the degree of temporal bone erosion and the relationship of the lesion to structures such as the vestibular labyrinth, cochlea, internal auditory canal, carotid artery and jugular bulb. MRI will not provide as much information on bone erosion as a high resolution CT but will assist in diagnosis. Cholesteatoma appears as an area of low signal intensity on T1 weight images and high intensity on the T2 weighted images. In general, cholesteatomas have the same intensity on T1 and T2 weighted scans as CSF. MRI may also be used to evaluate for intracranial extension.

Treatment for these lesions differs from the treatment of cholesterol granulomas in that more than drainage is required. Preoperative surgical planning should consider hearing, extent of disease, prevention of recurrence and prevention of a CSF leak. The most commonly used approaches include the middle cranial fossa, translabyrinthine-transcochlear and transmastoid approaches. The middle cranial fossa approach should be used only when hearing preservation is attempted. Because of limited exposure medially, complete extraction of the disease may be
difficult. It can be used to fully remove a cholesteatoma that invades the apex superiorly over the semicircular canals. It does not provide good visualization of lesions that extend to the apex or involve the hypotympanum.

The transmastoid approach also preserves hearing and may be used for lesions which have limited petrous apex involvement. Following a standard tympanomastoidectomy, access to a cholesteatoma involving the posterior petrous can be performed by using the following air cell tracts: the tract in the sinodural angle paralleling the petrous ridge, through the subarcuate tract beneath the superior semicanal or below the posterior semicircular canal. The third route can be followed anteriorly if the jugular bulb is low to reach the anterior petrous apex. Anterior petrous apex access usually requires taking the external auditory canal down. As mentioned, following the tracts below the posterior semicircular canal can lead anteriorly. Hypotympanic air cell tracts below the cochlea will also lead to the anterior petrous apex. Lowering the inferior portion of the external auditory canal may be needed to improve visualization.

Another route may be found over the area of the tensor tympanic muscle and anterior to the geniculate ganglion. The tensor tympani can be removed from its semicanal to improve visualization. Dissection can then be continued in the triangle bounded by the carotid artery, the cochlea and the middle cranial fossa dura. The complete apicectomy, without labyrinth sacrifice, may be performed by displacing the contents of the glenoid fossa anteriorly. The anterior wall of the external auditory canal may be removed or allowed to remain intact. The medial wall of the fossa can then be dissected to expose the internal carotid artery which can then be used as a landmark to access the medial extent of the apex. Following this approach a wide cavity with a wide meatus is formed exteriorizing the cholesteatoma. The translabyrinthine transcochlear approach should be used when hearing is not preserved.

In 1978, House, De La Cruz, and Hietelberg described the translabyrinthine-transcochlear approach. A postauricular incision is made and a simple mastoidectomy is done and carried at least 2 cm behind the sigmoid sinus, exposing the dura of the posterior fossa. A labyrinthectomy is performed and the internal auditory canal is skeletonized, identifying the transverse crest and the vertical bar. The incus is removed, the facial nerve is completely decompressed, and opened widely into the hypotympanum (extended facial recess approach). The external auditory canal and tympanic membrane are left intact to decrease the risk of postoperative CSF leak. The greater superficial petrosal nerve is transected and the facial nerve is completely removed from the stylomastoid foramen to the internal auditory canal and rerouted posteriorly. The fallopian canal, stapedius muscle, and the turns of the cochlea are completely exenterated, carrying the dissection forward until the internal carotid artery wall is identified.

If the lesion extends intracranially, the dura is opened over the posterior fossa and internal auditory canal. The facial nerve is identified both laterally and medially and may be found coursing laterally over the lesion, in contrast to acoustic neuroma where the nerve is usually seen medially. Atlas reported on facial nerve function following this procedure for cholesteatoma in 1992. He reported on fourteen patients and seven had normal facial nerve function preoperatively. Following this approach, 50% of patients had a House grade I or II function and another 21% had grade III function.
Petrous Apicitis

Gradenigo described a complex of symptoms consisting of diplopia, retro-orbital pain and otorrhea associated with suppurative disease of the petrous apex. Since the wide spread use of antibiotics, the classic presentation of this triad is uncommon. Petrositis may be classified as acute, chronic or complicated. Acute petrous apicitis usually represents an extension of acute otitis media and mastoiditis and may occur in a healthy patient. Abscess formation in the apex may result. More commonly, petrous apex involvent comes from chronic otitis media and is usually caused by Pseudomonas aeruginosa. Typically, the patient has had previous mastoid surgery, persistent purulent otorrhea and complains of deep retrobulbar pain. In a series of eight patients, four patients had deep facial pain, four had eighth nerve involvement, five had hearing loss, only two had abducens paralysis, and two had meningitis on presentaion. The mastoid and petrous apex are commonly poorly pneumatized. Osteomyelitis may also result from long standing infection.

Complicated petrositis is reflected by the development of meningitis, extradural abscess, cavernous sinus thrombosis, extradural abscess or labyrinthitis from either acute or chronic infections. Acute petrous apicitis is seen as an expansile lesions that does not enhance on CT scan. Chronic petrous apicitis has an irregular bony destruction and decreased pneumatizations of the mastoid and apex. MR scans of an acute infection demonstrates low intensity T1 images and high intensity T2 images with a rim of gadolinium enhancement. Chronic infections have an irregular appearance apain with a high T2 signal. Inflammation of the mucousa may cause some gadolinium enhancement. If osteomyelitis is suspected, nuclear medicine studies are important in evaluating the process. Technetium scans will show increased uptake in involved bone before significant bony demineralization can be detected with CT scans. Gallium, which labels inflammatory cells, will also enhance the involved areas and can be used scanning provides a map of the area involved by inflammation. Since technetium remains positive long after the infection has resolved, sequential gallium scanning is used to guide the length of antibiotic treatment.

Acute petrositis may be treated with appropriate intravenous antibiotics. Surgery is indicated if an abscess has formed or if the patients shows no response or their symptoms progress on antibiotics. Chronic petrositis is usually treated with both intravenous antibiotics and surgery. The goal of surgery is to eradicate the focus of infection. The surgical routes typically used are those described in the cholesteatoma section.

Langerhans' Cell Histiocystosis

Gianoli reported on the hearing results for primary petrous apex lesions in 1994. Of his patients, 12% were classified as eosinophilic granulomas. These cases were not discussed in detail. The only other report of an eosinophilic granuloma of the petrous apex was reported in 1993 by Goldsmith. Langerhans's cell histiocytosis or histiocystosis X is a spectrum of diseases characterized by varying degrees of body tissue involvement. Letterer-Siwe disease presents in infants and young children and involves multiple organs. It is the most severe form of the spectrum. Hand-Schuller-Christian syndrome affects children one to five years of age and involves histiocytic invasion of the bones, shin and bran. The classic triad is exophthalmos,
PETROUS APEX LESIONS  April 1995

radiolucent skull lesions and diabetes insipidus from involvement of the hypothalamic pituitary axis. Eosinophilic granulomas affect children and young adults. It usually presents as solitary radiolucent lesions of the skull, long bones ribs or pelvis.

Pathologic evaluation requires Langerhans' cells characterized on electron microscopy by the presence of Birbeck granules (trilaminar rod shaped organelles present within the nuclear cytoplasm). CT evaluation reveals a destructive lesion of the petrous. MR showed a marked enhancement with gadolinium. Treatment of the disease is based on the extent of involvement. For easily accessible lesions, curettage alone may be curative. Temporal bone lesions however are usually treated with low dose radiation therapy.

Chondroma and Chondrosarcoma

Chondromas of the petrous apex are rare and are believed to be derived from neoplastic transformation of cartilaginous rests in the region of the foramen lacerum. Radiographically, they appear as lytic lesions on CT that do not enhance and therefore resemble cholesteatomas and cholesterol granulomas. Chondrosarcomas histologically lie between the benign chondroma and malignant sarcomas and its prognosis can be correlated with histologic grading. Grade I lesions show changes similar to benign cartilaginous diseases and normal hyaline cartilage. Grade II and III exhibit electron microscopic changes similar to spindle cell sarcomas. Survival is related to histologic grade with five year survival rates being: grade I - 90%, grade II - 81%, grade III - 43%. CT scans are used to evaluate the extent of bony destruction. These lesions will enhance on MRI scan and these scans along with the CT should be used evaluate extent of disease and resectability. An arteriogram may be required to evaluate the patency of the carotid artery.

In 1986, Kveton et al reviewed five patients treated for chondrosarcoma of the skull base. Four of these five patients presented with hearing loss as an initial complaint. Other complaints included facial nerve dysfunctions (4 of 5), vertigo or unsteadiness (3 of 5), and pulsatile tinnitus (2 of 5). Diagnostic workup included an audiogram, ENG, ABR, CT scan and angiography. Surgical approaches included three translabyrinthine/suboccipital (TL/SO), two infratemporal fossa/translabyrinthine/transcochlear (IFT/TL/TC), one transmastoid/suboccipital (TM/SO), and one infratemporal fossa (IFT). Initial resections were done using the TM/SO and TL/SO approaches on the first two patients of the series. Two procedures were required to eradicate disease. Difficulty was encountered with tumor that extended anteriorly into the petrous apex, specifically that disease that extended medial to the internal carotid artery. The three remaining patients had procedures based on the infratemporal fossa approach. This procedure allowed for better exposure and more complete resection. The patients who had this procedure were NED at 2 years.

The infratemporal fossa approach begins by isolating the facial nerve and its branches, the internal jugular vein, the carotid aretery and cranial nerves IX, X, XI and XII in the neck. A radical mastoidectomy is then performed. The facial nerve is exposed from the stylomastoid foramen to the geniculate ganglion and it is transposed anteriorly. The anterior canal wallis taken down and the mandibular condyle is displaced anteriorly. Disection antrior to the cochlear reveals the infratemporal carotid artery. The vessel is skeletonized medially requiring exenteration of the eustachian tube. Labyrinthectomy, resection of the mandibualr condyle and
out fracture of the zygomatic arch may all provide improved visualization of the med aspect of the tumor. After resection, the cavity can be obliterated with abdominal fat.

**Effusion within a Pneumatized Apex**

The petrous apex air cell system may develop an effusion associated with an upper respiratory tract infection. This may be apparent in an asymptomatic patient who has a MRI for an unrelated condition. MRI findings are low to intermediated signal intensity on T1 and high signal intensity on T2 scans. A rim of enhancement may be seen with the use of gadolinium contrast. A CT scan reveals a soft tissue density filling the petrous. However, the complete bony architecture of the air cell system is intact and the contralateral petrous is often pneumatized. It is theorized that a simple effusion may evolve into an expanding cholesterol granuloma or mucocele over time. Surgery is not indicated initially but close follow up with serial radiographs should be performed.

**Asymmetric Pneumatization**

Asymmetry of the petrous apex may be initially interpreted as an abnormal finding because of increased signal intensity on T2 images of the nonaerated side. In a review of 500 CT scans, Roland found 34 patients with some asymmetry of pneumatization of the petrous apex. Of these 34, four had magnetic resonance imaging studies. As discussed earlier with cholesterol granulomas, bone marrow tends to have decreased signal intensity with prolonged T2 intervals. This was the finding of these four patients with four patients with asymmetric pneumatization. It is felt therefore that normal bone marrow composed the "abnormal" MR finding. In a review of 1600 tomograms, 15 patients were found to asymmetric petrous pneumatization with air cells greater than 1.5 cm.

**Chordoma**

Chordomas are rare, slow growing neoplasms which account for approximately 1% of all intracranial tumors. They arise from notochordal remnants and most frequently originate from the clivus. They may also arise from the petrous apex. CT demonstrates a well defined extra-axial soft tissue mass that is of increased density relative to the neural axis. Bone destruction and foci of calcification are typical. MR shows a well defined tumor with low signal intensity on T1 and a very hyperintense image on T2.

**Meningioma**

Although rarely originating from the petrous apex, meningiomas may infiltrate the region. On CT scan they typically are isodense to slightly hyperdense to brain. The density is generally homogeneous and sharply marginated. Calcification may be present in a number of forms. Small punctate (psammomatous) calcifications are common. Occasionally, large nodular calcifications may be present. Dense calcification of the entire tumor that obscures contrast enhancement is not uncommon. Typically, contrast produces a homogeneous, intense enhancement. MRI shows T1 images to be isointense to mildly hypointense when compared to adjacent brain. T2 images
reveal lesions that are isointense or mildly hyperintense to cortex. Tumors may also have a mottled appearance on MRI.

Schwannoma

Schwannomas usually effect the petrous apex by extension from their nerve of origin. The typical schwannoma on CT scan is isodense to the brain stem and prominent enhancement with contrast. Erosion of the petrous apex is smooth and with a distinct margin. Schwannomas have a smooth margin and appear isointense or hypointense on T1 images and typically enhance after contrast. The appearance on T2 weighted images depends on the size of the lesions. Small and medium sized tumors appear minimally to moderately hypointense. Large tumors typically undergo myxoid degenerative changes that show areas of hyperintensity intermixed with isointense or slightly hyperintense cellular portions. Destruction of the adjacent bony landmarks, rather than smooth erosion, suggests malignant change.

Metastasis

The petrous apex is the most common area in the temporal bone for hematogenous metastases to be found. In order of frequency, metastatic lesions of the following tumors have been found: breast, lung, kidney, prostate, and stomach. Metastasis to the temporal bone occurs late in the disease process and there is usually either physical or radiologic evidence of other systemic lesions. Radiologic appearance of these lesions is variable. Most will produce a bone eroding lesion. However, a smooth rounded defect may also be produced.

Intrapetrous Carotid Artery Aneurysm

Aneurysms arising from the petrous part of the internal carotid artery are unusual but may present as a petrous apex lesion. Angiogram is the preferred diagnostic procedure over surgery. A noncontrast CT scan shows uniform hyperdensity that may have adjacent bone erosion. With contrast, enhancement is homogeneous and intense. MRI findings are dependent on the patency of the artery, thrombus formation and the age of the lesion.

BIBLIOGRAPHY


