UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA

QXMÉDICAL, LLC,

Plaintiff,

v.

VASCULAR SOLUTIONS, LLC; TELEFLEX INNOVATIONS S.À.R.L.; and ARROW INTERNATIONAL, INC.,

Defendants.

Case No. 17-CV-1969 (PJS/TNL)

ORDER

Courtland C. Merrill, Philip J. Kaplan, and Ariel O. Howe, ANTHONY OSTLUND BAER & LOUWAGIE P.A., for plaintiff.

Luke L. Dauchot and Alyse Wu, KIRKLAND & ELLIS LLP; and Tom Vitt and Patrick J. O'Rear, JONES DAY, for defendants.

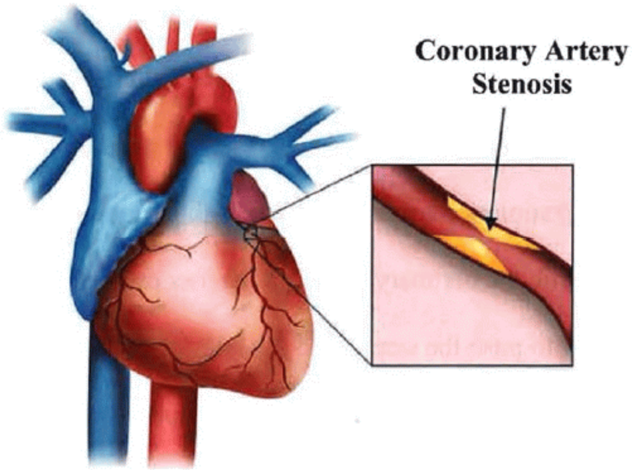
This lawsuit involves six patents—U.S. Patent Nos. 8,048,032 (the "'032 patent"), 8,142,413 (the "'413 patent"), RE45,380 (the "'380 patent"), RE45,760 (the "'760 patent"), RE45,776 (the "'776 patent"), and RE46,116 (the "'116 patent"). All six patents descend from a common patent application and share a common specification and common drawings. The patents are owned by defendant Teleflex Innovations S.à.r.l., whose parent corporation acquired defendant Vascular Solutions, LLC, in February 2017. A third defendant, Arrow International, Inc., has the right to sell products practicing the patents. For convenience, the Court will refer to the defendants collectively as "Vascular Solutions."

In April 2017, Vascular Solutions accused plaintiff QXMédical, LLC ("QXMédical") of patent infringement. In response, QXMédical brought this action, seeking a declaration that its "Boosting Catheter" does not infringe any of Vascular Solutions's patents. This matter is before the Court for construction of certain terms of the patents-in-suit in accordance with *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 390-91 (1996).

I. BACKGROUND

Vascular Solutions's patents relate to a medical device known as a "guide extension catheter." A guide extension catheter is used by a heart surgeon to deliver an interventional cardiology device (such as a balloon or stent) into a coronary artery.

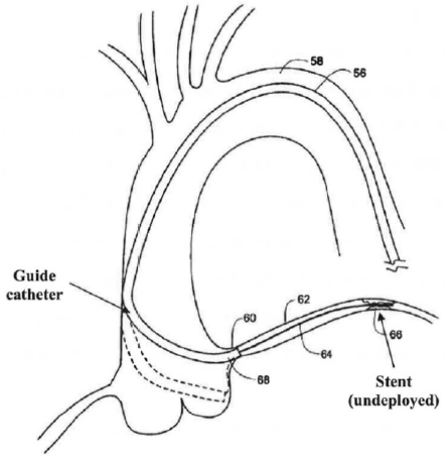
Coronary arteries are the arteries that supply oxygenated blood from the aorta to the heart muscle. The buildup of plaque inside a coronary artery can create a "stenosis"—that is, a narrowing of the coronary artery—that decreases blood flow to the heart and increases the risk of heart attack. A coronary artery stenosis looks something like this:



Root Decl. ¶ 8 (ECF No. 59).

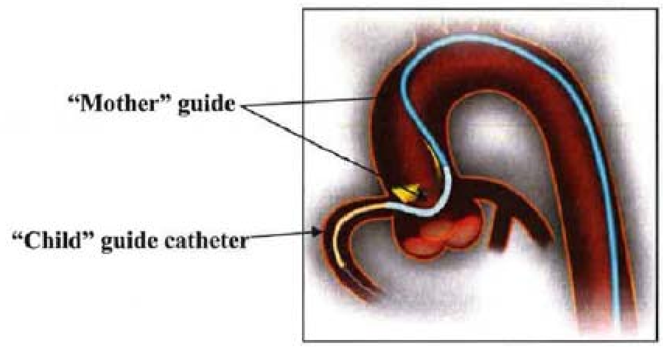
One way to treat a stenosis is to use a balloon or stent to reopen the coronary artery. *Id.* ¶ 10. To do so, of course, the surgeon must deliver the balloon or stent to the site of the stenosis. Typically, the surgeon will first insert a long, thin tube called a "guide catheter" into the patient's femoral artery (near the patient's groin) or the patient's radial artery (near the patient's wrist). Then the surgeon will push the guide catheter through the patient's body until the tip of the guide catheter reaches the opening (or "ostium") of the coronary artery. Next, the surgeon will push a long, thin wire—known as a "guidewire"—through the guide catheter, into the coronary artery, and through the site of the stenosis. Finally, the surgeon will slide a balloon or stent along the guidewire to the site of the stenosis, where the balloon or stent will be expanded. *Id.* ¶¶ 11-13.

The guide catheter is relatively rigid and often has a curved tip. *Id.* ¶ 15. The combination of these two characteristics means that it is generally unsafe for a surgeon to extend the guide catheter past the ostium and into the coronary artery. *Id.* ¶¶ 15-16. That is why a surgeon uses a guidewire to deliver the balloon or stent to the site of the stenosis. Sometimes, though, a surgeon has to push a balloon or stent through a particularly difficult stenosis. In this situation, the resulting backwards force can cause the guide catheter to dislodge, preventing the surgeon from successfully deploying the balloon or stent. The dotted lines in the diagram below illustrate this problem:



Id. ¶¶ 12, 15-17.

To solve this problem, inventors came up with the idea of using a second catheter within the guide catheter. In this "coaxial" arrangement, the inner catheter (the "child catheter") is straighter and more flexible than the outer catheter (the "mother catheter"). This allows the child catheter to be pushed past the end of the mother catheter and into the coronary artery, thereby anchoring the mother catheter and reducing the likelihood of the mother catheter dislodging. The picture below illustrates the use of a child catheter:



Id. ¶ 18.

Vascular Solutions did not invent the mother-and-child catheter system. But Vascular Solutions combined the mother-and-child catheter system with another concept known as a "monorail," "rapid exchange," or "sliding rail" system. *Id.* ¶ 22. A typical child catheter is a long tube that runs along a guidewire from the beginning of the mother catheter (that is, from the opening in the patient's femoral artery or radial artery) past the end of the mother catheter (that is, into the coronary artery). By contrast, a monorail catheter is not tubular along its entire length. Instead, a monorail catheter combines a short tube at the "distal" end (that is, the end closest to the heart)

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