PROJECT APPROACH & METHODS

ABSTRACT

Current pathological diagnoses, in post-mortem brain tissue sample, for Alzheimer’s disease (AD) focus on plaques of abnormal beta-amyloid protein and tangles (tau proteins) in dying nerve cells. However, many aging non-demented individuals also exhibit significant plaque and tangle pathology (Price et al., 1999). This suggests that there are unresolved issues in correlating the clinical evidence of cognitive impairment and diagnosis of AD with neuropathological findings. Understanding the anatomy of brain vasculature with respect to functional cerebral neuroarchitecture will help to emphasize vascular and hemodynamic factors as possible contributors to neurodegenerative processes leading to dementia.

The main cerebral arteries are: anterior cerebral (ACA), middle cerebral (MCA), lenticulostriate (LSA), anterior choroidal (AOC), and posterior cerebral (PCA) (van der Zwan, et al., 1991). These arteries perfuse different parts of the brain described as cerebrovascular domains or territories. Watershed zones are found at the margins of two adjacent vascular territories. These regions lack collateral circulation and exhibit lower blood perfusion pressure (Mangla et al., 2011). Nucleus basalis of Meynert, located in the basal forebrain beneath the anterior commissure (Nieuw, 2009), is a major collection of cholinergic neurons with widely dispersed cortical projections from subdivisions that have distinct trajectories. Its cholinergic fibers are involved in cortical activation and vasomotor control.

This interactive module employs visual demonstrations and clinical cases to integrate often separately studied components of neuroanatomy, neurovascular anatomy, and cortical fiber systems into a coherent demonstration of how structural relationships of these elements can play into the neuropathology and pathophysiology of dementia.

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Format of instructional module: Instructional module is separated into “Lecture” and “Map” format. This separation allows students to learn by recommended learning sequence or to free reign and learn the topic of interest based on their own preference. Components of instructional module. Interactive identification, instructional map, test boxes, learning objectives, trigger boxes, wipe animation and clinical case scenarios all enveloped this instructional module into complete interwoven learning process that aids in understanding difficult concepts in neuroscience that has a significant role in processes of aging and dementia.

BACKGROUND & RATIONALE

Topography of Cerebral Vasculature and Watershed Zones in Relation to Intracerebral Axonal Tract Systems and Cortical Connectivity

JiHyun Chun, BS; W. Frank Hughes, Ph.D. (mentor)
Master of Modern Human Anatomy Program, Department of Cell and Developmental Biology, University of Colorado Denver - Anschutz Medical Campus

REFERENCES & ACKNOWLEDGEMENTS

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Creating visual presentations. On Gimp (GNU Image Manipulation Program), various image rendering tools were used to annotate projection tracts, color shade vascular territories, and superimpose rendered images on the background of coronal and horizontal images. (Neuromancy Atlas from Boston University School of Medicine, Department of Anatomy and Neurology; coronal and horizontal brain sections photographed and labeled by Dr. Bruce Crawford and Kurt McBurney at the University of Victoria). All 3D cerebral blood vessels are taken from the Cerebro Atlas (Thieme) and superimposed on top of different background images. During the process of drawing and superimposing rendered images, each anatomical location was referenced from literature, functional description, visual demonstration of instructional module found in literature. Creating an Interactive Instructional Module. The entire interactive portion of this instructional module was created by using PowerPoint animations and actions. Audience of instructional module. The instructional module is designed for pre-professional audiences that include: i.e. medical students, residents in departments of neurology, neurosurgery, or psychiatry; and undergraduate or graduate students in psychology, neuroscience – or within our Master of Modern Human Anatomy Program.