

Assessment of Flow Quantity and Capture Efficiency of a Distal Protection Device

Kimiya SAKAMOTO ¹⁾, Shun-ichi NAGATA ²⁾, Yoshihisa MATSUMOTO ¹⁾,
Hiroshi AIKAWA ¹⁾, Masanori TSUTSUMI ¹⁾, Hidenori YOSHIDA ¹⁾,
Sumito NARITA ¹⁾, Taichiro MIZOKAMI ¹⁾, Housei ETOU ¹⁾,
Ritsuro INOUE ¹⁾, Shuko HAMAGUCHI ¹⁾, Kiyoshi KAZEKAWA ¹⁾

¹⁾ *Department of Neurosurgery and Neuroradiology, Fukuoka University Chikushi Hospital,
1-1-1 Zokumyoin, Chikushino, Fukuoka 8188502, Japan*

²⁾ *NAGATA Neurosurgical Clinic, 433-14 Higashimochida Aira, Kagoshima 8995421, Japan*

Abstract

Purpose: A distal protection device (DPD) is used to perform carotid artery stenting (CAS) more safely. The DPD requires high debris capture efficiencies and proper blood flow quantities to prevent slow flow. The flow quantity and debris capture efficiency of the Filterwire EZ (EZ) and Angioguard XP (XP) were assessed.

Methods: We created virtual models of the common carotid artery (CCA), the internal carotid artery (IC) and the external carotid artery (EC) and generated a pulsatile flow. A 50% or lower IC level of flow was defined as slow flow. DPDs were placed in the IC, and virtual debris was injected until slow flow occurred. Cellulose porous beads (CPBs) were used as virtual debris. The CPBs were administered until slow flow occurred, and the CPB dose, the number of missed CPBs and the ratio of missed CPBs to the total dose were compared.

Results: The dose at which the CPBs caused slow flow was significantly higher in the EZ group, and the number of missed CPBs and the ratio of missed CPBs to the total dose were significantly lower in the EZ group.

Conclusion: Compared with the XP, safer CAS procedures can be performed with the EZ device, because it provides higher blood flow quantities and has higher capture efficiencies.

Key words: Distal protection device, Flow quantity, Capture efficiency, Carotid artery stenting, Virtual model