Weekend Educational Course (Sunday, 6 May 2012)
Clinical MR of Cancer: Solving Problems in Cancer Patients – Case-Based Teaching

Isolated Cranial Nerve Palsy

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The cranial nerves are often involved in primary head and neck malignancies. Cranial nerve palsy may also be the presenting sign of metastatic disease to the skull base and cranial nerves themselves. This presentation focuses on the imaging features of perineural spread (PNS), metastasis to the skull base and cerebrospinal fluid spread. It will also highlight how imaging science based on a foundation of anatomy, pathology and clinical sciences can help to simplify imaging diagnosis.

PNS refers to tumour extension along nerve sheaths. Imaging plays a critical role because this condition is often asymptomatic in the early stage. PNS rarely presents before the detection of the primary head and neck tumour. More commonly, PNS occurs after the patient has been treated. The clinical signs and symptoms vary with the type of nerves involved. Pain and paraesthesia is associated with sensory nerves. Involvement of motor nerves leads to denervation atrophy of the skeletal muscles. In general, diagnosis of PNS is based on either directly identifying the infiltrated nerve or secondary changes in skeletal muscles.

Changes in the skeletal muscles following denervation can be divided into three phases: acute, subacute and chronic. In the first 4 weeks, there is a decrease in the calibre of muscle fibres but no change in the total amount of tissue water. There is, however, a relative decrease in intracellular water associated with a relative increase in extracellular water. In the chronic phase, muscular atrophy associated with fatty infiltration takes place. A mixture of features seen in the acute and chronic stages characterises the subacute phase. In addition, there is a relative increase in the perfusion of muscles and extracellular water following denervation. This phenomenon may explain the contrast enhancement seen in denervated muscles.

Following denervation T2-weighted images show high signals thus producing an oedema-like appearance. This is because T2 of extracellular water is longer than the T2 of intracellular water. These MRI features may be confused with tumour infiltration of the muscles concerned. It should be noted that malignant infiltration produces an increase in size of the affected muscles, whereas, denervation atrophy shows a decrease in muscle bulk.

Rarely, the cranial nerves themselves become sites of metastasis. Malignant cells are carried to the perineurium and endoneurium via the vasa navorum. Neoplastic cells may also be deposited on cranial nerves as a result of meningeal carcinomatosis. More commonly, metastasis involves bone around the neural foramen or the cavernous sinus. These lesions compress the cranial nerves resulting in various combinations and degrees of cranial nerve palsies. Metastases around the cavernous sinus or jugular foramen are notorious for multiple cranial nerve palsies.