COOK®

Drainage Flow Rates

A COMPARATIVE STUDY OF PERCUTANEOUS DRAINAGE CATHETERS

Introduction and Objective

The science of fluid flow applies to many facets within radiology, from arteriography and angioplasty to percutaneous drainage.[1] For percutaneous drainage, many variables can affect the rate of fluid flow. The objective of this paper is to present the results of a comparative study, conducted by MED Institute, on the flow rates of percutaneous drainage catheters. The drainage catheters tested were the Cook® Ultrathane® Mac-Loc® Multipurpose and the Boston Scientific Flexima™ Regular APD™ catheters. Twenty catheters in both 8 French and 12 French sizes* were examined in the following areas:

- Flow Rates under pressure (Inflow)
- Flow Rates under vacuum/suction (Outflow)

Flow Rate under Vacuum/Suction

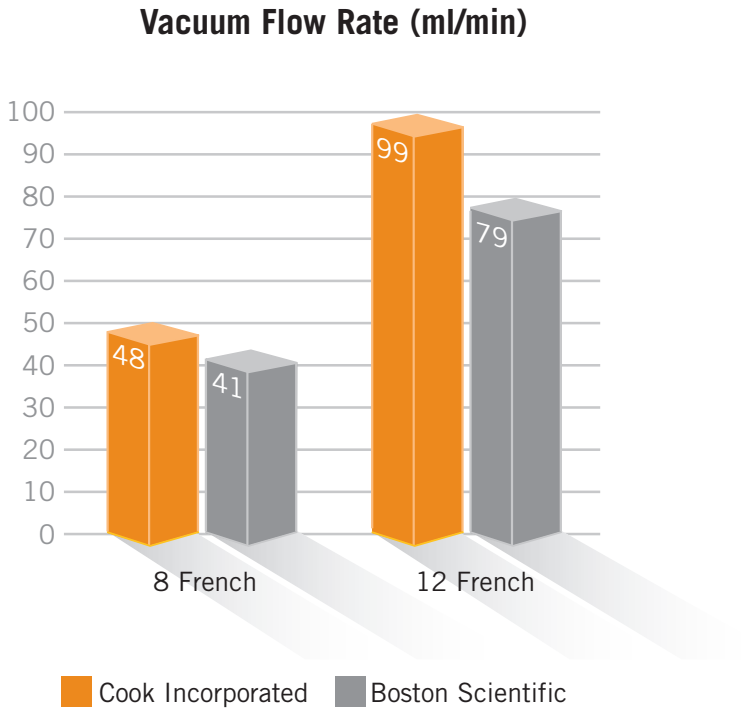
Test Method

The proximal hub of each catheter was connected to one end of a vacuum flask, which was in turn connected to a vacuum pump. The distal end of each catheter was placed in an aqueous solution of glycerin (55% by weight), which approximates the viscosity of abscess fluid.[2, 3]

A pressure of approximately -110 mmHg ± -10 mmHg was applied to the vacuum flask, and the flow through each catheter was collected for a time of 60 seconds ± 1 second.

Results

The Cook 8 French catheters exhibited 17% greater flow rates than the 8 French Boston Scientific catheters. The difference between flow rates was more significant in the 12 French sizes. Cook catheters had a 25% higher flow rate than Boston Scientific catheters. (See Table 1)



MANUFACTURER	8 FRENCH	12 FRENCH
Cook Incorporated	48 ± 5 ml/min	99 ± 4 ml/min
Boston Scientific	41 ± 4 ml/min	79 ± 5 ml/min

Table 1: Flow Rate under Vacuum/Suction

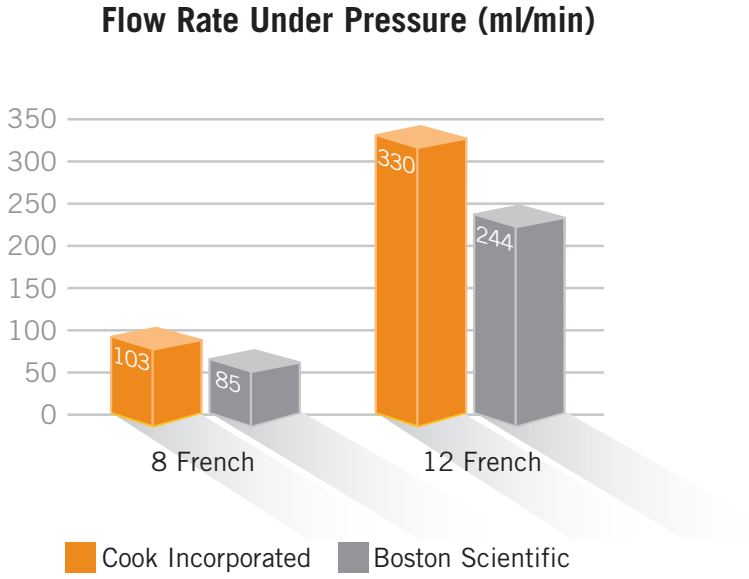
Flow Rate under Pressure

Test Method

To calculate flow rate under pressure, each catheter was connected to an elevated tank filled with an aqueous glycerin solution (55% by weight) at room temperature.[2, 3] The tank provided a constant pressure head of 120 mmHg ± 10 mmHg, as measured at the approximate midpoint of the catheter. The flow through each catheter was collected for a time of 60 seconds ± 1 second.

Results

As shown in Table 2, Cook catheters again demonstrated greater flow rates than Boston Scientific catheters, with the difference being greater in the 12 French sizes than the 8 French sizes. The 8 French sizes of Cook catheters had a 21% higher pressure flow rate than Boston Scientific's 8 French catheters. In the 12 French sizes, Cook devices exhibited a 35% greater flow than Boston Scientific devices.



MANUFACTURER	8 FRENCH	12 FRENCH
Cook Incorporated	103 ± 7 ml/min	330 ± 9 ml/min
Boston Scientific	85 ± 3 ml/min	244 ± 20 ml/min

Table 2: Flow Rate under Pressure

Conclusion

Although many variables are present when assessing flow rates, the results indicate that Cook drainage catheters offer higher inflow and outflow rates than the Boston Scientific drainage catheters under the conditions tested. Further testing needs to be conducted to determine clinical relevance as to how a catheter's dimensional characteristics affect flow rates in the clinical setting.

* The catheter French sizes reported on the manufacturers' label are not of actual size. The outer diameter of these catheters was measured for precise calculations. The following table illustrates the actual dimensions of both the 8 and 12 French catheters from each manufacturer.

MANUFACTURER	LABEL SIZE	ACTUAL SIZE
Cook Incorporated	8.50 Fr	8.47 Fr
	12 Fr	11.58 Fr
Boston Scientific	8 Fr	8.50 Fr
	12 Fr	12.27 Fr

[1] Sammett EJ et al. Basic Fluid Dynamic Principles—Application to Percutaneous Intervention. EMedicine® March 2004.

[2] Park, JK, Kraus, FC, Haaga, JR. Fluid Flow during Percutaneous Drainage Procedures: An *in vitro* Study of the Effects of Fluid Viscosity, Catheter Size and Adjunctive Urokinase. American Journal of Roentgenology 1993 Jan: 160(1): 165-9.

[3] Table of Viscosity Values for Glycerin, http://www.dow.com/glycerin/resources/table18.htm[0].

MED Institute, located in the Purdue University Research Park in West Lafayette, Indiana, specializes in the development and testing of medical devices, including non-clinical and clinical advanced research, technology development, product engineering, formal non-clinical, Good Laboratory Practices (GLP) and ISO17025 testing, prototype development, regulatory submissions and the conduct of clinical trials as a clinical research organization.

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