

Cardiac Computer Imaging: Intravascular Ultrasound and MRI Studies

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During the past 20 years, great progress has been made in the diagnosis and treatment of cardiovascular diseases in which imaging plays an important role. It is used for diagnosis, during treatment (intervention) and to help in evaluating new therapeutic strategies. Where in the early days only invasive angiography was available, today there is a whole array of imaging modalities to choose from - both invasive as well non-invasive.

One of the major breakthroughs in the treatment of acute coronary problems was the development of coronary angioplasty (PTCA), later followed by the implantation of permanent metallic stents to avoid acute lumen narrowing after PTCA. Today, these stents are coated with drugs to avoid the problem of scar tissue growth within the stents. The latest development is the bioabsorbable stent, which is designed to be absorbed after having done its healing job. To evaluate the safety and efficacy of these new treatment methods, intravascular ultrasound (IVUS) and optical coherence tomography (OCT) are used in addition to angiography. Both are invasive catheter-based modalities which can visualize coronary artery disease in great detail. The availability of computer-assisted software allows the use of these imaging modalities to quantify the effects of the treatment methods.

However, a follow-up angiogram is a major inconvenience for patients. Therefore, the hope is that in the near future this could be performed non-invasively by computed tomography or even by MRI. Although promising results have been reported using these two modalities, especially for diagnosis, unfortunately they are not yet capable of visualizing the coronary arteries with the same level of detail as the invasive imaging techniques. Hopefully, new computer algorithms can help to close this gap as this would have a major impact on further studies that aim to prevent cardiac related diseases.