During the last 10 to 15 years, significant and positive changes have occurred in cardiology in Turkey. Cardiology has become a prestigious and popular speciality, and remarkable investment by the government and the private sector in cardiovascular medicine has been realised. Currently, cardiology practice in Turkey is of a contemporary standard, both in terms of the diagnostic capabilities and therapies offered in 130 cardiac centres across the country.

Cardiovascular diseases remain the number one killer in Turkey. Based on a study supported by the Turkish Society of Cardiology (TSC), there is a pool of approximately 2.5 million coronary patients in the country. It is estimated that about 200,000 cardiovascular disease (CVD) deaths occur annually. These rates place Turkey at the top of the list in Europe for CVD mortality in women, and fifth for men. The fear is that the CVD mortality will double in 10 years as the population ages. Hypertension (31.8%), smoking (every other man and one fifth of women), and obesity (22%) are the top 3 risk factors. Metabolic syndrome is a major public health problem, particularly in women.

Cardiology has been recognized as a speciality since 1990, and the current number of cardiologists in the country is 1250 (1.85/1,000,000), and expected to reach 1750 (2.2/1,000,000) in 5 years. As demonstrated by these figures, the number of specialists in the country is inadequate. The uneven distribution across various regions adds to the complexity of the problem. There is also a significant shortage in the number of cardiovascular nurses and technicians.

Today, cardiology training programmes are under the legal authority of the Ministry of Health and also follow the recommendations of the European Union for Medical Specialists. Currently, the training period is 5 years, and there are plans to extend this to 6 years. For the first time this year, a voluntary National Board Examination will be carried out by the National Accreditation Council in Cardiology, an independent section within the TSC. The expectation is that a recertification process will soon follow. Furthermore, subspecialities in cardiology are being developed in at least 2 fields: interventional cardiology and cardiac electrophysiology.

The TSC plays a pivotal role in the postgraduate education of cardiologists in their speciality that involves several continuing medical educational activities throughout the country. These include an annual congress (a major educational activity) with 3000 participants, and also many meetings organized by working groups within the society. Many in-person and Internet-based distance learning courses are now available to cardiologists, as are the use of educational tools such as CD-ROMs.

With the epidemiological background of CVD in Turkey, the main priority for cardiologists here is prevention. The TSC, in collaboration with the Ministry of Health, has prepared the National Policy for Cardiovascular Diseases. The recently published Luxembourg Declaration, which has been signed by both the Ministry of Health and the TSC, has formulated the basic targets in prevention. The TSC has been active in public awareness campaigns, using radio and television programmes nationally and locally, as well as advertisements, brochures, and public conferences. The goal is to reduce the mortality from CVD in the same way as has been achieved in many countries of the Western World.
European Union, it seems that cardiology as a speciality is one of the most successful sectors in terms of education, research, and practice. The members of the TSC have been very active in the European cardiology scene and have already integrated with their colleagues in the rest of Europe professionally and also in terms of cardiological practice.

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From Zagreb, Croatia to Cleveland, Ohio

Tomislav Mihaljevic, MD, discusses his journey from medical student in Zagreb, Croatia, to staff surgeon at the Cleveland Clinic in Ohio, with Barry Shurlock, MA, PhD.

How did you come to the United States?
Immediately after graduating from Zagreb, I went, in 1992, to Switzerland and spent 4 years training at the University Hospital, Zurich. I intended to go for a year as a research assistant and stay for 4 years, working as a research fellow with Marco Turina, MD, who is also Croatian and was the head of the Department of Cardiac Surgery there. It was very exciting as I never thought of myself becoming a cardiac surgeon.

I had always wanted to become a surgeon of some sort, and was looking for a good place to train in Croatia. But when this offer came along, I just took it, and really fell in love with cardiac surgery. I stayed in Switzerland for 4 years, but when the chance to go to the United States arose in 1995 I took it because the postgraduate surgical education there is truly superb.

Did you have links with anyone in the United States?
I was lucky to have good personal contacts between Dr Turina and Larry Cohn, MD, at the Brigham and Women’s Hospital (in Boston). Dr Cohn was looking for someone to come over and work as a junior fellow in the Cardiac Surgery Department. It was only a 1-year contract, but I enjoyed it so much that I applied for a general surgical residency. It was a step back for me, and getting the post was not easy — there were nearly 600 applicants for 5 positions.

It is always a difficult step for a young European to get onto a specific training program in the USA.

Why do you think you were successful?
I think I was awarded the residency (the most important event in my career so far) for several reasons. Perhaps most important was that I could show a strong academic commitment. I was coauthor of about 20 papers with Dr Turina and others between 1993 and 1999. Also, they knew me through my clinical work.

In the US, dedication and work ethic are very important in the decision-making process. Another element is personality — you have to be able to get along with colleagues and work as part of a team. It is also important to recognize the essential importance of mentorship for success in academic surgery, such as I have received from Michael Zinner, MD, the chairman of the Department of Surgery at the Brigham and Women’s Hospital throughout my training and early career.

What, as a European, do you find special about working in the United States?
I did not intend to settle in the US, but one thing led to another. I enjoy my research, but I also enjoy my clinical practice. There is a lot of hard work, but the working environment here is superb and I have had the good fortune to work at 2 truly excellent institutions. It’s easy to work when your colleagues respect you, and the teaching is excellent. Academic work is strongly encouraged and people are recognized for what they accomplish. The collegiate atmosphere was something I was amazed by when I came to Boston, and I really enjoyed it — I felt like a kid in a toy store! It is a different world here. I would love to see some of the same ethos penetrating into European culture, in medicine in particular. There are many young physicians who have trained in the US and then gone back to Europe. Hopefully they will take back some of that culture.

Would you consider going back to Croatia?
I would consider going back to Croatia provided the circumstances were right, but just now it would be far too
premature. The Cleveland Clinic is a hospital that offers phenomenal clinical and research opportunities and equally phenomenal staff. It would be very hard to leave this institution.

**Do you enjoy life in the United States and outside of medicine?** My wife and I are very happy being here. I married a fellow Croatian, Iva Fattorini, MD, who is a dermatologist and director of International E-Health at the Cleveland Clinic Foundation. I love reading, particularly American and German literature. At one point I had to learn to speak German to secure a post in Switzerland, and I now truly like the modern German writers. I love sports. I used to play basketball when I was a child — now it’s a little bit too strenuous and too time-consuming — but I jog as much as I can.

**Dr Barry Shurlock is a freelance writer.**

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**Viewpoint**

**Anthony H. Gershlick, FRCP, looks at the history of percutaneous coronary angioplasty and asks what the future holds for drug-eluting stents.**

**P**ercutaneous coronary angioplasty (PCI) has become the dominant therapy for treating coronary artery disease, and the exponential rise in these procedures reflects the shift away from bypass surgery. It is interesting to consider how this has occurred over a relatively short period. As with many such developments, it is fundamentally driven by one group of specialists who want to change what they are doing for all sorts of reasons, primarily, but not exclusively, to try and attempt to improve the management of their patients.

Along the way issues such as evidence-base from randomised controlled trials, proof of efficacy and reassurance concerning safety, technological developments, training programmes, and the wishes of patients clearly all impact on whether a new discipline will sink or swim. However, inherent in all of this is the altruistic drive from a group of cardiologists to implement change and to move toward a less invasive approach. The question is, of course, “Is PCI as good as surgery?”

The progression of PCI from its inception in 1979 to today’s situation, where it has become a common treatment for coronary artery disease, is well documented, and in essence consisted of 4 phases. Balloon angioplasty (Figure 1) helped to develop our understanding of the mechanismic process and how to make PCI a useful therapeutic tool. We learned that injuring the artery had profound effects on the short-term and medium-term outcome. While it was true that most patients benefited from the procedure, there were clearly problems with injuring the vessel wall.

Because of occlusive intimal tears, the need to send patients for peri-procedural emergency surgery was not uncommon. Furthermore, 1 in 3 patients were returning with recurrent symptoms, and although millions of dollars were spent on drug trials to prevent restenosis, it was only when the mechanical issues of recoil and late negative remodelling were taken into account that stents, which had experienced a chequered history, became central to the PCI procedure.

Bare metal stents dramatically reduced the need for emergency surgery, and reduced the incidence of recurrence by >50%, but were not without problems. Stent thrombosis became the new challenge, with oral anticoagulant therapy failing to deal with this potentially fatal complication. Lessons learnt by previous generations of pathologists that had highlighted the central role of platelets in arterial thrombus led to appropriate randomised controlled trials that demonstrated that stent thrombosis could be reduced, with the use of potent anti-platelet therapy, from 10% to 2% or less. However, it is rarely emphasised enough just how important meticulous stent deployment is, and how one should tolerate nothing less than an excellent angiographic result.

Pharmacotherapy was also there to help, with agents such as the intravenous platelet final pathway receptor (glycoprotein Ib/IIIa) inhibitors appearing to be beneficial in those undergoing PCI in the setting of the thrombogenic acute coronary syndromes or the pro-thrombogenic diabetic patient.

Trials of PCI versus surgery showed the gap in outcome closing. Many studies in the late 1990s had been in patients with single-vessel disease, but of course surgery was a treatment for those with multivessel disease, including patients deemed at higher risk, such as those with left main stem disease. The Arterial Revascularization Therapy Study (**N Engl J Med. 2001;344:1117-1124**) was pivotal. It clearly crystallised what had been happening up to this point — it compared multivessel bare metal stenting with multivessel coronary artery surgery. Both treatments appeared equally safe, but PCI lost out in terms of need for repeat procedures, based on what was already known: that within-stent intimal smooth muscle hyperplasia, formed according to the response to...
injury paradigm, led to the need for re-PCI in 15%-20% of patients (as compared to <5% in surgical patients).

A number of clinical studies were published at this time that supported the elegant theoretical notion of delivering an antirestenotic drug to the site where it was required, in doses that were therapeutic at that site (but undetectable systemically). The need for repeat procedures fell to around 5%. Clinical scientists in the field moved to trialling the new drug-eluting stents (DES) (Figure 2) in patients with increasingly complex coronary artery disease (diabetics, small vessels, and long lesions). Containment of the restenotic process appeared robust, with acceptable rates of repeat procedures that are needed in such patients. Use of higher doses (600mg, previously 300mg) of the antiplatelet agent clopidogrel given at least 6 hours before the procedure have contributed to improving the acute safety profile of PCI, and it is believed to have reduced the need for intravenous GP IIb/IIIa agents.

Is the future rosy for DES and PCI? It is certainly true that the use of DES has become the perceived standard of care, with reductions in restenosis rates in all patient groups and lesion types tested in real world registries. Despite the price premium, using a DES has become the therapeutic target for the interventionist. However, different European healthcare systems with different reimbursement models and health technology assessments have resulted in variable DES uptake (Figure 3).

Cost efficacy data for a treatment where the outcome is regarded as noncritical (that is, in patients who tend to get recurrent angina rather than suffer death) become difficult to demonstrate, other than in the subgroups known to be at particularly high risk of restenosis (diabetics, those with sub-3mm vessels affected, or long lesions). Therefore, funding remains an issue.

**Figure 2.** Drug-eluting stents deliver an antirestenotic drug to the site where it is required, with a marked drop in repeat procedures.

Is DES truly effective and safe in all circumstances? There has been a groundswell of anxiety about stent thrombosis and DES, following anecdotal reports of this occurring late after the procedure. The issues are that for bare metal stents, re-endothelialisation takes about a month, and therefore these patients are covered by dual antiplatelet therapy for this period. DES may delay re-endothelialisation and therefore have the potential risk of late stent thrombosis. Because the event rate is small (but potentially fatal), randomised controlled trials are difficult because of the potential numbers required. Recent registries provide mixed results, with no difference between DES and bare metal stents and a trend to benefit with bare metal stents both being reported. It is clear that discontinuation of antiplatelet therapy within the time frame of risk (whatever this is, but probably no less than 6 months), is the biggest predictor of thrombosis.

Uncertainty about the postprocedural need for dual antiplatelet therapy has led many operators (often on the backs of apocryphal cases histories), to continue clopidogrel for up to a year (and sometimes for life) in more complex cases, or where the patient is at particular risk if stent thrombosis were to occur (such as in left main stem stenting).

**Figure 3.** Significant variations in DES uptake occur across Europe.

The problem is that of the hundreds of thousands of PCI patients in Europe, some (and maybe not a small number) will require a noncardiological procedure at some time in the post-PCI period. The “continue APT and risk bleeding” versus “discontinue APT and risk stent thrombosis” conundrum has not been resolved.

The DES has changed practice. These stents have allowed us to take on older patients, who may not have been offered surgery, and those whom we previously believed were not worth stenting because of the high risk of restenosis (in diabetics, small vessels, and those with diffuse disease). While much of the shift in patient treatment relates to increased operator skills, experience, and improved technology, what these stents have done is to allow the good acute results attained drum has not been resolved.

The DES has changed practice. These stents have allowed us to take on older patients, who may not have been offered surgery, and those whom we previously believed were not worth stenting because of the high risk of restenosis (in diabetics, small vessels, and those with diffuse disease). While much of the shift in patient treatment relates to increased operator skills, experience, and improved technology, what these stents have done is to allow the good acute results attained to be maintained. Reporting of events as this new treatment paradigm is rolled out into the real world is critical. Comparator trials of DES with surgery in high-risk patients (left main stem or 3-vessel disease) are ongoing, and will allow us to place PCI using DES in its appropriate context.

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A View From Ankara

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