

Introduction

The development of new revascularization devices has significantly improved recanalization rates and time to recanalization. A direct aspiration first-pass (ADAPT) technique for stroke thrombectomy was recently shown to be an effective and rapid way to achieve revascularization.

The technique focuses on engaging and removing the clot without the use of a separator or retriever. It relies on the force and aspiration generated by the catheter. We sought to compare the physical and fluid dynamic properties, force and aspiration, of

Methods

Aspiration for each catheter was measured by submersing the catheter into a graduated cylinder and aspirating water at room temperature. The volume of fluid aspirated, a direct correlation of flow, was compared for each catheter.

Force of aspiration at the tip of each catheter was measured and compared. Pressure at the tip of each catheter was measured utilizing a vacuum pressure gauge while the catheter was attached to a standard aspiration pump set to -29 inHg. Force was then calculated utilizing the formula $P = F/A$ ($P =$

Results

The data are presented in Table 1. The 5MAX ACE catheter had the greatest aspiration rate of all the catheters at 245 mL per min. The 5 MAX catheter aspirated 212 mL/min, followed by the Navian 058 and DAC 057 with 198 mL/min and 197 mL/min, respectively.

The 5MAX ACE generated the greatest tip force of 18.6 grams. The 5MAX had the least amount of force of 15.1 grams.

Conclusions

The physical and fluid dynamic properties of commercially available catheters suggest that the 5MAX ACE is the optimal catheter to employ for direct aspiration for stroke therapy.

Table 1

Catheter	Distal ID (in)	Distal Area (in ²)	Flow Rate (mL/min)	Force at tip (g)
5 MAX ACE	0.060	0.002827433	245	18.6
5MAX	0.054	0.002290221	212	15.1
Navian 058	0.058	0.002642079	198	17.4
DAC 057	0.057	0.002551759	197	16.8

Table showing inner diameter, distal area, flow rate and the force generated at the tip of the catheters studied

Learning Objectives

Determine the properties of commercially available catheters that are best suited for stroke therapy