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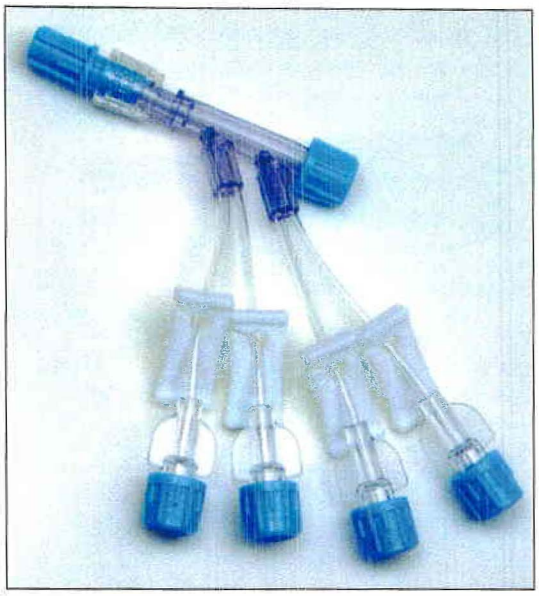

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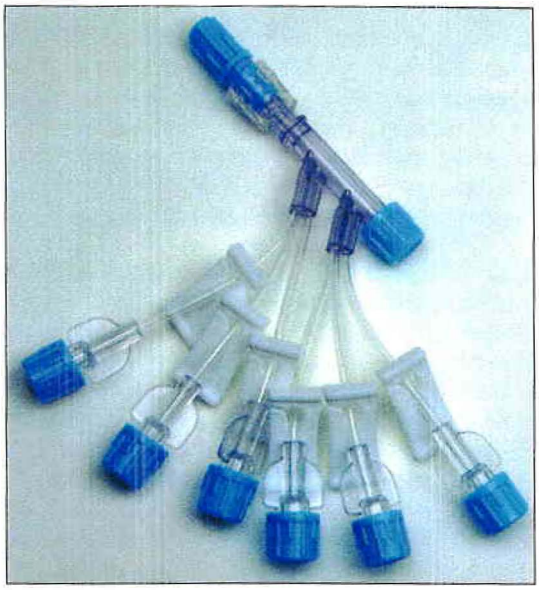

MC8006T

DirectFlow Sets

- ☑ SUPERIOR MICRO INFUSION
- ☑ BETTER PATIENT OUTCOMES
- ☑ SIGNIFICANTLY REDUCED PRIMING VOLUMES
- ☑ STOPCOCK & MANIFOLD ELIMINATION
- ☑ REDUCED TOUCH CONTAMINATION
- ☑ SAFER INFECTION CONTROL PRACTICE
- ☑ NO IN-LINE CONTRAINDICATED MEDICATION MIXING

DirectFlow Streamliner

The **DirectFlow Streamliner** system is a uniquely designed micr infusion product line providing superior drug delivery and enhance patient outcomes.

In the 4-line and 6-line **DirectFlow Streamliner** system T-Connect sets the unique design allows for the line extensions to terminate in tl distal end of the T-Connector ports, and thus into the fluid pathway.

The benefits of the **DirectFlow Streamliner** unique 4-line and 6-lin T-Connector configuration allow the clinicians to:

- Accurately deliver micro-infusions
- Allow for low flow rates of 1, 2, and 3 ml's per hour
- Reduce dead space.
- Eliminate the use of "ganged" stopcocks which directly benefits the fight against infections related to stopcock manipulation
- Reduce the amount of space taken up by stopcocks.
- Eliminate the confusion of stopcock handle positioning and infusing into a closed stopcock
- Angled ports allow for superior flow to the patient
- Angled ports minimize back flow into the other line extensions
- Priming volume is less than 1 ml in both the 4 and 6 line **DirectFlow Streamliner** sets

In Vitro Analysis of Central Venous Drug Delivery: Effect of Manifold and Port Selection

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Background: Central venous catheters (CVCs) are used extensively in the operating room (OR) and intensive care unit (ICU) for infusion of vasoactive, inotropic, antidysrhythmic, sedative and analgesic drugs. Frequently, the number of infusions required exceeds the number of CVC lumens available for delivery. To overcome this limitation, a multi-port manifold may be adjoined to a CVC lumen to allow for simultaneous administration of multiple drug infusions via a carrier fluid. Previous studies examining different CVCs have shown a significant effect of dead volume on drug delivery times (1,2). By using a manifold, dead volumes may be affected by both port selection and manifold design. Using an in-vitro model, we quantitatively compared the impact on drug delivery of the different ports in an individual manifold, and also compared two different manifolds with significantly different structures.

Methods: With previously described methods (1), we chose to evaluate a 16 cm, 7Fr triple lumen catheter, using the most distal lumen (16G) for infusion. One infusion pump delivered normal saline (NS) as the carrier fluid at 10 ml/hr. A second pump infused methylene blue (MB, 0.1 mg/ml) as the model drug at a rate of 3 ml/hr. Two manifolds were evaluated: a 4-gang stopcock and a 6-line T-connector. The 4-gang stopcock has four ports and the 6-line T-connector has two ports, each of which can accommodate up to three infusions. The delivered solution was collected every minute for spectrophotometric quantitative analysis and plotted on Excel (Figure 1). The time to reach half of steady-state delivery (t50) was determined for onset and offset. Each experiment was repeated three times. Results were compared with an unpaired t-test.

Conclusions: Using a traditional stopcock manifold, port selection significantly affects drug delivery kinetics. Selection of a more upstream port results in a larger dead volume that must be traversed by the infusion with resultant slower onset and offset times and a significant lag to achieve steady-state. Port selection was less important for the T-connector manifold and kinetics were faster compared to the second and fourth ports of the stopcock manifold. The smaller dead volumes of the T-connector manifold minimize unwanted delays in onset and offset allowing greater precision of drug infusions. The effect of manifold design is probably underappreciated and may play a significant role in optimizing drug delivery when it is most essential.

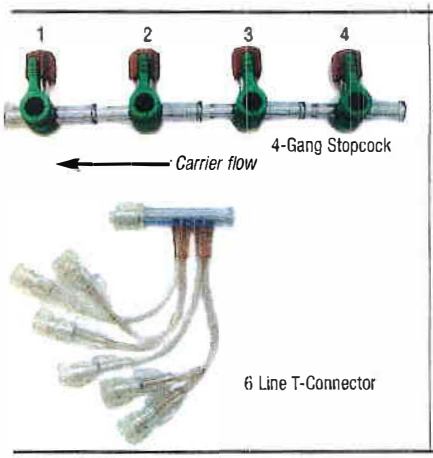
Results: Onset and offset times differed significantly between each individual port of the 4-gang stopcock manifold (Table 1). There was also a significant difference between the two ports of the T-connector but it was less pronounced. Both ports of the T-connector yielded delivery kinetics that were similar to the most downstream port of the 4-gang stopcock manifold. There was good correlation between kinetic data and dead volume for each of the sets.

References:
1. Anesth Analg 2005;100:1048-1055
2. Anesth Analg 2006;102:1147-1153

Port:	4-Gang #1	4-Gang #2	4-Gang #4	T-Connector #1	T-Connector #2
ONSET t50 (min +/- SD)	5.18 ± 0.17	7.11 ± 0.21	8.72 ± 0.56	4.90 ± 0.15	5.33 ± 0.12
OFFSET t50 (min +/- SD)	4.21 ± 0.38	6.34 ± 0.48	9.21 ± 0.33	3.53 ± 0.11	3.78 ± 0.10
Dead Volume (mL)	0.61	0.89	1.46	0.65	0.75

Table 1: Effect of Manifold and Port Selection on Drug Delivery Kinetics

Figure 1: Onset and offset kinetics of drug delivery as a function of time using the first, second, and fourth port of the 4-gang stopcock manifold, and both ports of the T-connector manifold. Infusion of the model drug, MB, was started at time 0 and stopped at time 30.



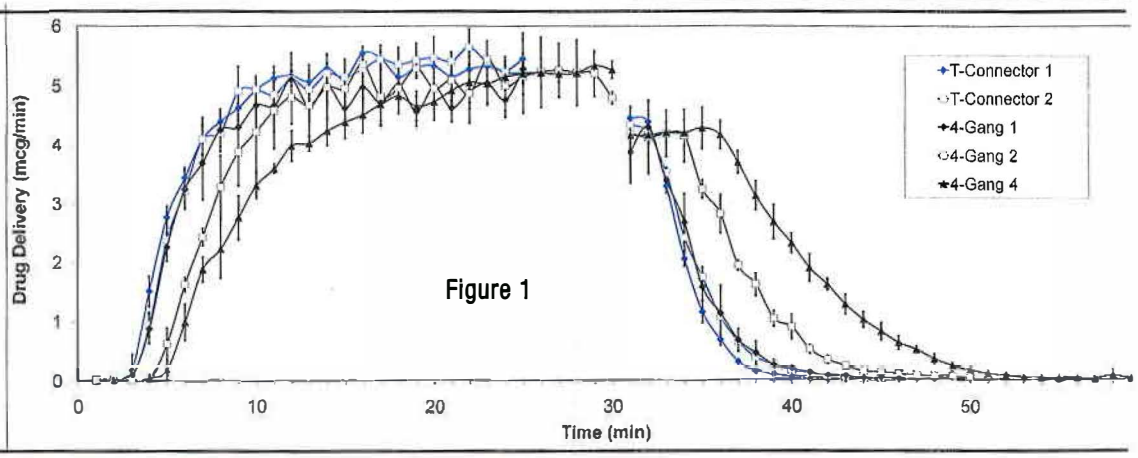


Figure 1