



Technical Publication No. 06-004

Tangential Flow Delivery Catheters

Julio Reategui

This invention describes the method and implementation of a novel catheter type having one or more orifices tangential to its internal diameter, and the use of these orifices to dispense fluids such as saline solutions, contrast agents and drugs. These fluids can serve multiple purposes, including removal of thrombus, homogeneous cell and drug delivery and enhanced imaging during angiographic, CT and MR procedures.

SPECIFICATION

Current devices have distal orifices or radial side holes. The tangential orifice distribution shown has the added benefit of producing a circular flow around the outer surface of the catheter that can be used to facilitate thrombus removal. Clockwise and/or counterclockwise patterns can be implemented. Further, by having alternate clockwise/counterclockwise sections along the catheter, it is possible to create differential force areas, away from the vein walls, that are expected to help break thrombus more effectively.

Further, the distribution of tangential orifices can be made in a plane perpendicular to the catheter axis or at an angle, thus facilitating specialty therapies. Further, therapy flexibility can be accomplished by varying the catheter operating parameters (such as flow rate and fluid velocity) and catheter geometry (such as internal diameter changes, number of tangential orifices, relative position and relative dimension of the holes).

Uses for the invention include:

1. Catheter for thrombus removal with no moving parts and reduced risk to damage to vein or artery walls.
2. Efficient contrast dispersion.
3. Flexibility for delivering cells or drugs by modifying the catheter operating parameters and the number, distribution and size of holes.
4. Circular flow induced around the exterior wall of catheter expected to provide uniform mixing of delivered fluid.
5. Under sustained circular flow conditions, the resulting centrifugal force is expected to drive the dispensed fluid contents outwardly, toward the vein or artery wall, thus facilitating the delivery of therapy drugs and requiring less contrast for vein visualization.

Problems Solved:

1. Reduced complexity and cost of thrombus removal catheter systems.
2. Reduced risk of damage to vein or artery walls, because the circular flow generated will tend to move the catheter away from the vein or artery wall.
3. Better visualization with less contrast, because most contrast will concentrate near the wall of the vein or artery.

