FDA Approves Volcano's iFR® Pressure Measurement Modality for Use in Coronary Stent Guidance

Volcano's iFR system measures intracoronary pressures without need for adenosine

March 19, 2014 -- This morning Volcano Corporation announced that the U.S. Food and Drug Administration has granted approval to the company's proprietary coronary pressure measurement modality, iFR (Instant wave-Free Ratio).

This morning's approval came earlier than expected; last fall, company sources indicated that they anticipated FDA approval sometime in the second half of 2014 (iFR was previously approved in CE Mark countries and Japan).

iFR: A New Method of Functional Measurement
iFR represents a significant advance in the field of functional measurement (FM), in which the actual flow pressures inside the coronary artery can be measured and the deficit caused by a coronary blockage or lesion can be accurately assessed. The primary modality in FM has been *FFR (Fractional Flow Reserve)*.

A number of studies utilizing FFR have demonstrated that outcomes of PCI (stenting and angioplasty) are significantly improved when FFR is used: blockages that measure 0.80 or less are considered ischemic and should be opened; those that measure greater than 0.80 are not considered ischemic, even though they may look significant on the angiogram, and can safely be left alone. In fact, dilating non-significant lesions can lead to negative outcomes, because the risk inherent in a PCI procedure outweighs the possible benefit of stenting. The DEFER, FAME and FAME II trials all showed that functional measurement trumped angiography for decision-making in PCI. In FAME, the use of FFR reduced the number of stents by a third, and improved outcomes by the same amount.

So Why Doesn't Everyone Use FFR?
After looking at the striking results of the FAME studies of Fractional Flow Reserve, one would think that no cath lab should be without this technology. Yet the utilization of FFR has hovered around 15% or less worldwide. Angioplasty.Org asked this question three years ago (see: *FFR: Why Isn't Everyone Using It?*). The answer is multifaceted. One reason is lack of proper reimbursement (in the U.S. in any case). But there's also a perception that FFR prolongs the procedure and makes it more complicated and expensive. FFR requires the use of adenosine, or similar hyperemic agent, to dilate the coronary arteries during measurement. Administration involves having the drug available in the cath lab, injecting it into the patient (which can cause discomfort) and then measuring. Although cost-effectiveness and time studies have shown these perceptions not to be valid, there has still been a resistance to greater implementation. Another factor is that adenosine cannot be administered to patients who are experiencing acute events, such as an infarction or unstable angina.

iFR: Simpler, More Cost-Effective, Expanded Use as Guidance Tool
iFR does not need adenosine for measurement of intracoronary pressures. The specifics of how iFR accomplishes this can be read in Angioplasty.Org's interview with one of iFR's developers, *Dr. Justin E. Davies* of Imperial College London. The elimination of adenosine has several advantages: (1) lower cost, since the drug itself and associated administration costs are eliminated; (2) faster, since a pressure wire can be advanced instantly during the procedure without waiting for the drug to be injected; (3) greater patient comfort; (4) expanded use as a tool to guide and assess the procedure's success.

This last point is a very important one that has the potential to make PCI more efficient and effective. The iFR wire can quickly be moved from one lesion to another in arteries that have multiple blockages to, first of all, determine which of them are ischemic and candidates for stenting. But the iFR wire can also be used very quickly during the procedure to see if, in fact, the stent has improved the pressure or if further expansion or additional work is necessary.

FFR has mainly been used to justify an intervention (or to safely defer it). iFR has the potential to help guide the procedure in real-time and assess its success instantaneously on the cath lab table.

iFR/FFR Hybrid Approach
As part of its ADVISE II program, Volcano also maintained a registry, comparing iFR to FFR. While iFR demonstrated a statistically high correlation to FFR, in cases where the results might be viewed as equivocal, FFR could be brought in for confirmation. This iFR/FFR hybrid approach, where iFR is used as the primary measurement tool, was shown to avoid the need for adenosine in two-thirds of all cases.

Can Be Used on Existing Systems
One advantage that Volcano has had is its multi-modality system architecture. IVUS, FFR, and iFR can all be performed using the same console in the cath lab. In most new cath labs, these technologies are integrated into the system. While

Share This Story:
Tweet
Email
SHARE

related stories on Angioplasty.Org:
Intravascular Guidance Center (IVUS, FFR, OCT)
iFR Can Reduce Use of Adenosine, Saving Time and Costs in Assessing Need for Stents
Interview with Justin E. Davies, MD
All Volcano Press Releases

external sites:
Volcano Corporation

iFR software can be utilized with existing pressure wires, the company states that iFR works most efficiently with its new Verrata™ Pressure Guide Wire. Volcano states in its press release (below) that, with this FDA approval, fully 90% of all its multi-modality systems worldwide can be upgraded to iFR.

This morning's press release from Volcano Corporation. follows:

Volcano Announces FDA Clearance of its Proprietary iFR® (instant wave-Free Ratio™) Modality and Immediate Commencement of U.S. Limited Market Release

March 19, 2014 -- San Diego -- Volcano Corporation (NASDAQ: VOLC) a leading developer and manufacturer of precision guided therapy tools designed to enhance the diagnosis and treatment of coronary and peripheral vascular disease, today announced FDA clearance of its proprietary instant wave-Free Ratio™ or iFR® Modality.

The iFR® Modality is a physiologic measurement performed using the same pressure wires and equipment utilized in cath labs for Fractional Flow Reserve (FFR), but avoids injection of hyperemic agents into the patient that induce stress to the heart. This allows for a meaningful, lesion-specific assessment in seconds by amplifying the resting pressure waveform. The iFR® Modality is currently installed on more than 300 systems around the world, primarily in Europe and Japan. FDA Clearance now means that more than 90% of Volcano's worldwide installed base of multi-modality systems can be upgraded.

"As cardiologists today we are concerned not only with the wellbeing of our patients, but also about the efficiency with which we deliver appropriate and individualized care for a very complex problem," commented Amir Lerman, M.D., co-principal investigator of ADVISE II and professor of medicine at the Mayo Clinic in Rochester, Minn. "Stents have proven beneficial when used selectively in patients that demonstrate a functional deficiency, and FFR is a terrific tool to identify the specific lesion causing the problem. iFR will further increase efficiency by reducing the time, cost and complexity required to properly identify lesions causing this functional deficiency, and then confirming the problem is resolved by the stent."

The iFR® Modality is used most efficiently with Volcano's recently-introduced Verrata™ Pressure Guide Wire, which is designed for simple disconnection and reattachment during a procedure, and facilitates making quick measurements multiple times during a procedure without injecting hyperemic agents each time.

"We are extremely excited that both the iFR Modality and Verrata can now be made available to clinicians here in the United States, as the two tools are designed to be used together," commented Joe Burnett, Executive Vice President and General Manager of the FM Business at Volcano. "In Europe, where we are now seeing how physicians use the two technologies alongside FFR, the feedback has been very positive. In the past, physicians would place the wire in the vessel, perform an FFR to 'justify' the need for intervention, and then return to the angiogram to 'guide' how many stents should be placed and where. Adding the iFR Modality and Verrata to the picture, that same physician can now not only perform FFR to identify the vessel that needs treatment, but also can switch to iFR to quickly identify which lesion causes the largest drop in pressure, place a stent, and then re-connect to confirm that the stent helped reduce the pressure drop. This is a workflow that would be very uncommon with older wire technology and the need for multiple drug infusions. This helps to evolve physiology from a justification tool to a guidance tool."

The performance of the iFR® Modality has been tested prospectively in approximately 800 patients as part of the ADVISE II (Adenosine Vasodilator Independent Stenosis Evaluation) study which was presented as a late breaking clinical trial at TCT last fall. The iFR Hybrid Approach Analysis performed on the independently-held ADVISE II dataset was the first prospective, real world registry comparing iFR and FFR and it demonstrated a statistically high correlation (sensitivity 90.7% for FFR less than or equal to 0.80, specificity 96.2% for FFR greater than 0.80). The hybrid method would have avoided the need to use a hyperemic agent in 65.1% of this patient population. Patients in ADVISE II were recruited from more than 40 centers in the United States and Europe, and all procedures were performed with operators blinded to the iFR® values which were calculated offline at an independent core lab in Rotterdam, Netherlands.

"As physicians we routinely ask for tools that make these valuable measurements faster, easier and less expensive to put into practice," continued Dr. Lerman. "The fewer barriers there are to use, the more patients that will benefit from guidance tools that measure live physiology during a procedure. In an environment where cost, efficiency and personalized medicine workflows are endpoints of major clinical trials, the hybrid iFR/FFR workflow's 94% match with FFR and 65% patient reduction in the time and cost of a hyperemic drug infusion seem to address a couple very significant barriers and is worth pursuing. If iFR is enough to get non-users off the fence to embrace physiology, then this can only benefit patients by moving away from angiography alone."

About Volcano Corporation
Volcano Corporation is revolutionizing the medical device industry with a broad suite of technologies that make imaging and therapy simpler, more informative and less invasive. Our products empower physicians around the world with a new generation of analytical tools that deliver more meaningful information - using sound and light as the guiding elements. Founded in cardiovascular care and expanding into other specialties, Volcano is changing the assumption about what is possible in improving patient outcomes by combining imaging and therapy together.

Forward-Looking Statements
This press release contains forward-looking statements within the meaning of the U.S. Private Securities Litigation Reform Act of 1995. Any statements in this release that are not historical facts may be considered "forward-looking statements," including statements regarding the potential benefits and effectiveness of the products and technologies described above, further market development and expansion, anticipated clinical

trials and the impact of clinical and other technical data. Forward-looking statements are based on management's current expectations and are subject to risks and uncertainties which may cause Volcano's results to differ materially and adversely from the statements contained herein. Some of the potential risks and uncertainties that could cause actual results to differ include the pace and extent of market adoption of the company's products and technologies; unexpected clinical trial results, including unexpected new clinical data and unexpected additional analysis of existing clinical data; unexpected regulatory actions or delays or government regulation generally; the company's ability to obtain or maintain patent or other proprietary intellectual property protection; competition in general; government, industry and general public pricing pressures; unexpected manufacturing issues; growth strategies; timing and achievement of product development milestones; outcome of ongoing litigation; the impact and benefits of market development; product introductions; unexpected new data, safety and technical issues; market conditions; and other risks inherent to medical device development and commercialization. These and additional risks and uncertainties are more fully described in Volcano's filings made with the Securities and Exchange Commission, including our recent report on Form 10-K. Undue reliance should not be placed on forward-looking statements which speak only as of the date they are made. Volcano undertakes no obligation to update any forward-looking statements to reflect new information, events or circumstances after the date they are made, or to reflect the occurrence of unanticipated events.

Reported by Burt Cohen, March 19, 2014
