

# SurFlash® Safety Peripheral IV catheter: Flow rates with power injection<sup>1,2</sup>

## Background

Contrast media is used during computed tomography and magnetic resonance imaging scans such as angiograms to enhance the contrast between blood vessels and their surroundings. Typically, a contrast medium is introduced into a patient's blood vessel via a power injector. Contrast power injectors are typically flow-rate controlled with user-adjustable, pressure-limiting capability. The flow rate is dependent on solution viscosity and volume, pressure, the cross-sectional area of the tubing and the vessel anatomy.

## Purpose

The SurFlash® Safety family of catheters 22 G thru 18 G have a pressure rating of 325 psi, allowing them to be used for the injection of contrast via power injectors. To guide clinicians in this practice, flow rates were assessed via various catheter gauges and lengths using a glycerol solution with the viscosity of five commonly used contrast media at room temperature and also at body temperature. **Table 1** lists the various viscosities of the five contrast media and the references from where the assessment information was obtained is on file at Terumo.



Table 1: Contrast media viscosity and temperature

Contrast Media	Viscosity at 20°C	Viscosity at 25°C	Viscosity at 37°C	References
Omnipaque™ 300	11.6		6.1	**Data on File
Optiray™ 350		14.3	9.0	**Data on File
Isovue® 370	20.9		9.4	**Data on File
Omnipaque™ 350	23.3		10.6	**Data on File
Visipaque™ 320	25.4		11.4	**Data on File

## Test methods

Glycerol solutions were formulated to simulate the viscosity of five contrast media at both room temperature and body temperature for a total of 10 different viscosities to be tested. For accuracy, the viscosities of each of the solutions was verified by a third party vendor. The different solutions were tested on 30 samples of each of the catheters (300 total) that are pressure rated for 325 psi. A fluid collection system was created with a needle injection port. The catheter was then used to cannulate the injection port and the stylet was then removed from the catheter. The simulated power injector and tubing was then connected to the catheter. 242 mL of each of the different viscosity glycerol

solutions was injected at 300 psi pressure and allowed to flow through each of the different catheters. Time was recorded in seconds for the delivery of the 242 mL of glycerol solutions. This number was then divided by the time recorded in seconds to calculate the flow rate (mL/sec) of the catheter.

## Results

All 300 flow rates were recorded and are on file at Terumo. The lowest flow rate for each catheter size was then rounded down to the nearest 0.5 mL to match the rate settings on current power injectors. **Table 2** below was created as a guide for clinicians to understand the flow rate capabilities of the various sizes of the SurFlash family of catheters.

Table 2: Lowest flow rates achieved/catheter size

Simulated to perform as:	Omnipaque 300		Optiray 350		Isovue 370		Omnipaque 350		Visipaque 320	
Power injection testing results for SurFlash catheters	Temperature 20 °C Viscosity 11.6 cP	Temperature 37 °C Viscosity 6.1 cP	Temperature 25 °C Viscosity 14.3 cP	Temperature 37 °C Viscosity 9 cP	Temperature 20 °C Viscosity 20.9 cP	Temperature 37 °C Viscosity 9.5 cP	Temperature 20 °C Viscosity 23.5 cP	Temperature 37 °C Viscosity 10.6 cP	Temperature 20 °C Viscosity 25.4 cP	Temperature 37 °C Viscosity 11.4 cP
	Flow rate (mL/sec)		Flow rate (mL/sec)		Flow rate (mL/sec)		Flow rate (mL/sec)		Flow rate (mL/sec)	
18 G x 1 ¼"	20.0	17.5	16.5	19.0	16.0	16.5	14.5	19.5	17.0	20.0
20 G x 1	13.0	14.5	13.0	13.0	11.0	13.5	11.0	12.5	11.5	14.0
20 G x 1 ¼"	13.0	14.0	12.0	13.0	11.5	12.0	11.0	13.5	11.0	14.0
22 G x 1	7.0	8.0	7.0	8.0	6.5	7.5	6.0	7.0	6.0	8.5
22 G x 1 ¼"	6.5	8.0	7.0	7.5	6.5	7.5	5.5	7.0	5.5	7.5

It is important to note that this is benchtop testing, and in real-life scenarios there are many factors that can contribute to flow rate capabilities other than catheter internal diameter. These may include but are not limited to placement location, vessel trauma, vessel size and pathway.



## References

1 ECRI Institute and the Institute for Safe Medication Practices (ISMP) under contract to the Pennsylvania Patient Safety Advisory Authority. CT Contrast Media Power Injectors Can Rupture Conventional IV Sets. Pa Patient Saf Advis, December 2008, 5(4):136-137. Retrieved on June 12, 2014, from: [http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2008/Dec5\(4\)/Pages/136.aspx](http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2008/Dec5(4)/Pages/136.aspx). 2 Data on file.

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