

# Adapting to a changing environment in research, education, and technology

**Prof. Panos Vardas, past European Society of Cardiology President said it was ‘imperative’ for the European Society of Cardiology to adapt to fast evolving modern environments**



Prof. Vardas spoke to a packed Inaugural Session at the ESC Congress 2014, ‘with medicine at a cross-roads for ‘critical change’, the leaderships of our Associations must acknowledge developments in those strategic areas likely to influence our prospects’. Quoting the Greek philosopher Philostratus, he warned: ‘Wise men perceive approaching things’.

Sharing his own perspective on such ‘approaching things’, Panos Vardas predicted that understanding the digital health revolution would prove crucial. ‘The ESC should seek to establish channels of communication with the large digital technology players who offer the potential to provide new streams of revenue’.

Postgraduate education and professional development, areas once dominated by universities and scientific societies, have been targeted recently by for-profit organizations operating over the Internet. ‘Faced with these evolving realities, medical associations should collaborate with selected academic institutes’, said Prof. Vardas.

He announced that the European Heart Academy, one of the three new ESC satellite institutes in Brussels, will collaborate with the London School of Economics to develop a 2-year course in Health Economics, Outcomes and Management in Cardiovascular Sciences leading to a Master’s degree.



The standing of academic medicine has suffered setbacks in recent years, with remuneration of academics falling behind that of clinicians. ‘It’s important to promote our values and persuade policy makers of

the need to make academic medicine the attractive career choice it used to be’, said Prof. Vardas.

On healthcare systems, Prof. Vardas warned that heterogeneity leads to inequalities. The ESC he said, was not only creating guidelines but developing initiatives such as the Atlas of Cardiovascular Health Care Systems, to address such inequalities. He noted that the demystification of healthcare information is catalysing the move for patients to become partners in their treatment. ‘It seems that consumers will dominate healthcare and any healthcare institution ignoring this trend does so at its peril’, said Prof. Vardas.

While medical innovations have extended the life expectancy of cardiovascular patients by 8–10 years, the field has become a ‘victim of its own success’. As a result of patent loss, Prof. Vardas explained, the compound annual growth rate in pharmaceutical companies currently stands at –10%. ‘Such decline can prove disastrous for research and jeopardise the future of our medical associations, which largely depend on industry support’, he said. ‘We need to go to the next level of innovation, in stems cells, tissue engineering and nanotechnology’.

By placing its spotlight on innovation, the ESC Congress 2014 hoped to further stimulate research in cardiovascular science. Prof. Vardas paid tribute to the ESC gold medallists in 2014, Sir Rory Collins, Petr Widimsky and Alain Carpentier. ‘Their innovations in population studies, acute cardiac care and valve surgery have truly changed the way we practise cardiology’, he said.

The first certificate of excellence in training in interventional cardiology was awarded to Prof. Marc Hartmann from Thorax Centrum Twente in Enschede, the Netherlands. The training programme is an e-learning initiative of the EAPCI.

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# New high for *European Heart Journal* impact factor

## The *European Heart Journal* begins 2015 with a new record level of 14.723 increased from 8.9 in the 6 years 2008–14

Release of last year's Journal Citation Reports was delayed by more than a month but, for the *European Heart Journal* (EHJ), the delay was well worth the wait. Yet again, the EHJ increased its impact factor to a new record of 14.723, from 8.9 in 2008, maintaining its profile in the cardiology category at an all-time high.

There is still much debate in academic circles on the value of impact factors as the sole assessment of quality in scientific journals, but few would disagree that the EHJ's leap last year was, in the words of its editor-in-chief Thomas F. Lüscher, 'spectacular'. Having broken through into the exalted realm of double-digit impact factors in 2011, last year's score, based on article citations for 2012, shot ahead to 14.097, a move of almost 5 points on the previous year (Tables 1 and 2).

Such a move was unprecedented, says Lüscher, but he is once again happy to see the EHJ making further progress, although this time of a more modest scale.

'The top three journals in cardiology are now all very close to each other', Lüscher told Congress News, 'and we're beginning to pull clear of the rest. There's a pattern now forming'.

Nor was the EHJ the only European Society of Cardiology journal with an increased impact factor

- The *European Journal of Heart Failure* jumped from 5.247 to 6.577.
- EHJ Supplements jumped from 5.065 to 5.640.
- *EuroIntervention* from 3.173 to 3.750.
- *Cardiovascular Imaging* from 2.394 to 3.669.
- *EP-EuroPace* from 2.765 to 3.050.

With >3700 original manuscripts submitted each year and a rejection rate of ~90%, Lüscher is confident that the EHJ's editorial policy of transferring well regarded papers to the more specialized sister journals is helping raise their quality and profile.

Lüscher attributes the huge success of the EHJ to several factors, but especially to the journal's ever broadening international scope. 'We're now a truly global journal', he says, 'with a fully international structure of deputy and associate editors and editorial board. This has made a big difference to our appeal'.

He also notes editorial innovations in the commissioning of more commentaries and opinions, and the introduction of fast track publication (with a time to first decision of 1 week), which, he says, have been especially important in citations for the new impact factor. This year will have seen nine simultaneous publications of Hot Line studies from the European Society of Cardiology (ESC) Congress. But above all, lies the intrinsic quality of the original manuscripts accepted for publication. 'A higher impact factor attracts the better

**Table 1** Impact factors in Cardiology 2013

Journal title	Impact factor
<i>Journal of the American College of Cardiology</i>	15.343
<i>Circulation</i>	14.948
<i>European Heart Journal</i>	14.723
<i>Circulation Research</i>	11.089
<i>Nature Reviews Cardiology</i>	10.154

**Table 2** European Society of Cardiology journals family, impact factor 2013 and 2014

ESC journal	IF 2013	IF 2014	Delta
<i>European Heart Journal</i>	14.097	14.723	+0.626
<i>European Journal of Heart Failure</i>	5.247	6.577	+1.334
<i>Cardiovascular Research</i>	5.940	5.808	-0.132
<i>European Heart Journal Supplements</i>	5.065	5.640	+0.575
<i>EuroIntervention</i>	3.173	3.750	+0.577
<i>European Journal of Preventive Cardiology</i>	3.903	3.691	-0.212
<i>European Heart Journal – Cardiovascular Imaging</i>	2.394	3.669	+1.275
<i>EP-EuroPace</i>	2.765	3.050	+0.285
<i>European Journal of Cardiovascular Nursing</i>	2.042	1.828	-0.214

papers', says Lüscher, 'and now we're able to take only the best'. Papers on TAVI, valvular heart disease and preventive cardiology have been well cited.

With weekly publication introduced at the start of last year, the EHJ has now joined a select list of high-ranking journals, which includes *JACC* and *Circulation*, but this, admits Lüscher, has surprisingly had no detrimental effect on impact factor. The increased frequency prompted a slight reduction in the size of each issue, which has now settled into a weekly rhythm of four original papers per issue and an additional wealth of news, opinion, invited reviews, guidelines, and correspondence.

ESC Press Office  
Andros Tofield

# European Society of Cardiology Gold medallists 2014

## Sir Rory Collins, Alain Carpentier, and Petr Widimský receive European Society of Cardiology honours at European Society of Cardiology Congress 2014 in Barcelona



**The three European Society of Cardiology Gold Medallists after their awards at the Inaugural Session of the European Society of Cardiology Congress**

(From left to right, Sir Rory Collins, Alain Carpentier, and Petr Widimský.)

### Prof. Sir Rory Collins, Oxford, UK

It is now more than a decade since the first results of the Heart Protection Study were published in *The Lancet* showing that lowering levels of LDL-cholesterol in a wide range of patients with pre-existing vascular disease or diabetes, irrespective of their starting cholesterol level, would lower their risk of subsequent cardiovascular events, results subsequently confirmed by the Cholesterol Treatment Trialists' collaborative meta-analyses from the major statin trials. The leader of these two projects is the recipient of an ESC Gold Medal this year, the Oxford epidemiologist Prof. Sir Rory Collins.

'The Heart Protection Study helped revolutionise the way cholesterol-lowering drugs are used', says Collins, 'until then, the benefits of statins were thought to be restricted to those with elevated cholesterol levels. But the Heart Protection Study showed that the risks of heart attacks and strokes could be reduced with statin therapy even in patients with cholesterol levels in the "normal" range. That really changed the landscape'.

Controversy in 2014 centred on extending statin therapy to those at a lower risk of CVD, with the balance of side effects and benefit. For example, the National Institute for Health and Care Excellence (NICE) in the UK proposed reducing the threshold for statin therapy from a 20% CVD risk over 10 years to a 10% risk. The evidence, said NICE, was 'overwhelming', before confirming this change in its latest recommendations.

Collins publicly supported the NICE position – results published from the Cholesterol Treatment Trialists' collaboration in 2012 showed that the benefits of statin therapy outweighed the hazards even in these lower risk individuals. But there were also objections

to NICE's proposal, notably in two reports in the *BMJ* which included claims that statin side effects occur in as many as 18–20% of patients. Collins pointed out a serious error in that particular claim to the editor of the journal and, after a 6-month delay, the authors of the two papers were required to withdraw it. The two papers were not withdrawn by the journal.

Today, mortality trends in most developed countries show steep and consistent declines in premature death from heart disease and stroke and, in the UK, vascular mortality rates in middle age have fallen by more than half in the past three decades. The Clinical Trial Service Unit (CTSU), of which Collins and Prof. Sir Richard Peto have been co-directors for >20 years, has made substantial contribution to these trends in its major studies of statins, smoking, blood pressure, aspirin, and streptokinase. Among the other influential trials performed by the CTSU – from a 30-year catalogue of major trials – is the 1988 ISIS-2 trial of antiplatelet and thrombolytic treatment in acute MI.

Today, Collins and his colleagues continue to emphasize the need for large-scale observational and randomized evidence about the prevention and treatment of major diseases. Indeed, it was the CTSU in the 1980s which pioneered the concepts of mega-trials and meta-analysis in vascular disease, and by so doing demonstrated that even modest effects on major health outcomes in widely prevalent conditions could have dramatic public health consequences.

Collins, who was knighted in 2011 for his services to science, is clearly no stranger to honours, but he describes his inclusion on the list of cardiology luminaries who have received the ESC Gold Medal as 'humbling'. 'For someone working in the field of cardiology', he says, 'it's the ultimate recognition'.

### Prof. Petr Widimský, Prague, Czech Republic

Petr Widimský has arguably done more than anyone to promote primary PCI through his series of PRAGUE studies and the ESC 'Stent for Life' initiative.

'The ESC Gold Medal represents the height of my professional career', he says. 'But it isn't just a personal honour – the award acknowledges the achievements of a great many co-workers who took part in the PRAGUE studies'.

This recognition from the ESC is also particularly special for Widimský, whose father Jiri Widimský was an ESC Board member and vice-president.

Now, there is an element of nostalgia in his return to Barcelona, for it was here at the ESC Congress in 1999 that Widimský presented his landmark PRAGUE 1 study showing the superiority of immediate PCI

over thrombolysis in acute MI patients. 'With the great expansion of cardiology services in the Czech Republic, we had the advantage of a young workforce willing to get up in the night to perform angioplasty', recalls Widimský, then as now from Charles University Hospital in Prague.

When PRAGUE 2 confirmed the results in 850 patients from 51 participating hospitals this fully convinced Czech health providers of the benefits of a primary PCI programme throughout the whole country. A dramatic decline in STEMI mortality followed, which in turn encouraged the Czech Society of Cardiology to publish the first guidelines in 2002 and define primary PCI as the default perfusion strategy.

The idea of the 'Stent for Life' initiative, which Widimský launched with William Wijns in 2008, was to encourage equal access to PCI interventions throughout Europe and bring everyone up to the high-standard set by the Czech Republic. A survey had shown that the use of primary PCI ranged from as high as 92% of MIs in some countries to as low as 5% in others. The project identified barriers to guideline implementation, and provided tailored plans to meet the specific needs of different countries.

A later survey showed a doubling between 2007 and 2011 in PCI use in six target countries (Bulgaria, France, Greece, Serbia, Spain, and Turkey). 'But there's no room for complacency', said Widimský. 'We're now looking to reduce time delays across Europe and beyond'.

Following the success of PRAGUE 1 and 2, Widimský realized that the same efficient infrastructure might be used to answer other investigator-led questions in cardiology. To date 19 different PRAGUE studies have been launched, 12 completed and two more (PRAGUE 20 and 21) are currently in planning. Widimský may be presenting PRAGUE data in ESC Hot Line sessions for many years to come!

## Prof. Alain Carpentier, Paris, France

Innovations throughout the career of cardiac surgeon Alain Carpentier, the father of modern mitral valve repair and another of this year's three ESC Gold medallists, have included the Carpentier-Edwards heart valve and more recently the first bioprosthetic artificial heart. 'An award like this provides a real boost to keep doing what you do', says Carpentier, from the Hôpital Européen Georges Pompidou in Paris.

It was during his surgical residency in 1964 that Carpentier began research on biological heart valves. A few weeks after implanting the Starr-Edwards valve, a clot formed on the device from which his patient suffered a stroke. Pledging to solve the problem of clot formation, Carpentier acquired training in chemistry (obtaining his Chemistry PhD in 1975) which allowed him to demonstrate that treatment of animal tissue with glutaraldehyde-reduced immunogenicity.

Aiming to create tissue devices which could be inserted as simply as mechanical valves, Carpentier went on to mount his porcine tissue valves in Teflon-coated metallic frames, coining the term 'bioprosthesis'. Implanting the first patient with his 'home made device' in March 1968, he later worked with the Edwards laboratory, which would commercialize the product.

Next Carpentier became convinced that, in the mitral position, surgical techniques preserving the native valve were superior to valve replacement. His key innovation, detailed in his landmark 'French Correction' paper, was the Carpentier-Edwards ring, which stabilizes and reshapes the structure holding the valve, allowing patients to keep their own valves. The advance has been widely credited with ushering in the modern era of valve reconstruction.

Carpentier's current endeavour is to develop a bioprosthetic artificial heart as a permanent implant and not just a 'bridge' to transplant. The CARMAT device (representing a contraction of Carpentier and the manufacturer Matra) combines animal tissue with sensor technology adapted from guided missiles. The device, which can be totally implanted within the patient's pericardial sac, has sensors to detect increased pressure, allowing internal control systems to adjust blood flow during exercise.

The first human implantation was performed by Carpentier together with Christian Latrémouille and Daniel Duvéau in a 75-year-old patient suffering from end-stage heart disease in December 2013. Although, initially successfully, the patient died 2.5 months later from failure of an electronic component. The company has since overcome the problem and now plans to undertake three further implantations in terminal heart failure patients with no other options.

Retirement, says Carpentier, who has just celebrated his 81st birthday, is the option of defeated generals. 'I see no reason to stop operating if you remain physically fit', he says. 'Experience gives surgeons enormous advantages and you have the responsibility to pass knowledge on to the next generation'.

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# Bernard J. Gersh, Mayo Clinic, Rochester, MN, USA, provides a transatlantic perspective on the 2014 European Society of Cardiology Guidelines on Diagnosis and Management of Hypertrophic Cardiomyopathy



Gersh praises the new guidelines document for their clarity, readability, and as a welcome addition to the joint American College of Cardiology (ACC), and American Heart Association (AHA) guidelines, which he co-chaired. Prior to the American guidelines in 2011, guidance on HCM was limited to a consensus document from the ACC/AHA and the European Society of Cardiology (ESC).

Gersh says: 'The ACC/AHA guidelines were written on the understanding that HCM as a condition doesn't lend itself to large randomised trials'. We made it very clear that not only was the grade of evidence supporting our recommendations going to be low given the relatively small size of published studies, but also that there would be no large randomized trials in most of the treatment aspects of HCM, such as a comparison of septal reduction therapies'.

The similarities between the two sets of guidelines stand out as a major feature and the more recently updated ESC document complements the earlier ACC/AHA publication. A welcome difference is however, a much more detailed discussion of the different aetiologies of diseases that can mimic HCM in the ESC guidelines. The American guidelines did not deal with identifying 'morphologic variants' such as the storage diseases or mitochondrial disorders – mostly because HCM is by definition hypertrophy without a cause.

One of the main areas of difference is in regard to invasive therapies – in this case septal reduction therapy in the form of either surgical septal myectomy (SM) or alcohol septal ablation (ASA). Gersh says: 'Both agree that these treatments need to be carried out in centres with documented expertise and significant experience because HCM is relatively rare and the various therapeutic modalities and tools such as MRI should be available, as well as access to genetic counselling and reproductive advice. The difference between the US and European approach is that, we said very clearly, if patients need septal reduction therapy and are good surgical candidates, it should be a 2A recommendation. We did not make it a class 1, because we have no randomized trials which our guideline terminology requires. Nonetheless, we made it into a very strong recommendation'.

In those patients who were good surgical candidates, we made SM in experienced hands a class 2A, as we did for ASA in patients who were not good surgical candidates. For those patients not deemed good surgical candidates because of various co-morbidities and other complications, we also recommended a 2A. However, in those who were good surgical candidates, and who after 'a balanced and reasonable discussion' still wished to avoid surgery, then we made ASA a class 2B.

This was the most controversial aspect of the American guidelines and we emphasized the need for more long-term studies of ASA. In

the ESC guidelines there is a difference, it's nuanced but it is very real in that they effectively give equal status to both, but make the point that the decision should be driven by the presence of other lesions requiring surgical correction, e.g. mitral valve repair or replacement, papillary muscle intervention and if needed, a surgical approach is preferred.

I would agree with that but, still feel that given the extensive long-term data outcomes after SM, it is still preferred to ASA. We need more long-term studies of ASA outcomes. The American guidelines did add one other caveat namely, that in patients under the age of 21 years ASA was contraindicated, as in the case of people with very extensive left ventricular septal thickness. I believe it is also important to assess the extent of mid-ventricular and not just outflow tract obstruction because the former will not respond to ASA'.

A further point to be made is that SM is not actually performed in many European countries where ASA dominates. 'I personally think that's a mistake; centres that treat patients with HCM should have expertise in both techniques and at my centre, the Mayo Clinic, we do both in large volumes'.

Gersh also says that in his experience, mitral valve replacement, as detailed in the ESC guidelines, is extremely rare and he suggests a reparative procedure should always be performed if possible.

The other major area where Gersh draws distinctions between the two sets of guidelines is the indications for ICD. The ESC guidelines use a model developed by Elliot and O'Mahony. 'Previously risk stratification for sudden death was dichotomous and restricted to a yes/no answer, but here they take a different approach in utilizing many of the risk factors as continuous variables'.

Gersh cautions that there is a long way to go in refining current methods of risk stratification and whatever method a practitioner chooses, there will always be limitations. Neither set of guidelines outlines a perfect method of risk stratification. There remains an over-riding requirement for detailed and individualized discussion with patients who will vary in how they approach the risk of sudden cardiac death and in their reaction to having a permanent device implanted at a young age.

While randomized trials of ASA vs. SM are not a realistic option due to the difficulty in screening and randomizing patients, Gersh says more studies on the long-term results of ASA are needed. 'A better and more effective alternative to randomised trials in weighing up the pros and cons of SM versus ASA are prospectively entered large national registries of patients treated with both forms of therapy'. 'Many European and particularly Scandinavian countries

have developed wonderful registries for atrial fibrillation and acute coronary syndromes and have ongoing national registries in a variety of various conditions. I would urge very strongly that HCM be followed through these national or multi-national registries. That would be my number 1 priority for the future'.

Gersh suggests that new pharmacological approaches that do not rely on beta-blockers and other drugs of 30 or so years ago are needed. He also believes that refining risk stratification for sudden cardiac death should be viewed as an ongoing priority. A final priority

concerns genetic screening, which he believes will identify numerous subsets of patients who have previously been placed under the HCM umbrella as only having symptoms that mimic HCM.



## Obituary: Jos R.T.C. Roelandt

# Final farewell to Jos R.T.C. Roelandt, former European Society of Cardiology Gold Medallist and founding editor of the *European Journal of Echocardiography*



## A great mentor in the field of Echocardiography has departed from cardiology in 2014

Cardiologists were deeply saddened at the death of Prof. Jos Roelandt, a leader in European Cardiology and a pioneer and innovator in Echocardiography who died 31 August 2014.

Jos Roelandt received his MD degree *magna cum laude* from the University of Leuven, Belgium, in 1964 and went on to specialize in internal medicine and cardiology at the same University and at the University of Leiden, Netherlands. He joined the Thoraxcentre in Rotterdam in November 1969 and started research in clinical echocardiography. During 1976–77, he was visiting professor at the University of Oregon Health Sciences Centre in Portland, OR, USA.

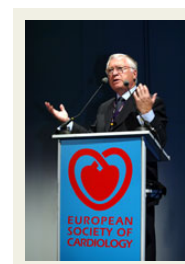
He obtained his PhD *cum laude* at Erasmus University Rotterdam where he became professor of echocardiology in 1983. Later he became chairman of the Department of Cardiology of the Thoraxcentre, Erasmus Medical Centre, Rotterdam, in 1987 a position he held until 2004 where he promoted 37 doctorate theses.

In 1995 Jos was awarded an honorary doctorate from the Albert Szent-Györgyi Medical University in Szeged, Hungary. He was an honorary member of the American Heart Association, the Italian Society of Cardiology, the Philippine Heart Association, the Croatian Society of Cardiology, the Slovakian Society of Cardiology, the Dutch Society of Cardiology, the American Society of Echocardiography, and the European Association of Echocardiography.

Jos Roelandt served on the Editorial Board of numerous major cardiology journals, and was the author of over 1000 papers and 19 textbooks.

In 1989 he delivered the prestigious 'P.D. White International Lecture' at the American Heart Association meeting in New Orleans. In 1993 he received an award from Tufts University in Medford near Boston, USA, for his pioneering work in cardiac ultrasound and presented in 1994 the 'Andreas Gruentzig Lecture' of the European Society of Cardiology in Berlin. He delivered the 'R.T. Hall Lecture' of

the Australian and New Zealand Society in 1996, the 'Edler Lecture' of the European Society of Cardiology in 1997, the 'Edler Lecture' of the Swedish Cardiac Society in 1999 and received the Distinguished Scientist Award of the Portuguese Society of Cardiology in the same year. He presented the '55 112 Memorial Lecture' at the XIVth World Congress of Cardiology in Sydney and the 'Joan Barber Memorial Lecture' at the New York University Medical Centre, New York, USA in 2002. In 2003 he presented the 'Denolin Lecture' on clinical cardiology of the European Society of Cardiology and the 'Wenckebach Lecture' of the Dutch Society of Cardiology.



### Jos Roelandt, Denolin Lecture, ESC Congress 2003, Vienna

He received the 'Pioneer Award' of the Mayo Clinic in 2004, then in 2008 he presented the 'Edler Lecture 2008' of the American Society of Echocardiography in Toronto.

Non-medal awards that Jos received were the Cross of Officer in the Order of Leopold in 1993 and he became a Knight in the Order of the Dutch Lion in 2003.

Jos Roelandt served as chairman of the ESC Working Group on Echocardiography (1976–82) and as president of the Dutch Society of Cardiology (1995–97), the International Cardiac Doppler Society (1997–98), and the International Society of Non-Invasive Cardiology.

He started the first formal teaching and training courses in echocardiography in Europe in 1974 at Erasmus University and The International Postgraduate Course on Advances in Cardiac Ultrasound in Davos, Switzerland, in 1980.

Jos was the founding editor of the *European Journal of Echocardiography* and the editor-in-chief from 1999 to 2010.

The passing of Jos R.T.C. Roelandt is a great loss to European Cardiology and particularly to the echocardiography community. 'If you knew him only by his work, then you knew a lot. He was a brilliant critic, but those of us who knew him personally saw how the wit and brilliant mind were always in play'.

He will be greatly missed but not forgotten.



## Book review

# 3D Computed Tomography Virtual Intravascular Endoscopy: Clinical Applications in Cardiovascular Disease

Author: Zhonghua Sun

Publisher: Nova Science Publishers, Inc.

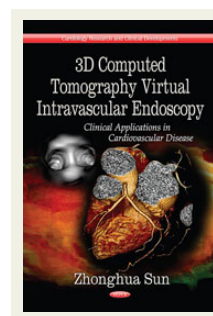
ISBN 978-1-62618-116-8

Hardback: 170 Pages

Computed tomography (CT) has become a widely used clinically accepted imaging modality for the visualization of vessel morphology. This is true because of the high spatial and temporal resolution of current CT machines. Being a cross-sectional imaging modality, CT provides information not only about the vessel lumen but also about the vessel wall and obstructing structures such as plaques and thrombi. While the standard for analysing CT images remains the review of the transverse 2D source images, there are several post-processing techniques available that can be also applied to the transverse CT data. These post-processing techniques include multi-planar reformations, maximum intensity projections, and volume rendering, the latter providing a 3D image impression of the vessel anatomy. Three-dimensional images in CT can be reconstructed from virtually all directions and perspectives, and in any arbitrary plane. One particular feature of the 3D volume rendering technique is the so-called virtual intravascular endoscopy (VIE), which provides intraluminal views of the vessel including pathological changes.

This book, written, and edited by Zhonghua Sun who is associate professor in medical imaging at Curtin University, Perth, Australia, consists of 10 chapters illustrating the potential of VIE based on CT images in a variety of cardiovascular diseases. Each chapter can be read separately and references are provided at the end of each chapter for readers who want to study the subject further.

A multitude of images are presented in each chapter and for illustrating the VIE aspects of each disease.



After an introduction of the topic in the first two chapters, the third chapter deals with the potential as well as with the pitfalls of VIE image interpretation. Here, it is shown how variable post-processing settings affect the images and hence, the diagnoses. Chapters 4–8 address the various cardiovascular diseases such as aortic dissection, pulmonary embolism, and coronary artery disease and chapter 9 includes a description of VIE images in endovascular stent grafts. The book ends with a chapter summarizing the value of the post-processing technique in modern CT angiography.

This practical book can be used for conducting 3D image post-processing in CT angiography. The content is easily comprehensible and the format is pleasing. Notwithstanding the nice images presented, VIE represents a supplement to the gold standard in CT image interpretation, which remains the evaluation of the transverse 2D source images eventually complemented by multi-planar reformations.

