

# Bacterial Ventriculitis and Obstructive Hydrocephalus Associated with *Pseudomonas aeruginosa* in a Dog

Nicholas Goody<sup>1,2</sup>, Tobias Schwarz<sup>1</sup>, Bunita Eichelberger<sup>2</sup>, Cody Alcott<sup>2</sup>, Rainier Ko<sup>3</sup>, Elizabeth Kieran<sup>4</sup>

## Objective

This report describes the clinical presentation, magnetic resonance imaging (MRI) findings, and necropsy findings of bacterial *Pseudomonas aeruginosa* ventriculitis, meningitis, and associated obstructive hydrocephalus in a dog.

## Methods

A five-year-old male neutered working German Shepherd Dog presented to an emergency hospital for acute onset and rapid progression of obtundation, vertical nystagmus, and ataxia. MRI of the brain was performed using a 1.5 T scanner including: T2w, T2 FLAIR, T2\* GE, T1 STIR, T1 3D GE, T1w pre & post-contrast series. Cerebrospinal fluid (CSF) was obtained for culture and cytology. The patient was euthanized, a necropsy was performed, and fresh-frozen brain tissue was collected for culture.

## Results

- ❖ **Marked contrast enhancement** of the **ependymal lining** of the mesencephalic aqueduct, third ventricle, and fourth ventricle supportive of periventriculitis/ependymitis (Fig. 1).
- ❖ **Increased hyperintensity** of the **lining of the ventricular system** relative to the adjacent white matter on T2w and T2 FLAIR sequences, supporting periventricular oedema (Fig. 2).
- ❖ Moderate contrast enhancement on the left rostroventral calvarial margin (Fig. 3).
- ❖ Contrast enhancement in the **cervical meninges** and within the **central cervical spinal cord** (Fig. 4 & 5).
- ❖ Mild FLAIR hyperintensities along the dorsal grey matter of the cerebral cortex without contrast enhancement (Fig. 6).
- ❖ **Severe obstructive hydrocephalus** with foraminal herniation of the cerebellar vermis (Fig. 7).
- ❖ Asymmetric distention of the lateral ventricles, greater in the left, with generalised dilatation of the ventricular system.
- ❖ **Necropsy and histopathology** revealed hydrocephalus, herniation of the cerebellar vermis, ventriculitis, and meningitis.
- ❖ A moderate yield of *P. aeruginosa* was detected on both CSF and brain tissue culture.

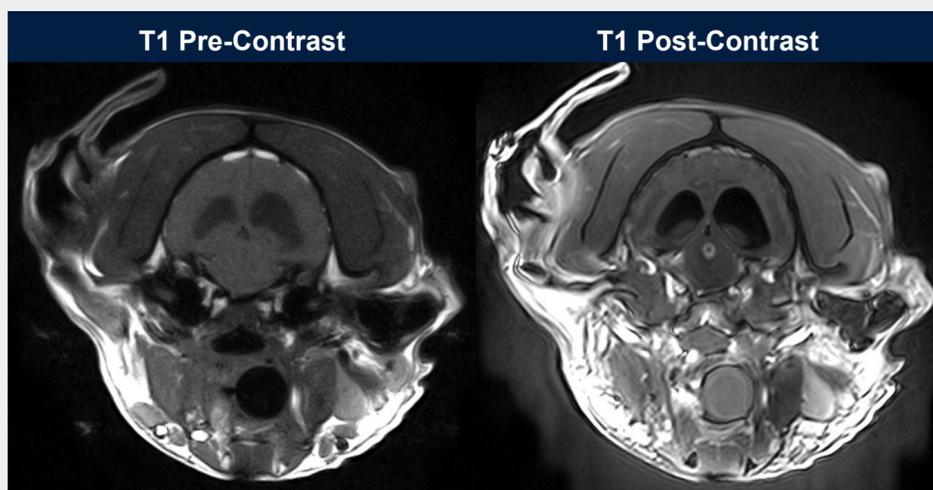


Fig 1. T1w pre- and post-contrast, showing periventricular enhancement.

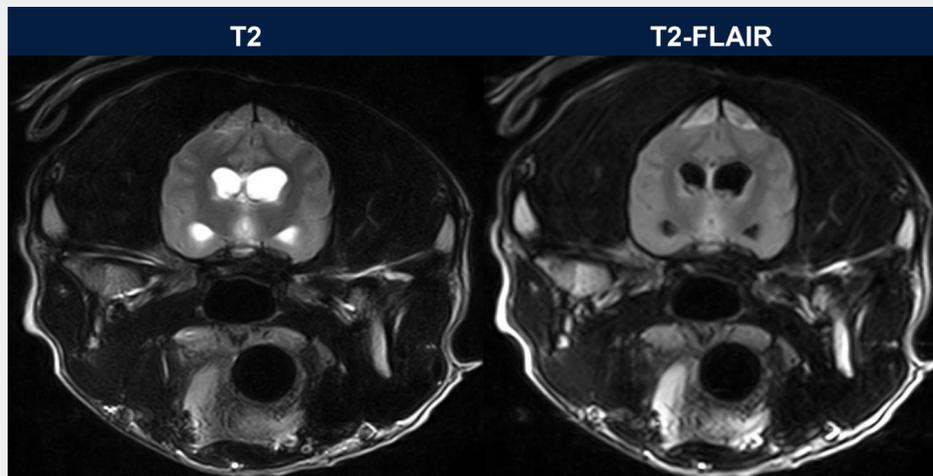
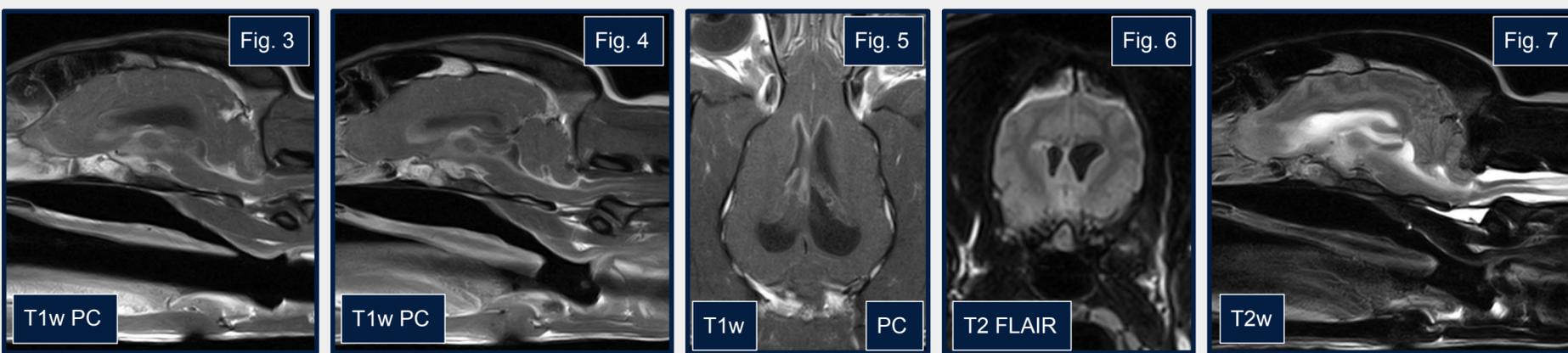


Fig 2. T2w & T2 FLAIR, showing increased periventricular hyperintensity.



## Discussion

Ventriculitis associated with *P. aeruginosa* reported in humans are most commonly nosocomial in cause and occurring after surgery that disrupts the blood-brain barrier<sup>1,2,3</sup>. These reports describe MRI imaging findings similar to this dog - including periventricular contrast enhancement, and increased hyperintensity of periventricular tissues on T2 FLAIR weighted images, suggestive respectively of ependymitis & oedema. The few canine cases of bacterial meningoencephalitis reported in dogs were described with post-mortem evidence of gross external inoculation such as migrating nasal foreign bodies or severe otitis<sup>4,5</sup>. No source of infection was present on this necropsy; no aural disease was present, and the cribriform plate & nasal cavity were normal.

## Conclusion

Peracute bacterial encephalitis can be considered for obstructive hydrocephalus in dogs exhibiting MRI findings that include periventricular contrast enhancement, and increased T2w/FLAIR hyperintensity of periventricular tissues.

## References

1. Pai et al (2016). *Pseudomonas aeruginosa* meningitis/ventriculitis in a UK tertiary referral hospital. Monthly Journal of the Association of Physicians.
2. Segal et al (2021). Pseudomonal Meningoencephalitis With Ventriculitis Secondary to Bacteremia in a Burn Patient. J Burn Care & Research.
3. Hayashi et al (2015). *Pseudomonas aeruginosa* Ventriculitis after Transsphenoidal Surgery. Open Journal of Modern Neurosurgery.
4. Wu et al (2015). Cerebral Ventriculitis Associated with Otogenic Meningoencephalitis in a Dog. J of the American Association of Animal Hospitals.
5. Dennis (2005). Bacterial Meningoencephalitis and Ventriculitis Due to Migrating Plant Foreign Bodies in Three Dogs. Veterinary Pathology.

## Affiliations

1. The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Roslin EH25 9RG, UK. 2. Tucson Veterinary Specialists, Tucson, AZ 85704, USA. 3. Veterinary Specialty Center of Tucson, Tucson, AZ 85704, USA. 4. University of Arizona, Tucson, AZ 85721, USA

E-Mail Address: [NGOODY@ED.AC.UK](mailto:NGOODY@ED.AC.UK)