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Ultimately, it is only with an understanding of normal embryologic development that there can be an understanding of why and how a specific malformation develops. Knowing where and when a specific part of the nervous system develops and what morphogens are at play will enable us to identify undescribed malformation, as well as better define causality. The following article reviews the normal embryologic development of the mammalian nervous system and is intended to serve as a foundation for understanding the various malformations presented in this issue.

**Congenital Hydrocephalus**  
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There are several types of hydrocephalus, which are characterized based on the location of the cerebrospinal fluid (CSF) accumulation. Physical features of animals with congenital hydrocephalus may include a dome-shaped skull, persistent fontanelle, and bilateral ventrolateral strabismus. Medical therapy involves decreasing the production of CSF. The most common surgical treatment is placement of a ventriculoperitoneal shunt. Postoperative complications may include infection, blockage, drainage abnormalities, and mechanical failure.

**Chiari-like Malformation**  
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Chiari-like malformation is a condition of the craniocervical junction in which there is a mismatch of the structures of the caudal cranial fossa causing the cerebellum to herniate into the foramen magnum. This herniation can lead to fluid buildup in the spinal cord, also known as syringomyelia. Pain is the most common clinical sign followed by scratching. Other neurologic signs noted are facial nerve deficits, seizures, vestibular syndrome, ataxia, menace deficit, proprioceptive deficits, head tremor, temporal muscle atrophy, and multifocal central nervous system signs. MRI is the diagnostic of choice, but computed tomography can also be used.

**Atlantooccipital Overlap and Other Craniocervical Junction Abnormalities in Dogs**  
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The term craniocervical junction abnormality (CJA) is an umbrella term for a variety of malformations that occur in the craniocervical region. These abnormalities include Chiari-like malformation, atlantooccipital overlapping,
atlantoaxial instability, occipitoatlantoaxial malformations, atlantoaxial dural bands, and dens abnormalities. Syringomyelia can occur secondary to any of these malformations, or a combination. Clinical signs in dogs with a CJA typically include neck pain and varying signs associated with a cervical myelopathy. MRI of CJAs with computed tomography imaging is necessary for a full evaluation. Some dogs with CJAs respond to medical management, but for most surgery is the treatment of choice.

Intracranial Intra-arachnoid Diverticula and Cyst-like Abnormalities of the Brain 253
Simon Platt, Jill Hicks, and Lara Matiasek
Primary intracranial cystic, or cyst-like, lesions include intra-arachnoid, epidermoid, dermoid, and choroid plexus cysts. Differentiation of these cystic lesions can usually be accomplished by imaging studies alone; however, some cysts are similar in appearance and require histopathology for definitive diagnosis. Clinical signs often reflect the location of the cysts within the intracranial cavity rather than the type of cyst. If clinical signs are significant and progressive, surgical removal is warranted and may be successful, although cystic contents could be harmful if allowed to contact surrounding brain parenchyma or meninges.

Atlantoaxial Instability 265
Meghan C. Slanina
Atlantoaxial instability is a congenital neurologic condition predominantly affecting toy breed dogs. Neurologic signs of a cranial cervical myelopathy typically present at a young age and can range from cervical pain (hyperesthesia) to paralysis. Diagnosis is often based on survey radiographs, although advanced diagnostic imaging can facilitate surgical planning, allow evaluation of spinal cord parenchyma, and rule out concurrent neurologic conditions. Treatment options consist of medical or surgical management, with surgical management being preferable in patients with neurologic deficits or those with unresolved cervical pain despite medical management. The prognosis for surgery is generally favorable.

Cystic Abnormalities of the Spinal Cord and Vertebral Column 277
Ronaldo C. da Costa and Laurie B. Cook
Cystic lesions of the vertebral column and spinal cord are important differential diagnoses in dogs with signs of spinal cord disease. Synovial cysts are commonly associated with degenerative joint disease and usually affect the cervical and lumbosacral regions. Arachnoid diverticulum (previously known as cyst) is seen in the cervical region of large breed dogs and in the thoracolumbar region of small breed dogs. This article reviews the causes, diagnosis, and treatment of these and other, less common, cystic lesions.

Kyphosis and Kyphoscoliosis Associated with Congenital Malformations of the Thoracic Vertebral Bodies in Dogs 295
Curtis W. Dewey, Emma Davies, and Jennifer L. Bouma
Congenital malformations of the thoracic vertebral bodies are commonly encountered in veterinary practice. These anomalies are prevalent in
juvenile and adult small breed dogs. These anomalous vertebrae typically result in various degrees of kyphosis and scoliosis in the region of the abnormality. They are thought to occur following developmental errors during embryonic or fetal vertebral segmentation and ossification; most are incidental. This article focuses on those anomalies of the thoracic vertebral bodies that lead to clinical signs of neurologic dysfunction. Based on a limited number of reported cases, the prognosis for surgically managed dogs with thoracic vertebral body abnormalities is favorable.

Congenital Malformations of Vertebral Articular Processes in Dogs 307

Jennifer L. Bouma

Articular process anomalies are considered congenital. Their occurrence in specific breeds may be indicative of undetermined genetics. Clinical significance varies and is interdependent upon location, function and anatomy. Etiology, uniform nomenclature and classification of vertebral articular process anomalies in the dog are lacking; however, recent efforts are beginning to address this deficit. This author proposes that the term articular process dysplasia appropriately encompasses the spectrum of anomalies in severity as well as including those affecting both the cranial and caudal articular processes. The general category description of articular process dysplasia doesn’t preclude, but rather allows for more specific designations.

Spina Bifida, Meningomyelocele, and Meningocele 327

Rachel B. Song, Eric N. Glass, and Marc Kent

Spina bifida, with or without meningocele, or meningomyelocele, is encountered infrequently in small animal practice. The English bulldog and Manx cat are breeds that are predisposed. Although often silent, in those animals with clinical signs it is important to recognize the signs early and to understand the appropriate imaging modalities employed in establishing a diagnosis. In a select population of affected animals, proposed surgical intervention may be considered to prevent neurologic decline, prevent secondary complications, and potentially improve outcomes.

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