Dick White Referrals

The University of Nottingham

MRI assessment of the effect of age on hippocampus height in dogs

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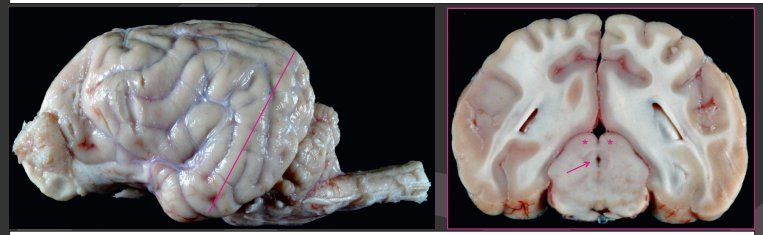
INTRODUCTION

In human medicine hippocampal volume changes have been associated with neurological conditions including Alzheimer's[1], Parkinson's[2] Huntington's diseases[3], epilepsy[4], schizophrenia[5] and depression[6,7]. Hippocampal volume reduction also occurs across the typical adult lifespan, but the magnitude of normal hippocampal age-related change is unclear. In veterinary medicine the relationship between progressive canine brain atrophy and aging has been documented in several post-mortem studies[8-10] and with a variety of MRI techniques[11-15]. Similarly to what has been observed in man, hippocampal atrophy plays a significant part in canine cerebral atrophy and can be considered an early marker of cerebral aging[15-17].

OBJECTIVE

The goals of this study were 1) to develop an easy method for measuring the hippocampus and 2) to determine whether the "decreased height" of hippocampus was related to brain aging in dogs.



RESULTS

- 134 dogs (84 in the young and 50 in the old group)
- HH was 7.7 (1.2) mm in young and 6.6 (1) mm old dogs (P<0.001) **(Graph 1)**
- HB was 45.3 (3.4) mm in young and 45.5 (4) mm in old animals (p=0.075)
- HBr was 17.1 (2.5)% in young and 14.6 (2.5)% in old dogs (P<0.001) **(Graph 2)**

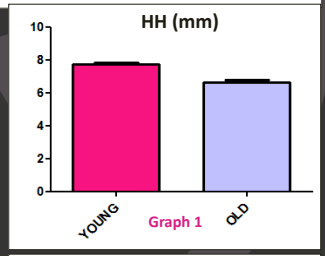
MATERIALS AND METHODS

- Brain MRI performed at DWR (2007-2014) were reviewed; studies in which there was no macroscopic evidence of brain abnormalities were collected
- Two groups: young (1-3 y) and old (>10 y) dogs
- Measurements on a single transverse T2 FLAIR image containing rostral colliculi* and mesencephalic aqueduct (arrow) :

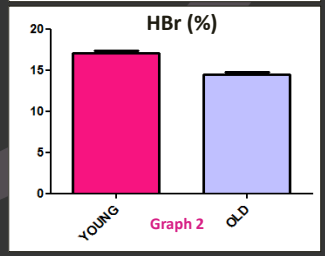
1. HH : height of hippocampus
2. HB: height of the brain
3. HBr: HH to brain ratio (HH/HBx100)

- Measurements were obtained by a non-experienced observer
- Student t-test (P<0.05); data reported as mean (SD)

Transverse T2 FLAIR brain images of a young (A) and an old dog (B). HH and BHr measured at the level of rostral colliculi and mesencephalic aqueduct (C).



Graph 1



Graph 2

CONCLUSION

We demonstrated a statistically significant reduction in HH in older patients. In the present study, the HH was used to assess the hippocampal atrophy, whilst in previous literature they have used visual rating assessment[17] or voxel-based morphometry (VBM)[15]. This represent an easy method to evaluate canine hippocampus measurement by a non-experienced observer who would be able to establish the presence of hippocampal atrophy and to assess its severity in old dogs.

1. Jack et al., 2000. Neurology 55, 484-489. **2.** Camicioli et al., 2003. Mov Disord 18, 784-790. **3.** Majid et al., 2011. Mov Disord 26, 2544-2551. **4.** Liu et al., 2001. Neuroimage 14, 231-243. **5.** Wang et al., 2008. Biol Psychiatry 64, 1060-1068. **6.** Arnone et al., 2013. Mol Psychiatry 18:1265-72. **7.** Steffens et al., 2011. Am J Geriatr Psychiatry 19, 4-12. **8.** Reifinger, 1997. Anat Histol Embryol 26:141-6. **9.** Borràs et al., 1999. Vet Pathol 36:202-11. **10.** González-Soriano et al., 1999. Ann Anat 183:283-91. **11.** Kimotsuki et al., 2005. J Vet Med Sci 67:961-7. **12.** Su et al., 1998. Neurobiol Aging 19:479-85. **13.** Su et al., 2005. Prog Neuropsychopharmacol Biol Psychiatry 29:389-97. **14.** Hasegawa et al., 2005. Vet Radiol Ultrasound 46:452-7. **15.** Tapp et al, 2006. Neuroimage 29:234-44. **16.** Tapp et al., 2004. J Neurosci 24:8205-13. **17.** Pugliese et al., 2010. Vet J 186:166-71.