Case Report
An eleven-year-old, female neutered, stumpy tail cattle dog was presented with a right fore-limb lameness of six months duration. Pain and discomfort were initially identified in the right shoulder. Moderate degenerative changes were seen on radiographs. The dog was treated for arthritis with pentosan polysulphate (Cartrophen), carprofen (Rimadyl), firocoxib (Previcox), oral glucosamine supplements, and an intra-articular injection of methylprednisolone acetate (Depo-Medrol). Despite these treatments, the lameness deteriorated and three months later there was frequent knuckling of the right front foot with collapsing episodes.

The dog was referred and on examination there was marked muscle atrophy particularly of the right triceps and extensor carpi radialis muscles. The extensor carpi and triceps reflexes were hyporeflexic. There was hyperaesthesia of the distal right fore leg with loss of some motor function and proprioception. The left forelimb and hind limbs were neurologically normal and there were no other signs of spinal or central nervous system problems. No axillary mass was palpable. No abnormalities were detected on three view thoracic radiography. A mass in the brachial plexus distal to the dorsal horn with no spinal cord compression was detected on contrast enhanced CT- myelogram. This was constant with a diagnosis of a tumour of the right brachial plexus.

A forequarter amputation was performed with particular care to remove the components of the brachial plexus as proximal as possible en block with the limb and the mass in the plexus. C6 to T2 nerves were transected as they exited the vertebral foramina. The axillary lymph node was removed en block with the limb as well.

The proximal ends of the transected nerves were inked with tissue marking dye and together with the 35mm diameter lobular mass within the plexus and the regional lymph node were submitted for histopathology. The diagnosis was a completely excised malignant schwannoma with lymph node hyperplasia.

The dog recovered well with our standard analgesic protocol and remains clinically well three months after surgery.

Malignant Schwannoma
Malignant schwannomas are also known as a malignant peripheral nerve sheath tumours (MPNST) in which the cell of origin is thought to be a Schwann cell. In general, MPNSTs are mesenchymal neoplasms that are included under the general group of soft-tissue sarcomas due to similarities in biologic behaviour. However when these tumours occur in the brachial plexus and other major peripheral nerves they present some specific clinical issues. The classification of nerve sheath tumours has been widely debated. Studies have shown that the most reliable classification is based on a combination of ultrastructural features and immunocytochemical demonstration of cell-specific marker proteins, by which the most appropriate nomenclature would be schwannoma or nerve sheath tumour.

In dogs, these tumours most commonly arise from the brachial plexus nerves (C6-T2), although occurrence in other peripheral nerves, spinal roots and cranial nerves have been documented.
Diagnosis
The time from onset of clinical signs till diagnosis of nerve sheath tumours range from 3 weeks to 3 years. This may be due to the fact that it is difficult to diagnose brachial plexus tumours on the basis of clinical signs alone. Survey radiography, myelography, electromyography (EMG), computed tomography (CT), and magnetic resonance imaging (MRI) are commonly used to detect brachial plexus tumours. The specificity and sensitivity of plain radiography detecting brachial plexus tumours is low. Myelography is useful in determining vertebral canal involvement, but the potential for false negative studies is still high.

EMG can be used to detect denervation in muscles; however this is not specific for a tumour, as certain myopathies may show similar findings. In one study, ultrasound was effective in detecting brachial plexus tumours. It is reported that contrast-enhanced CT and MRI provide excellent imaging of the brachial plexus tumours and they are currently considered the best procedures. It appears that MRI is the preferred imaging tool for brachial plexus tumours due to excellent contrast resolution, ability to distinguish nerve bundles from vessels, and primary multiplanar imaging. Overall, however, either contrast enhanced CT or MRI provide imaging which is useful in determining the extent of disease for treatment planning.

Treatment
Metastatic disease has been reported therefore thoracic radiographs should be part of the staging process even though metastasis is a low probability. The treatment of choice is wide surgical excision. This usually involves amputation, resection of the involved plexus and foraminotomy, laminectomy or hemilaminectomy to remove the proximal nerve root as close to the spinal cord as possible. Because this dog’s tumour was quite distal in the brachial plexus, there were normal sized nerves for quite some distance from the cord and the myelogram was normal, foraminotomy was not performed and the nerves were sectioned immediately as they exited the vertebrae. However, if wide excision cannot be achieved due to involvement of the spinal cord, curative treatment may not be possible. Adjuvant radiation treatment is unlikely to be curative because the radiation dose required to treat this soft tissue sarcoma is higher than the tolerable dose for the spinal cord. On the other hand, if the tumour is situated in other peripheral nerves and cranial nerves where a curative dose of radiation therapy is possible, a combination of marginal resection and adjuvant radiation treatment may be useful.

Studies have shown that there is a median survival of 1416 days and a 15% recurrence rate with wide excision alone. McKnight et al reported a 16% recurrence rate and a 5-year survival rate of 76% for dogs treated with radiotherapy (median dose of 63 Gy) for incompletely resected Grade I and II soft tissue sarcomas which included 28 dogs with MPNST.

Prognosis
Complete excision of malignant schwannoma in the brachial plexus in dogs may be curative and this is likely related to early detection and prompt treatment. Potential prognostic factors for malignant schwannomas include size, location, grade, previous treatment, and surgical margins. In general, the prognosis for dogs with malignant schwannoma is poor however, because the tumour cells readily spread along the nerves making complete resection difficult resulting in recurrence following incomplete resection. Prognosis for dogs with tumours confined to the plexus is better than for dogs with tumours affecting a plexus and invading the vertebral canal.
References:


Surgery Chapter