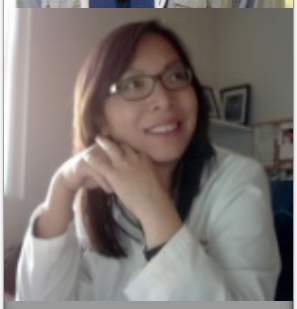

DETECTION OF DAMAGED COLLAGEN IN UREMIC BLOOD VESSELS USING COLLAGEN MIMETIC PEPTIDES

Jason Chieh Sheng Tey (Yan-Ting Elizabeth Shiu)
Department of Internal Medicine

Introduction: The arteriovenous fistula (AVF) is the preferred type of vascular access for kidney failure patients on chronic hemodialysis, but it often fails to mature and become usable. We hypothesized that collagen in the fistula vein is damaged by kidney failure-induced uremia, leading to fistula maturation failure. We proposed to use collagen mimetic peptides (CMPs), which bind specifically to damaged collagen, to detect damaged collagen in uremic blood vessels. We conducted a pilot experiment to optimize our protocol by using healthy blood vessels and heat-induced collagen damage.

Methods: Thin-sections of formalin-fixed and paraffin-embedded carotid artery and jugular vein tissues from healthy pigs were probed with CMPs or type I collagen antibody. Some tissues were heated at 95°C for 10 minutes in sodium citrate buffer beforehand. CMPs and type I collagen antibody were tagged with fluorescent markers, and stained samples were observed under a confocal microscope.

Results: We found stronger CMP fluorescent signals in heated vessels than in non-heated vessels, suggesting that more CMPs bound to heated and damaged collagen than non-damaged collagen. We observed some degree albeit weaker fluorescent signals in non-heated vessels. We attributed this to collagen being damaged by formalin. When we compared CMP-stained veins and arteries with type I collagen antibody-stained veins and arteries, we found that collagen patterns were qualitatively similar, suggesting that the damaged collagen was type I collagen. Veins also had more collagen than arteries, regardless of whether in CMP-stained or type I collagen antibody-stained samples. The greater abundance of collagen in veins than in arteries suggests a more important role of venous collagen in fistula maturation.

Conclusion: CMPs will be further used to detect damaged collagen in uremic vessels in the future. We will consider to use other tissue preservation methods (such as cryopreservation) and alternative antigen retrieval techniques (such as trypsin) to minimize collagen damage due to factors other than uremia. The concentration of CMP solution will also be further optimized to achieve the optimal fluorescent signals.