

CONGENITAL HYPOPLASTIC DENS

Case Report
Amanda S. Hummel, DVM

REVIEWED BY
KENNETH BRUECKER, DVM, MS, DACVS



Signalment:

“Gracie”

3 year old, intact female Australian Shepherd
5/9 BCS



History:

Gracie originally presented to VMSG Emergency Service for several seizure like episodes over the past two years. During these episodes she would typically vocalize, collapse, have rigid inability to use her limbs and begin to recover within a few minutes, though full recovery took hours. During the first episode Gracie ran into a wall. Two days prior to presentation she had two episodes of collapse and conscious proprioceptive deficits; she was also observed to be making repeated scratching motions with her left pelvic limb. Diagnostics at original presentation included abdominal ultrasound, echocardiogram and full blood work with urinalysis; all had no clinically significant findings. The only clinically relevant abnormality was a mild increase in ALT. Gracie was referred for an MRI which showed that she lacked a well defined odontoid process and trauma of the overlying spinal cord at C1-C2. Gracie is an agility dog who had a PDA ligation at 5 months of age and has had no complications from this procedure.

Clinical Exam:

Gracie presented to VMSG Surgery Service with a left sided head tilt. She was stiff in the neck and resisted ventro-flexion but showed no signs of pain on palpation. Her gait and neurologic exam were within normal limits.

Diagnostic Imaging:

Cervical radiographs: Poor visualization of the dens with possible C1 - C2 subluxation

Cervical CT evaluation: Absent dens of C2 with ossified body in the area of the apex of the dens. (See Figures 1-3).

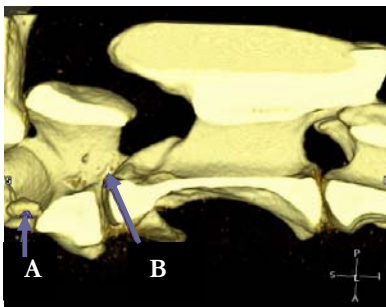


Figure 1

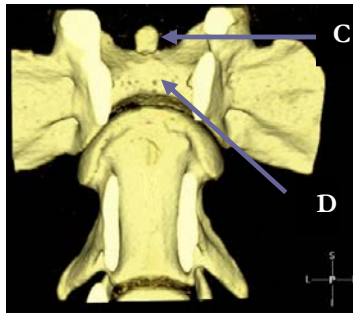


Figure 2

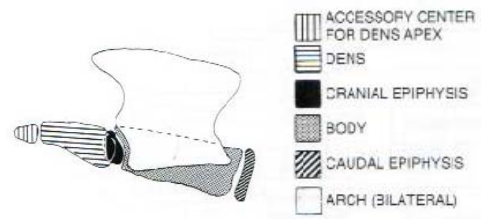


Figure 3

Figure 1: Saggital 3D reconstruction from CT. A) Ossified body, suspected apex of the dens. B) Lack of the body of the dens of C2.
Figure 2: Dorsal 3D reconstruction from CT. C) Ossified body, suspected apex of the dens. D) Lack of the body of the dens of C2.
Figure 3: From *Textbook of Small Animal Surgery* (p 1175) see reference number 3. Ossification centers of C2 in the canine.

Diagnosis:

Congenital hypoplastic dens with spinal cord trauma.

Treatment/Management:

Gracie was hospitalized for CT followed by surgical correction. She was placed under general anesthesia (pre-anesthetic: atropine 0.02 mg/kg, butorphanol 0.3 mg/kg; induction: diazepam 0.3mg/kg, propofol 3mg/kg; maintenance: isoflurane 1.5 -0.9%) for pre-operative radiographs and CT scan. The CT showed poor visualization of the body of the dens, however the cranial aspect of the dens was seen (See Figures 1-3). She recovered uneventfully from anesthesia and was hospitalized in the ICU overnight. The following day she was anesthetized for surgery (pre-anesthetic: atropine 0.054mg/kg, morphine 0.3mg/kg; induction: diazepam 0.3mg/kg, propofol 3mg/kg; maintenance: isoflurane 0.9-2%). A dopamine (3-5 mcg/kg/min) CRI was utilized intraoperatively. Atlanto-axial fusion/stabilization was performed using two Accutrax, headless, self compressing cannulated screws transarticularly, autogenous cancellous bone graft harvested from the proximal humerus and rh BMP (recombinant bone morphogenic protein). Solumedrol (30mg/kg) was given IV over thirty minutes intra-operatively to reduce inflammation in the area and decrease

compression on the cord. A MLK (10mg/kg) CRI was used intra-operatively for pain control. Cefazolin (22mg/kg) was administered q2hr intra-operatively. Post-operative radiographs were taken showing appropriate fixation (See Figures 4-5). A neck bandage was placed for stability. Gracie recovered uneventfully from anesthesia. MLK CRI (2.5ml/kg/hr) was weaned by 0.5 ml/kg/hr q2-3 hrs post-operatively through the following morning, then discontinued. She was monitored in ICU, her pain was controlled with Tramadol PRN and agitation was controlled with acepromazine PRN. The morning after surgery, Gracie was able to walk on her own but was stumbling and knuckling. Approximately 24 hours post-operatively she was able to walk briskly with no obvious CP deficits and minimal stumbling. Her head tilt was difficult to assess due to the neck bandage but appeared to be improved. She was discharged from VMSG 2 days post-operatively and at that time was ambulating well, eating and drinking normally, and urinating on her own.



Figure 4



Figure 5

Figure 4: Intra-operative radiograph: Screw has been placed on the right. K-wire is being used to visualize angle of drill hole on the left side.

Figure 5: Immediate post-operative radiograph: Implants stabilizing C1-C2.

Post-operative care:

Gracie was placed in a neck brace/bandage post-operatively for 8 weeks. She was given Tramadol and acepromazine PRN and kept crate confined initially then gradual leash controlled exercise was permitted. Post operatively Gracie's owner reported that she had increased respiratory effort and audible noise with periodic nasal discharge. The bandage was changed to ensure that there was no compression on the laryngeal area causing increased respiratory difficulty. Gracie was brought back in for periodic bandage changes and rechecks with radiographs at 3, 8, and 10 weeks (See Figures 6-8). Following her ten week recheck Gracie was allowed to slowly return to normal activity.



Figure 6



Figure 7



Figure 8

Figure 6: Three week recheck radiographs: Significant callus formation can be seen ventral to C1-C2 stabilization.

Figure 7: Eight week recheck radiograph: Further formation of bony callus bridging C1-C2.

Figure 8: Ten week recheck radiographs: Bony callus formation and fusion of C1-C2.

Discussion:

Atlanto-axial instability is most commonly seen in small breed dogs due to congenital abnormalities or large breed dogs with traumatic fracture of the dens (odontoid process). There are six ossification centers in a normally formed dens (See Figure 3) [3]. In Gracie's case we suspect that she had aplasia of the body of the dens with the apex of the dens present and not attached to C2. Typically dogs with an instability exhibit clinical signs prior to one year of age. In general instability does not cause clinical signs unless stress is placed on the area or a traumatic event occurs [3]. Signs can range from pain to tetra-paresis, with the majority of animals resisting ventral neck flexion on physical examination [2].

Some of these dogs can be managed medically, with strict confinement and neck brace for 6-8 weeks. Surgery is indicated when the signs are more chronic, when reoccurring neurologic deficits are severe, when medical management fails or in mature patients. The most successful surgical cases are in animals with mature bone allowing secure implant fixation [2]. One of the more common post operative complications is implant migration, which is more common in young dogs with soft bones [1].

Pain and agitation control is critical in the immediate post operative and recovery period to reduce the chances of implant loosening and failure [2].

Post operative complications associated with the surgical procedure itself include laryngeal paralysis, spinal cord compression, implant failure, difficulty swallowing and respiratory compromise [2]. As always anesthetic complications can arise.

References:

- 1) Platt SR, Chambers JN, Cross A. A Modified Ventral Fixation for Surgical Management of Atlantoaxial Subluxation in 19 Dogs. *Veterinary Surgery* 33: 349-354, 2009.
- 2) Seim HB. Surgery of the Cervical Spine: Atlantoaxial Instability. In Fossum TW, Hedlund CS, Johnson AL, Schulz KS, Seim HB, Willard MD, Bahr A, Carroll GL: *Small Animal Surgery*, 3rd ed. Mosby Elsevier, St. Louis, 2007, p1441-1447.
- 3) Shires PK. Atlantoaxial Conditions and Wobbler Syndrome. In Slatter D (ed): *Textbook of Small Animal Surgery*, 3rd ed. W.B. Saunders Co., Philadelphia, 2003, p1173-1180.