IR congress news

CIRSE 2017 – Copenhagen
Monday, September 18, 2017

Film Interpretation Quiz

The Film Interpretation Quiz is one of CIRSE's most exciting sessions as it pits IR against IR in a fun and challenging "last man standing" quiz. This session was started over 10 years ago and has been growing in popularity (and difficulty!) ever since. This year, the session will be moderated by Quiz Masters Xavier Buy and Ian McCafferty, who will show images of cases and present the audience with three possible answers to each scenario. Those choosing incorrect answers will be eliminated and must sit down, while those who get the answer right will continue to the next case. The last few contestants left standing will be invited onstage for a head-to-head finale. Those eliminated at the very beginning will have another chance towards the end to put their skills to the test once more. This is sure to be a fun and educational session, so brush up on those flash cards, review some cases and get ready for an afternoon of testing your IR knowledge!

To see photo highlights from previous years, flip to page 11.

Going Open Access: CVIR Endovascular

Helen Hemblade, CIRSE Office

To mark the release of *CVIR Endovascular* here at the Annual Meeting, Prof. Jim Reekers, Editor-in-Chief, spoke to us about this exciting new, multidisciplinary, open access journal from CIRSE, which is now officially open for submission.

CIRSE: Why do we need a new interventional journal?

Jim Reekers: Interventional radiology has always been a unique medical specialty driven by new technologies, observations and first experiences. It is for this innovative spirit, which is so typical for interventional radiology, that we want to offer a podium. Currently, there is so much good endovascular content that cannot be published in *CardioVascular and Interventional Radiology (CVIR),* due to a lack of space. 70% of all endovascular papers submitted get rejected for publication, including good case reports. Furthermore, all major journals now have open access, online journals alongside their main journal: *Lancet, JAMA, Nature,* just to name a few. We think it is important to offer a new publication opportunity within the CIRSE family where there is no limitation in pages. Secondly, we want to reach out to the other medical specialists in the field of endovascular treatment. *CVIR Endovascular* should also be a forum where all endovascular groups come together.

CIRSE: Does CVIR Endovascular take direct submissions?

Jim Reekers: Yes, *CVIR Endovascular* is open for direct submission of all endovascular papers. However, we will offer a special transfer service to papers sent to *CVIR* which have been rejected but contain good scientific content and can also be proposed for publication in *CVIR Endovascular.* If the authors indicate that they agree with direct resubmission, their paper will automatically be transferred to *CVIR Endovascular.* No new submission is needed.

CIRSE: Where does CVIR Endovascular differ from CVIR?

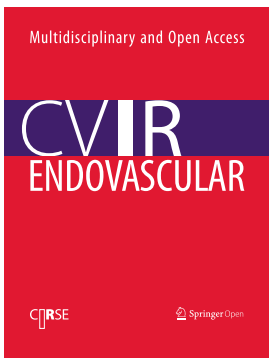
Jim Reekers: As I mentioned, unlimited publication space is a big factor here. *CVIR Endovascular* will also concentrate on more direct communication. We also want to connect to young and first-time authors, as reflected in our editorial board. We will, therefore, offer new ways to communicate with authors, not only through social media channels like Twitter and Facebook but also a blog-like forum, which will be available for discussions and exchange of ideas. I think that a publication should not be an endpoint but merely a starting point to connect colleagues working in the same field. What is more rewarding that sharing your findings with the whole IR community?

Lastly, because for *CVIR Endovascular* the slogan is "Communication through open access publication", we are using an open peer-review model. Reviewers will know the identity of the authors, and the reviewer's name will be available as soon as the comment has been submitted. What makes it so special is that all reviews will be published together with the article and will be displayed for everyone to read and comment on them.

CIRSE: Can you explain more about open peer review?

Jim Reekers: Open peer review offers two benefits: more transparency for the readers and acknowledgement of the reviewers. Normally, a reader will not necessarily be interested in the review process but, if the reader finds the paper a good starting point for a discussion on one of the *CVIR Endovascular* electronic platforms, they might also find some arguments for the discussion in the peer review. The second thing I hope will happen is that reviewers will understand their changing role from "quick" judge to mentor. Every medical specialty needs their experienced peers to rely upon and to make the specialty grow.

There is a lot of discussion going on about the "old fashioned" peer-review system. The criticisms you hear are that it is prejudiced or biased, that younger authors have less opportunities to get their papers published. My point of view is that reviewers should be more than judges; they should be critical co-authors, helping to make a paper better. They should, in turn, also be acknowledged for that work. More and more major journals have, thus, adopted the system of open peer review for their new open access journals. The *British Medical Journal* is an example of this.



NOW OPEN FOR SUBMISSION!

CIRSE: What are the main advantages of open access?

Jim Reekers: Open access means that your published paper will be available for free for everybody. There are no longer any barriers like subscription or fees. The advantage is that your work will get a much bigger audience, and your work will be picked up and cited more. Of course, this will also have a small price, as publishers get their revenues out of subscriptions. With open access the authors now have to pay a handling fee. Like all new things, this might be seen as a major change, but actually the advantages of open access outweigh this by far.

Many European hospitals and academic institutions have already made deals with the major scientific publishers to receive waivers or reductions for open access publications. We also see that many institutions that provide research grants now ask for open access publication of the results and the costs for that are already included in the grant. *CVIR Endovascular* and Springer publishers are also able to give waivers for publications. More information about this can be found on the *CVIR Endovascular* website.

Visit *www.cvirendovascular.org*.

Don't miss it !
Expert Round Table
Controversies in Type B dissection
Monday, September 18, 16:15-17:15
Auditorium 3

IDEAS 2017

Which patients should still be treated medically with TBAD?

Mike Dake

Michael D. Dake
Stanford University Hospital
Stanford, California, USA

Mike Dake is the Thelma and Henry Doelger Professor of Cardiovascular Surgery at Stanford University and Director of the Catheterization and Angiography Laboratories at Stanford Medical Center. He worked and trained in many different US cities, including at the newly founded Miami Vascular Institute with Barry Katzen in the late '80s, before returning to California as Section Chief of Cardiovascular and Interventional Radiology at Stanford University School of Medicine and Co-Director of the Catheterization and Angiography Laboratories at Stanford University Hospital, a group which went on to perform pioneering work in the treatment of venous obstruction and many medical firsts. Dr. Dake is a CIRSE Distinguished Fellow and was the 2009 Honorary Roesch Lecturer.

The most recently published societal guidelines for management of thoracic aortic diseases represent a dramatic change in the consensual opinion regarding the standard of care for treatment of patients with lesions involving the descending thoracic aorta [1,2]. When intervention is indicated, the guidelines now recommend thoracic endovascular aortic repair (TEVAR) as the treatment of choice for intact and ruptured descending thoracic aneurysm, traumatic aortic injury, aortic intramural haematoma, penetrating aortic ulcer, and acute type B aortic dissection (TBAD).

This is a remarkable contemporary endorsement of the broad impact, general acceptance and wide-spread adoption of TEVAR as a first-line therapeutic strategy. In total, these societal recommendations underscore the relative benefits of TEVAR across the full range of descending thoracic aortic diseases and a clean sweep displacement of open surgery as the intervention of choice in this aortic segment.

Actually, that's not completely true.

The guidelines do emphasise one important category of aortic disease where open surgery is preferred over TEVAR: chronic TBAD. In patients with chronic TBAD and aneurysmal degeneration and/or symptoms, open repair is recommended because TEVAR is frequently unable to provide a sustained benefit due to residual pressurisation of the false lumen via distal fenestrations in the dissection septum.

Are there other clinical situations when TEVAR therapy for TBAD should be withheld because of its risk of complications or its inability to reliably obtain a successful result?

Yes, indeed; in terms of acute TBAD, there are cases where TEVAR may not be appropriate and medical therapy should be favoured as the strategy of choice.

The situations where medical therapy is considered the preferred management approach are, for the most part, related to anatomic factors that make TEVAR less attractive because of a higher risk of procedural complications or failure. Obviously, certain underlying clinical considerations may also influence the appropriateness of TEVAR in acute TBAD. Advanced age, limited life expectancy, important pre-existing medical conditions, and associated complications of the dissection, such as stroke or paraplegia, may all contribute to making TEVAR a less attractive option; however, in everyday practice a variety of anatomic considerations tend to create more vexing challenges in determining the suitability of TEVAR for acute TBAD.

These considerations may be arbitrarily grouped into those related to the underlying anatomic configuration of the aorta, especially the aortic arch, and those that are associated with the dissection process and its extent of involvement.

In terms of the aortic arch appearance, one of the most problematic configurations for TEVAR placement in acute TBAD is a highly angulated, frequently referred to as "gothic", arch with the apex of the peak in the central or distal arch (Fig. 1). This particular geometry, when it involves the proximal landing zone for a stent graft, can impose a significant challenge that may result in asymmetric forces exerted by the proximal stent structure against the aortic wall, usually along the greater curvature. This may cause a device-induced secondary tear which may result in a retrograde type A dissection or rupture. This risk of retrograde dissection is especially high when the proximal stent margin is located within an aortic wall segment already compromised by haematoma or dissection.

Even without the occurrence of an acute secondary tear, the presence of stent-related asymmetric point loads against the aortic wall in acutely angulated anatomy may lead to a wall erosion or haematoma and, consequently, saccular aneurysm.

Similarly, the proximal extent of the dissection may affect the success and risk of complications of TEVAR for acute TBAD. TBAD is typically thought of as exclusively involving the descending thoracic aorta, however, by definition, if the aortic arch is also affected, but not the ascending aortic segment, the process is categorised as TBAD. Although this is not the classical appearance, when it is encountered, it is an important factor to consider in the selection of the most appropriate therapy.

If an intimal tear, primary entry or otherwise, is diagnosed in the arch segment, standard TEVAR is not possible without branch vessel coverage. Consequently, any endovascular intervention becomes more complex with a need for surgical or endovascular branch vessel revascularisation in conjunction with TEVAR coverage of the septal tear in the arch. This can become a more complicated procedure if there is arch branch vessel involvement by the dissection.

If the arch is involved in the dissection, but without associated branch vessel involvement or a tear in the septum, and the primary entry tear is diagnosed in the descending aorta, TEVAR may be contemplated with proximal placement in a typical location with the understanding that the risk of complications may be higher when landing in a dissected aorta. Across the spectrum of acute TBAD with arch involvement that ranges from the presence of a tear in the arch with or without branch vessel involvement to retrograde arch involvement with a primary entry tear in the descending aorta, the ultimate decision concerning the best management strategy – intervention or medical therapy exclusively – is often predicated on the patient's symptoms and whether the case is considered complicated or uncomplicated.

Complications may be related to the arch involvement, but frequently the indication for intervention is related to distal complications such as aortic rupture of abdominal branch vessel compromise. In this setting, weighing of the risk-benefit ratio of TEVAR versus other endovascular (septal fenestration, branch vessel stent placement, etc.) or open surgical approaches, is often difficult.

In the setting of acute uncomplicated TBAD with a highly angulated aortic arch and a primary entry tear distal to the left subclavian artery, medical management may be the most appropriate strategy, at least initially, to avoid the increased risk of procedure-related TEVAR complications, the most catastrophic being retrograde type A dissection. Similarly, if there is a tear diagnosed within the arch without ascending aortic involvement and no branch vessel involvement or other complications, medical management alone may be the most judicious option rather than proceeding to a complex endovascular or hybrid procedure with the attendant risks and complications associated with manipulations of the arch and its branches.

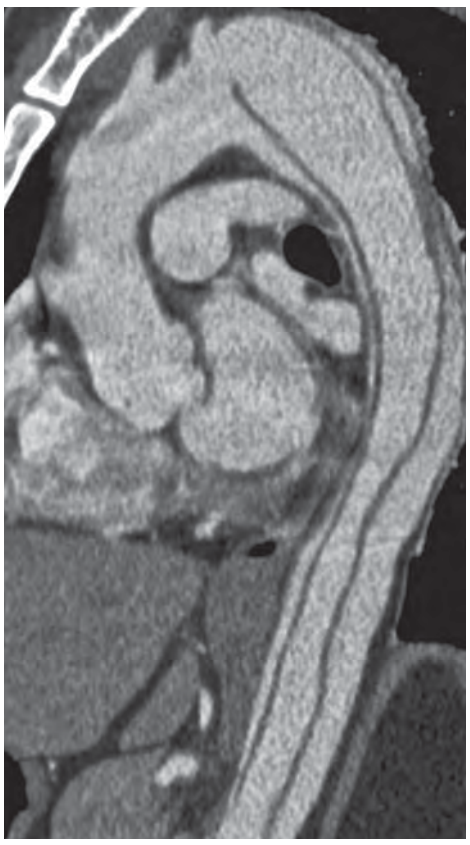


Fig. 1: Highly angulated "gothic" aortic arch. Sagittal reformation of CT angio data set acquired through the chest in a 67-year-old man with acute TBAD depicts acute angle of aortic arch with peak in mid-arch close to primary entry tear site and left subclavian artery.

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Steering CIRT Forward

Michelle Weiss, CIRSE Office

CIRT CIRSE Registry for SIR-Spheres Therapy

Since the beginning of 2015, CIRSE has been conducting a European-wide registry, the CIRSE Registry for SIR-Spheres Therapy (CIRT), to collect data on how radioembolisation therapy with SIR-Spheres is being used to treat liver tumours. Now, two and a half years in, the registry has already been able to recruit 30 hospitals from eight different countries and has enrolled over 700 patients. With such progress being made and patient recruitment marked to stop at the end of this year, we sat down with the Chairman of the CIRT Steering Committee, José Ignacio Bilbao, to discuss the objectives and future plans for CIRSE's first registry.

CIRSE: You are now two and a half years into the CIRT registry; can you elaborate on what the main objectives are?

Bilbao: The main objectives of CIRT are to conduct a post-market study analysing the daily practice of radioembolisation in Europe, and we are trying to include as many hospitals in as many countries as possible. We have established that the centres we include should have a minimum knowledge of the treatment so that we avoid a learning curve and really gain valuable information on what happens in hospitals where the interventional radiologists have the proper experience. This will provide clear knowledge of the real-life use of radioembolisation and help us to know what the indications are to perform the procedures, how the procedure is conducted, what the relationship is with other techniques, and what the complications and follow-up results are. Ultimately, we are collecting this data to understand the safety and efficacy of the therapy. We also have a subgroup that deals with complications, so we are paying close attention to that and communicating with the hospitals about what has occurred if the information is ever unclear.

Another important aspect of the registry is that it is completely multidisciplinary, so the information that we are collecting is not only interesting for interventional radiology but also for other specialities, such as surgery or nuclear medicine. Our Steering Committee, as well, is made up of members from other specialities, including hepatology, oncology and internal medicine. If I had to summarise the primary considerations of the study, I would say: post-market safety, efficacy, knowledge of daily practice, and multidisciplinary teamwork are the key focus points.

CIRSE: CIRT has now enrolled over 700 patients across eight countries, were you expecting to reach that many? Is that a sufficient number to consider the application of SIR-Spheres in Europe?

Bilbao: At the beginning, it was not so easy to establish contracts with hospitals and enrol patients, but the CIRSE Office has done extraordinary work in terms of teaching, preparing and promoting the inclusion of hospitals and patients. This is a clear demonstration of what a well-oiled machine can accomplish, and now we are seeing the results with more and more cases being included in the data collection. I expect that by the end of our enrolment period, we will have around 800 cases. I believe with that number of patients it will be possible to have a good picture of how radioembolisation is being performed in Europe and to what effect.

CIRSE: After enrolment of patients in CIRT has finished, what are the next steps?

Bilbao: Our aim is to finish recruiting patients at the end of 2017, but we will follow this information for two more years in order to see what happens with the patients, which is really the primary goal of the study: to know if what we are doing is good or bad for the patients. This is vital to the study and for any future research stemming off from CIRT.

CIRSE: CIRT is one of CIRSE's first registries, how do you see it paving the way for other CIRSE-sponsored registries? What have you learned from this experience as the Chairman of the Steering Committee?

Bilbao: This registry has been a very significant experience for me and for CIRSE. We understood when we started CIRT that multidisciplinary, multinational registries should play an important role at CIRSE, and we spent a lot of time preparing everything extremely well before including patients in the study. Although this first registry is on radioembolisation, it is not for radioembolisation alone. With the initial set-up we have done, we are now ready and prepared to use this structure for other registries if everything goes well. And registries are a very important part of our work in interventional radiology, because, when we demonstrate what we do in daily practice and provide good scientific support, the information we deliver will be very important for establishing guidelines or how we engage with other medical or surgical specialities. CIRT is an important step for CIRSE, because it will prepare the path for other registries or trials.

CIRT Steering Committee

Today's Featured Papers

will be presented in the Free Paper sessions, taking place from 16:15-17:15 and from 17:30-18:30

16:15-17:15

FP 2207 Radiation protection
Room 18
Occupational radiation exposure to the lens of the eye in interventional radiology
G.S. Goh, S.S. Wang, W. Clements; Melbourne, VIC/AU

FP 2208 Drug-coated balloons
Auditorium 11
Twelve-month clinical outcomes after treatment of femoropopliteal lesions with a novel paclitaxel-matrix coated balloon catheter
G. Tepe[1], Ö. Gögebakan[2], U. Redlich[3], J. Tautenhahn[3], J. Ricke[4], Z. Halloul[3], D.-R. Meyer[2], M. Waliszewski[2], B. Schnorr[2], T. Zeller[5], S. Müller-Hülsbeck[6], T. Albrecht[2]; [1]Rosenheim/DE, [2]Berlin/DE, [3]Magdeburg/DE, [4]Munich/DE, [5]Bad Krozingen/DE, [6]Flensburg/DE

17:30-18:30

FP 2306 Peripheral arterial disease
Auditorium 11
Primary stenting of the superficial femoral artery in intermittent claudication improves health-related quality of life, ABI, and walking distance: 12-month results of a randomized controlled multicenter trial
H. Lindgren; Helsingborg/SE

FP 2307 GI tract intervention
Room 19
Spectrum of fluoroscopy-guided percutaneous diagnostic and treatment procedures via the pancreatic duct percutaneous drainage tract: feasibility and technique
M. Mizandari[1], T. Azrumelashvili[1], N. Habib[2]; [1]Tbilisi/GE, [2]London/UK

FP 2308 Dialysis access
Room 20
Near-infrared fluorescence imaging of MMP-2 activity as a biomarker of stenosis in AV fistulae
G.J. Nadolski, S. Hunt, T. Gade; Philadelphia, PA/US

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Dialysis access surveillance: clinical or ultrasound?

Michiel de Haan, EBIR

Don't miss it !
Dialysis fistula management beyond PTA
Special Session
Monday, September 18, 08:30-09:30
Auditorium 2

Michiel W. de Haan
(EBIR)
Maastricht University
Medical Center
Maastricht, The Netherlands

Michiel de Haan is a professor of interventional radiology at the Maastricht University Medical Center. He received his M.D. at the University of Leiden in 1986. After a three-year period as surgical resident in The Hague, Prof. de Haan completed his residence in radiology at the University of Maastricht, before completing a fellowship in interventional radiology at the University of Leuven (Belgium). Prof. de Haan returned to Maastricht, where he became the Head of the Department of Interventional Radiology. He is a committee member of the Dutch Society of Interventional Radiology. His clinical interests include advanced endovascular repair techniques in complex thoraco-abdominal aneurysms, interventions in critical limb ischaemia and non-invasive vascular imaging.

Chronic kidney disease is becoming a global healthcare problem with increased incidence and prevalence over the last decades. The majority of patients with chronic kidney disease rely on haemodialysis to survive renal failure. A viable vascular access, in terms of function and patency, is, therefore, of vital importance for these patients. Low access flow and loss of patency may impede adequate haemodialysis and even lead to increased morbidity and mortality [1-3]. Predicting access failure is, thus, of great clinical and socioeconomic importance for both patient and society.

The rationale for implementing a structural surveillance programme is the timely detection of access stenosis, allowing for early treatment in order to prevent underdialysis and thrombosis. In order to forecast access dysfunction, several techniques are available.

Physical examination

Inspection, palpation and auscultation are the three main components of physical access examination, which can be used to assess vascular access function. Swelling/oedema of the extremity, ischaemic fingers, aneurysms and/or collateral veins can be detected by visual inspection and may indicate access-related complications. Although subjective, assessing the strength of the arterial inflow and venous outflow by palpation and/or auscultation is a useful test. Normally, a fistula has a continuous thrill and is soft and compressible. If there is a downstream stenosis or occlusion, however, the fistula becomes very pulsatile ("water-hammer pulse") with a weak thrill. Conversely, a weak pulse indicates poor arterial inflow and/or a stenosis at the level of the anastomosis. Also, the location of stenosis can be palpated by experienced hands. A local intensification of bruit over the graft or the venous anastomosis may suggest a stenosis [4].

Although proven cost-effective, regular physical examination has not been very popular among nurses and/or doctors at the haemodialysis units. This is probably due to the high workload at the dialysis departments, but the lack of specific training also plays an important role.

Indirect flow measurement

The ultrasound dilution technique is a well-established method for indirectly measuring access blood flow during haemodialysis. With the aid of ultrasonic sensors, changes in protein concentration can be measured while infusing saline distally in the vascular access, which allows for calculation of the access blood flow. Although accuracy of this technique is influenced by many (haemodynamic) parameters which potentially under- or overestimate the flow, it is the most validated and broadly accepted technique [5].

Venous dialysis pressure

Pressure measurements from the haemodialysis circuit were not originally designed to assess access (dys)function, but it is currently a prominent surveillance tool. The pressures can be measured through the arterial and venous needles and have to be compared to each other as well as to the mean arterial pressure in order to assess the location of the possible stenosis. When the intra-access pressure is increased to greater than 50% of mean arterial pressure, graft flow has commonly decreased into the thrombosis-prone range and the presence of stenosis is likely. Because of the variability of the haemodynamic parameters, there is little correlation between a single measurement of flow and pressure. Serial measurements of pressure in each patient are more valuable than isolated measurements [6].

Duplex ultrasound

Duplex ultrasound allows for direct flow measurement by assessing the blood flow velocity in relation to the cross-sectional area of the access. The accuracy of the measurement depends strongly on a correct Doppler angle and on a proper estimation of the cross-sectional area, which makes the technique error-sensitive and operator-dependent. Furthermore, duplex is not very sensitive in the region of the central veins [7]. In experienced hands, however, duplex ultrasound is a valuable tool not only to assess the access flow, but also to locate the underlying stenosis, which is particularly helpful in planning the subsequent (percutaneous) intervention. In addition, several studies suggest that duplex-guided balloon angioplasty of failing or non-maturing AVFs is feasible and safe, even when it is performed as an office-based procedure [8].

Magnetic resonance angiography

Magnetic resonance angiography is an attractive modality for evaluating both haemodialysis access anatomy as well as function. Using phase-contrast and time-of-flight techniques, it is possible to assess the vascular access flow without the need to administer contrast media. However, the wide range of flow rates complicates interpretation: high flow rates may produce signal voids, suggesting severe stenosis at only mild narrowings and/or sharp-angled anastomoses. Contrast-enhanced MRA has been shown to be a reliable tool for detection of stenosis and occlusion not only in the upper extremity veins but also in the arteries. Apart from issues regarding the costs and availability of this technique, all interest in MR imaging of dialysis access sites has virtually evaporated due to concerns regarding the use of gadolinium in patients with renal failure [9]. Perhaps the recent development of other more modern and safer gadolinium-based contrast agents will revive the research into MRA imaging of haemodialysis access sites.

Multi-slice computed tomographic angiography

Multi-slice computed tomographic angiography is a relatively new minimally invasive technique for stenosis detection in haemodialysis access. Multi-slice CTA has been shown to be clinically feasible for evaluating the complete vascular tree [10]. Moreover, the modern dual-source CT systems can provide haemodynamic details over the access. However, concerns regarding radiation exposure and the use of contrast material have so far hampered widespread application of CTA for access imaging.

Results

Several studies have been published comparing physical examination with angiography or duplex ultrasound. All studies showed a moderate to strong agreement between physical examination and the gold standard in the diagnosis of both inflow and outflow stenosis, with sensitivities ranging between 85-100%, and specificities between 68-93% [11]. The application of duplex ultrasound in detecting underlying stenoses in dysfunctional dialysis access sites has been demonstrated in numerous studies. In one of the most recent of these studies, Raju et al. [12] showed an overall sensitivity of 96% and specificity of 57% for duplex ultrasound compared to angiography. Compared to duplex ultrasound, the number of publications on this issue regarding MRA and CTA are sparse. The few studies on MRA show very high sensitivities and specificities, but these results have not been (and are unlikely to be) confirmed in later and/or larger studies [13]. Likewise, initial studies on CTA in detecting stenoses in failing dialysis fistulas or grafts show respectable results, but its role in a clinical setting has yet to be established [10].

Discussion

The rationale for surveillance is based on the assumption that progressive stenoses are accurately detected before thrombosis and patency of the vascular access can be maintained with subsequent open or percutaneous intervention. To date, however, randomised controlled trials have not consistently shown that surveillance programmes improve outcomes in grafts, which might be explained by the number of clinical and haemodynamic parameters, variation in definitions and differences in risk of thrombosis. Surveillance aimed at a high sensitivity in predicting thrombosis has, as a consequence, a high false-positive rate that likely yields many unnecessary interventions.

Furthermore, balloon angioplasty by definition induces mechanical trauma, accompanying neointimal hyperplasia, and thereby, the risk of stenosis and impaired access survival. Given the poor reproducibility of the measurements, it seems plausible that surveillance will improve if measurements are taken more frequently. Regular, consecutive measurements would allow calculation of average values that may neutralise haemodynamic variation.

Despite the controversial data, surveillance continues to be widely supported as a routine part of access maintenance.

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New radiation safety legislation in 2018!

Visit the Radiation Protection Pavilion

CIRSE's Radiation Protection Pavilion, located in the exhibition hall, is here for you during the entire Annual Meeting, offering information material, interactive tools, and opportunities to engage directly with experts in radiation protection. This year, you can learn more about the impact of European Directive 2013/59/Euratom on safety standards and regulations regarding radiation exposure and how it will affect practitioners and patients.

Today's RPP Mini-Talks, which feature short expert presentations, again cover a wide range of topics delving further into various aspects of radiation safety.
We hope to see you there!

Today's RPP Mini-Talks

	Time	Mini-Talk	Speaker
MON SEPT 18	09:45 - 10:00	Protection of the staff: how to implement effective shielding at reasonable cost?	R. Adamus *(Nürnberg/DE)*
	10:00 - 10:20	The implementation of the new Directive 2013/59/Euratom: highlights and challenges	E.P. Efstathopoulos *(Athens/GR)* E. Vano *(Madrid/ES)*
	11:00 - 11:15	New standards in radiation protection of the eye (MAVIG)	M. Schmid *(Munich/DE)*
	11:15 - 11:35	Occupational radiation hazards in hybrid ORs	G. Bartal *(Kfar-Saba/IL)* E. Vano *(Madrid/ES)*
	12:30 - 12:45	Patient and operator dose reduction with multi-parameter exposure control (Siemens Healthineers)	H. Bosmans *(Leuven/BE)*
	12:45 - 13:00	Basic safety standards directive: what's new for workers	A. Ploussi *(Athens/GR)*
	13:00 - 13:15	Practical aspects on RP in fluoroscopy-guided procedures	E. Vano *(Madrid/ES)*
	13:15 - 13:30	Radiation safety: image quality versus safety during TACE (Mentice)	L. Lönn *(Copenhagen/DK)* D. Steffel *(Gothenburg/SE)*

Our Burning Issue: Radiation Protection

Helen Hemblade, CIRSE Office

Don't miss it!
Radiation protection: burning issue
Hot Topic Symposium
Monday, 18 September, 15:15 – 16:00
Auditorium 1

Since the creation of the Radiation Protection Subcommittee and the Radiation Protection Pavilion (RPP) at our Annual Meetings, it has been one of CIRSE's key initiatives to provide advice and education on radiation protection for those working in the medical field and their patients. With the new radiation protection legislation on the way, it will be essential to be informed and prepared when the Directive is transposed into national legislation by 6 February 2018, requiring all EU countries, the radiology community and the industry to adapt their regulations, procedures and equipment to the new high standards of radiation safety.

The topic of radiation protection is widely covered at CIRSE with our Radiation Protection Pavilion, which provides daily mini-talks on various radiation safety topics. Today's Hot Topic Symposium will cover the Directive, as well as relevant issues in radiation protection, such as the level of risk to pregnant workers, radiation protection in paediatrics and occupational protection. Ahead of this exciting session, we caught up with speakers Eliseo Vano, Professor of Medical Physics at Madrid's Complutense University and member of the Radiation Protection Subcommittee; Dr. Claire Cousins, Chair of the ICRP and former IR at Addenbrooke's Hospital in Cambridge, UK; Prof. Gabriel Bartal, Director of the Department of Medical Imaging at Meir Hospital, Israel, and member of the Radiation Protection Subcommittee; and Dr. Anna Sailer, interventional radiologist and postdoctoral research Fellow at Stanford University in the US.

CIRSE: What changes will the new legislation bring to medical practices?

Eliseo Vano: The new European Directive 2013/59/Euratom, which will lay down basic safety standards for protection against the dangers arising from exposure to ionising radiation, should have a positive impact on European radiology. The Directive was unanimously adopted by the Council of the European Union (EU) on 5 December 2013. According to the new Directive, a clear definition of responsibilities and tasks among all professionals involved in medical exposure are fundamental to ensure adequate protection of patients and staff. Furthermore, the Directive provides radiation protection education, training and provision of information. The basic safety standards take into account the new recommendations of the International Commission on Radiological Protection (ICRP).

The Directive modifies the occupational dose limit for the eye lens to 20 mSv per year from the previous value of 150 mSv per year. Furthermore, the Directive strengthens and expands the previous requirements regarding diagnostic reference levels. If the diagnostic reference levels are consistently exceeded, corrective action is necessary without undue delay. There will also be new requirements for imaging equipment and patient dose registries and the capacity to transfer this information to the record of the examination.

Practitioners and the individuals involved in the practical aspects of medical radiological procedures shall have adequate education, information, and theoretical and practical training for the purpose of medical radiological practices, as well as relevant competence in radiation protection. Medical physics experts shall be involved in radiodiagnostic and interventional radiology practices.

CIRSE: How real is the occupational radiation hazard to female IRs?

Claire Cousins: The lack of knowledge or misinformation provided by the medical community on radiation risks for pregnant women often leads to undue apprehension and may deter potential female trainees. Once a pregnancy has been declared, ICRP recommends that the additional dose to the foetus should not exceed 1 mSv during the remainder of the pregnancy. The threshold dose for foetal injury is 100 mSv. The average dose received by a working pregnant interventional radiologist over the entire gestation is 0.3 mSv, and to the foetus, is approximately 0.09 mSv. The risks from occupational radiation exposure during pregnancy are very small compared with other risks that may affect a pregnancy, i.e. a spontaneous abortion rate of 15% and an incidence of major malformation of 2–4%. Pregnancy outcomes after exposure to radiation levels encountered in the angiography suite are indistinguishable from outcomes among those exposed to natural background radiation.

Pregnant interventional radiologists often request to be moved away from tasks that entail radiation exposure because, despite knowing that the risks are small, they do not wish to accept any risk. This may be logistically difficult if other employees are needed to fill the vacated position. If a pregnant interventional radiologist continues working, it is important to keep the dose to a minimum by wearing appropriate personal protective shielding and practising careful fluoroscopic techniques. In answer to the question, there is no real radiation hazard for young female doctors entering interventional radiology.

CIRSE: What about the radiation risk for children?

Gabriel Bartal: Fluoroscopy and CT-guided interventional radiological procedures carry higher risk per unit of radiation dose on average for the development of cancer in infants and children, compared with that in adults owing to known reasons such as longer life expectancy in children and developing organs and tissues that are more sensitive to the harmful effects of radiation. A child should therefore not be considered a 'small adult' but a standalone entity in terms of procedure safety in general and radiation safety in particular.

Important factors to consider when using and selecting imaging are age, size and sex of the child; the latter reason being that the female reproductive organs can be affected, even at a young age.

CIRSE: What can be done to lower this risk?

Gabriel Bartal: For paediatric dose management, good and well-controlled sedation or general anaesthesia should be routine for pain and anxiety and, as a consequence, dose management because a relaxed child requires shorter fluoroscopic time and intervention, as well as less retakes during DSA run, if at all.

Exposure parameters on X-ray machines are often not adjusted for paediatric patients, and there is a clear need for appropriate selection of technical parameters such as focal spot size, pulse width, pulse rate, field size, air-gap magnification, filter thickness and position and anti-scatter grid systems.

Interventional radiologists should furthermore limit fluoroscopy time and the number of images obtained in angiographic and radiographic acquisitions, appropriate use of last image hold and storage of dynamic fluoroscopy, flexible automated detection systems, radiation-free patient positioning and collimation and post-processing magnification. No correlation is found between fluoroscopy time and measured entrance dose, but a strong correlation is observed between cumulative skin dose and patient weight.

IR procedures in children should always be individually justified and accurately planned. A clinically justified balance between the risk and the benefit is necessary. It is important to have a history of previous procedures, including radiation exposure values. We have to verify that the procedure is necessary based on the natural history of the disease and the risks and benefits of other available therapeutic options.

CIRSE: How has protecting yourself as an IR against radiation exposure evolved?

Anna Sailer: I remember when I visited my father at work, there were these incredibly heavy, large lead aprons. Interventional radiology procedures have become more technically complex and more frequently performed by a distinguished group of specialists providing 24/7 coverage. Occupational safety, including personal radiation protection and protection from work-related back and neck pain, has become a burning issue for interventional radiologists. Nowadays we see many "light-weight" protective aprons on the market, weight reduction is achieved by using garments that are either lead-reduced (lead composite with alternative absorbing elements of lower atomic number than lead) or even lead-free garments. Many interventional radiologists have their own tailored apron, often in the form of a skirt and vest plus thyroid collar. Furthermore, more radiologists are using lead protective glasses, triggered by the adjustment of the annual eye lens dose limit by the ICRP in 2011.

CIRSE: Can you give any advice for selecting personal protection wear?

Anna Sailer: When it comes to buying or selecting an apron, most importantly, interventional radiologists should realise that weight reductions for protective garments are only achievable within a limited range. Concerning lead composite or lead-free aprons, one should be aware that the lead (Pb) equivalence label on the apron does not mean, per se, that the garment attenuates X-ray photons the same as lead in equivalent thickness among the X-ray beam qualities used in interventional procedures. The attenuation testing and labelling is performed by the manufacturers and the stated Pb equivalence values strongly depend on the radiation beam quality and measurement settings used during the attenuation testing. Before you buy an apron, ask the manufacturer about the warranty period of the apron and the attenuation profile according to the IEC 2014 (or equivalent) standards. It is furthermore important that an apron fits the personal body shape and is well maintained, including annual testing of the integrity of the garment. I encourage and welcome everyone to join our Hot Topic Symposium today.

We look forward to seeing you there!

Eliseo Vano
Complutense University
Madrid, Spain

Claire Cousins
Chairperson of the ICRP
Cambridge, UK

Gabriel Bartal
Meir Hospital
Kfar Saba, Israel

Anna Sailer
Stanford University
Stanford, California, USA

Don't miss it !
Therapy of painful bone metastases
Fundamental Course
Monday, September 18, 08:30-09:30
Auditorium 10

Transarterial embolisation of skeletal and spinal metastases

Anthony Ryan

Anthony Ryan
University Hospital Waterford
Waterford, Ireland

As befits a consultant interventional radiologist at a university teaching hospital and lecturer in radiology at the Royal College of Surgeons, Dublin and University College Cork, Dr. Anthony Ryan has completed medical training in a number of English-speaking countries (Ireland, Australia, Wales, Canada and England), thereby acquiring extensive training in vascular/interventional, musculoskeletal and abdominal radiology. In addition, he has earned a Masters of Science in Engineering and Physical Sciences in Medicine and a Higher Diploma in Clinical Education. Dr. Ryan is the Irish representative on the ESR Education committee, the Honorary Secretary of the Faculty of Radiologists and the immediate past President of the Irish Society of Interventional Radiology. In recent years, he has become more actively involved in the running of CIRSE, not only as regular faculty member of CIRSE and ECIO, but also as a member of the Ethical Task Force, the Editorial Board of Intervention IQ, and of the outgoing Membership Committee.

Osseous metastases can result in intractable pain, fracture, neurologic compromise and devastating disability. Embolisation should be given consideration as part of the treatment algorithm, alone or in combination with other techniques (Fig. 1)[1-3].

Indications

Instrumental stabilisation and corpectomy (in the spine) are the treatments of choice to restore stability and relieve or prevent neural compression. Without pre-operative embolisation, it is occasionally necessary to abandon these resections due to uncontrolled haemorrhage [1,2]. Pre-operative embolisation limits intraoperative blood loss [4-16], ensuring optimal visualisation and adequate resection [4], reducing operative duration and mortality.

In the non-operative palliative setting, the goal is tumour devascularisation without non-target compromise, reducing tumour turgor and periosteal pain-fibre stimulation. In this setting, embolisation is frequently employed in combination with other percutaneous modalities [2,3]. Additional potential benefits include reduced recurrence rates and prolonged survival (documented in hepatocellular carcinoma [5]).

Contraindications

When a radiculomedullary artery arises directly from the segmental artery, this is usually considered an absolute contraindication to embolisation [10]; however, in centres with expertise, test occlusion or vessel provocation, with monitoring evoked potentials to determine the risk of cord infarction are used. Peripheral vascular disease may contraindicate an adequate embolisation and/or protective coiling if the distal circulation depends on the collateral circulation.

Patient selection

Predictably, lesions with histologies known to produce hypervascular metastases respond more favourably. Embolisation is not precluded by the presence of prior instrumentation and may be repeated (Fig. 2). If both embolisation and radiotherapy are planned, the latter should be performed first, given its dependency on target oxygenation [17].

Predictors of a positive outcome post-embolisation are: purely lytic tumours, pathologic fracture, rapid size increase, and/or progressive destruction [9].

Angiographic anatomy

Critical to avoiding complications, especially in the spine where profound neurologic ischaemia is a potential adverse outcome, is a thorough knowledge of the arterial anatomy, its variants and the variations in flow dynamics that may occur during the procedure.

Spinal and radiculomedullary arteries

The spinal cord is supplied by a single midline anterior spinal artery (ASA) and paired posterolateral posterior spinal arteries. The ASA commences at the vertebrobasilar junction and extends to the filum terminale. The anterior and posterior spinal arteries are narrowest between T4 and T8, with usually only one radiculomedullary artery (T4 or 5) supplying the ASA at this level, resulting in the particular vulnerability of these segments of the cord to ischaemic insult. The radiculomedullary arteries arise from the radicular branch of the dorsospinal branch of aortic segmental arteries, each radicular branch dividing into anterior and posterior radiculomedullary arteries which run alongside the anterior and posterior nerve roots. The radiculomedullary arteries supply the cord, adjacent nerve roots, dura and bony wall of the spinal canal. Crucially, at the expansions, they may be the dominant supply to the cord.

The largest radiculomedullary artery (of Adamkiewicz [18], with the classic "hairpin" appearance, found in 75% of cases between T9 and T12, three times more commonly on the left) gives the most supply to the ASA in the lower thoracic and upper lumbar levels. A less frequently visualised radiculomedullary artery has a shared origin with the right bronchial artery from a T4 level intercostobronchial trunk, hence the risk associated with bronchial artery embolisation.

Vertebral supply

In the majority of cases, the principal supply to a vertebral lesion is from the segmental artery at that level; however, the two levels above and below must also be interrogated to identify anastomotic supply, and to identify radiculomedullary branches. In the cervical spine, there are four potential additional arterial supplies, namely, the occipital artery, the ascending cervical arteries, the deep cervical arteries and the vertebral arteries. For skull base and C1/2 lesions, the ascending pharyngeal artery also requires interrogation given its potential anastomoses with the occipital artery. In the high thoracic spine, the superior intercostal arteries and supreme intercostal arteries must be assessed. For lesions in the sacrum, the median sacral artery (from the aorta) the iliolumbar and lateral sacral arteries (both from the posterior division of the internal iliac artery) need to be assessed.

Embolisation

The goal of embolisation is complete devascularisation of the tumour. Guiding catheters are recommended to secure stable access in the cervical spine and for lesions deriving supply from the internal iliac circulation. The segmental arteries at the level of the lesion should be catheterised and once access is stable, angiography performed to demonstrate the arteries supplying the tumour, supply to the cord and potential non-target circulations. Road-mapping and superselective microcatheters are routinely employed.

Calibrated particles are the preferred embolic agent given their reduced tendency to clump and consequently, more predictable capillary distribution and a lesser likelihood of microcatheter occlusion. Either polyvinyl alcohol or clear acrylic copolymer (trisacryl) microspheres can be used as, in this setting, no clinical advantage has been identified with the use of either [19].

300–500 micron particles are most frequently used. Extra caution must be used when using 100–300 micron particles as there is an increased risk of non-target embolisation through intra-lesional arteriovenous anastomoses. Particles less than 100 microns should be avoided because of potential passage into the systemic venous circulation.

In order to protect tissues distal to the tumour circulation, the segmental artery distal to the take-off of the tumour vessels may require protective coiling. When this is performed, it may effect "flow-diversion" as this occlusion can encourage more antegrade flow of embolic into the tumour-feeding artery [20,21]. This same technique is employed in the periphery, where, provided an adequate collateral circulation is present (as is usually the case) coil protection may be employed.

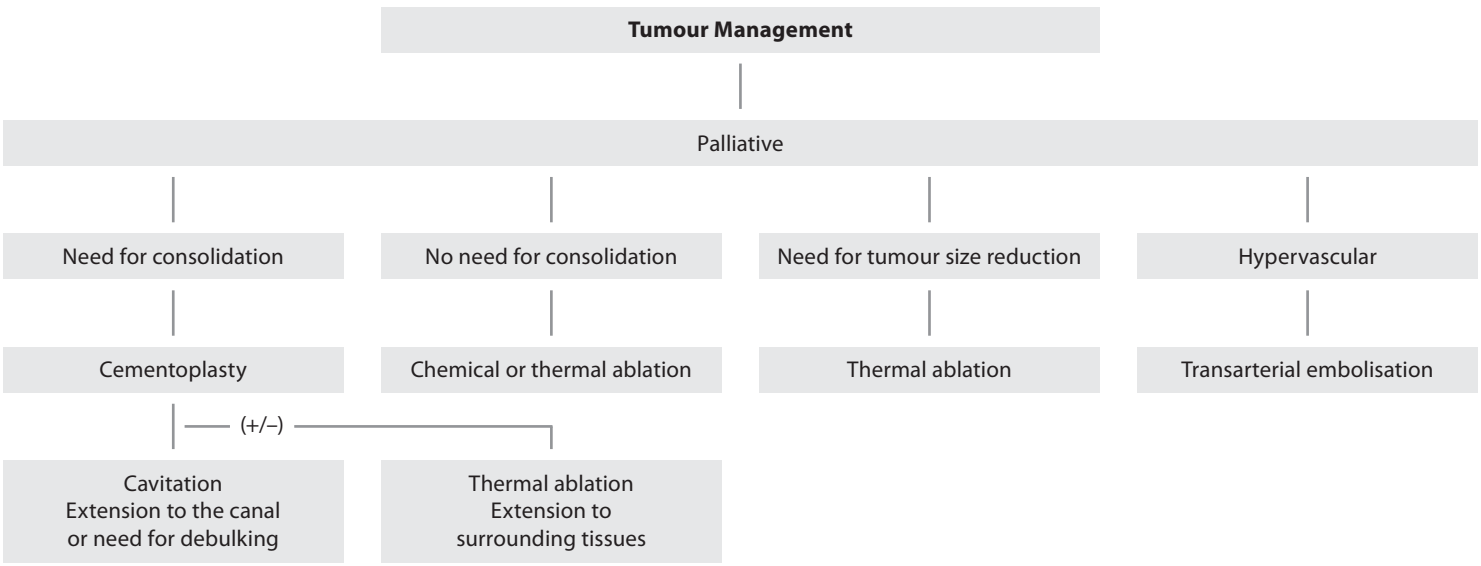

Fig. 1: Modified Algorithm 1 from CIRSE Quality Improvement Guidelines for Bone Tumour Management, the column on the right added to encourage consideration of transarterial embolisation if the lesion is hypervascular.

To ensure an adequate embolisation, repeat angiography +/- further embolisation of the embolised branches is recommended, as the particles "pack" distally, resulting in incomplete occlusion if unrecognised. Spasm may give rise to a false impression of occlusion. Proximal embolisation of feeding vessels (e.g. with coils or gelfoam) without microparticle embolisation is doomed to failure as rapid collateralisation occurs (within hours). For this same reason, larger embolic particles e.g. greater than 700 microns should also be avoided.

The more complete the embolisation, the greater the reduction in perioperative blood loss [21]. Schmidt showed that the adequacy of embolisation in a group of metastases was the only predictor of the extent of blood loss [16]. Clausen et al. recently reconfirmed the reduction in operative time and reduced blood loss in hypervascular spinal metastases [22]. Evidence regarding the use of liquid agents, e.g. Onyx and n-butyl cyanoacrylate (nBCA), is limited, and these are not first-line agents given their expense and the expertise required for their use.

Alcohol is discouraged in the spinal setting given its propensity to pass into radiculomedullary branches with resultant spinal cord infarction [10]; however, Sundaresan reported good results using alcohol in 17 patients with renal cell metastases [23]. A superselective position and a slow infusion technique are mandatory.

The sooner resection follows embolisation, the greater the reduction in perioperative blood loss [10,24,25].

Complications

Without adequate care, devastating neurologic ischaemia is a risk; however, in experienced hands, the risk of neurologic complications is less than the usually quoted 2%.

Conclusion

Transarterial embolisation is effective and safe in the palliation of pain and disability due to osseous metastases and in the reduction of perioperative blood loss. Coil protection, in the spinal and peripheral settings prevents non-target embolisation and increases payload delivery. Meticulous technique and avoidance of embolisation of radiculomedullary arteries prevents serious permanent neurologic deficits.

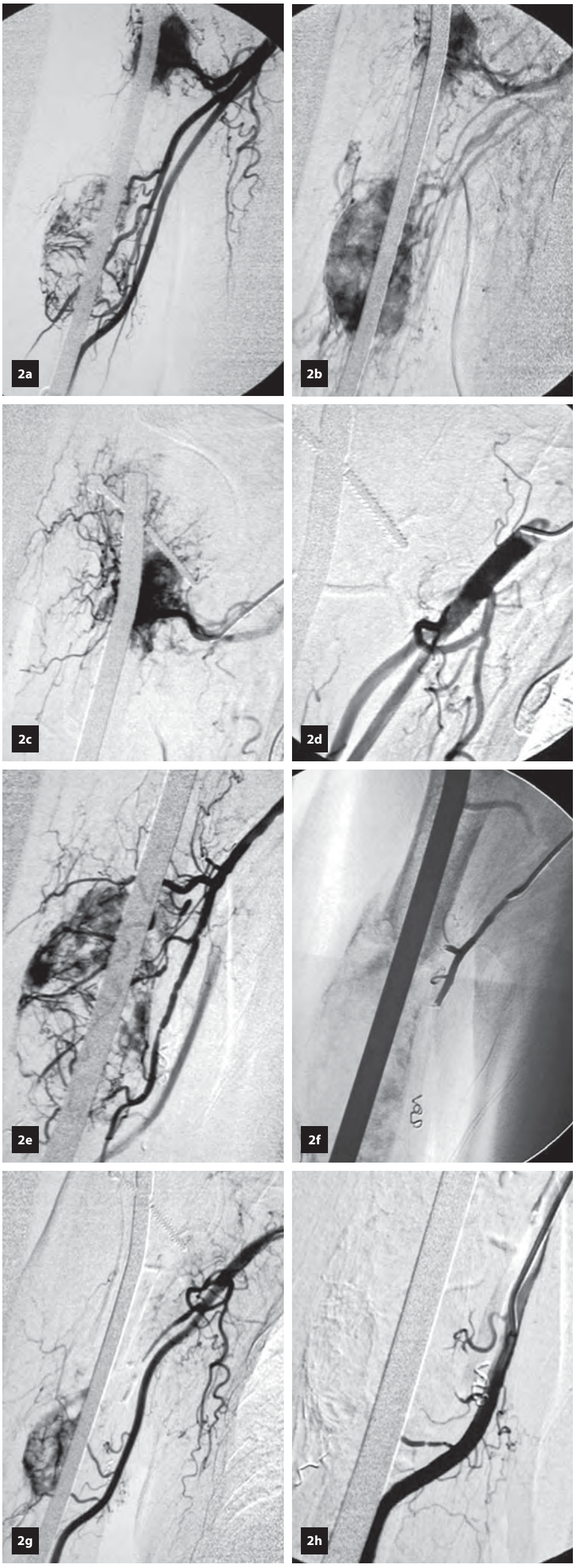

Fig. 2: Multiple hypervascular renal cell carcinoma humeral metastases. ***(a,b)*** *Status post intramedullary nailing;* ***(c,d)*** *Angiography pre- and post-embolisation with 500-700 micron microspheres of the more proximal lesion;* ***(e,f)*** *Angiography pre- and post-embolisation with 500-700 micron microspheres of the second larger lesion with coiling of the distal profunda brachii to protect distal tissues;* ***(g,h)*** *New lesion in the same patient treated with subsequent 500-700 micron microsphere embolisation. Prior instrumentation does not preclude embolisation which may be repeated in the event of new lesions/recurrence.*

References:

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Don't miss it !
Abdominal aorta 2 – short and adverse necks
Lecture Session
Monday, September 18, 08:30-09:30
Auditorium 3

IDEAS 2017

Chimneys – do or don't?

Michael Jenkins

Michael P. Jenkins
St. Mary's Hospital and Imperial College London, UK

Michael Jenkins has been a consultant vascular surgeon at St. Mary's Hospital since 2001 and is currently the Director of AAA screening in North-West London and Director of the Major Trauma Centre at St. Mary's. He serves as President of the British Society of Endovascular Therapy and Chairman of the Circulation Foundation, and as a Council Member for the Vascular Society of Great Britain and Ireland. His interests include thoracic and aortic aneurysm, aortic dissection and endovascular surgery. He is a highly regarded teacher and examines for the European vascular exit exam, FEBVS. He was a faculty member for IDEAS 2016.

As many as 30-40% of abdominal aortic aneurysms are anatomically unsuitable for standard endovascular repair [1]. As technology progresses and operator experience develops, more patients with challenging abdominal aortic aneurysms are being treated using increasingly complex endovascular techniques. Abdominal aortic aneurysms unsuitable for conventional EVAR necessitate consideration of open surgery or, for more high-risk patients, more complex endovascular techniques [2].

These endovascular strategies can be divided into parallel grafts, including chimney, snorkel, periscope and sandwich grafts, and branched or fenestrated devices. Fenestrated EVAR has shown good short- and long-term results, but is disadvantaged by cost, manufacture time and lack of "off-the-shelf" availability. Fenestrations can be used in combinations with branches to provide custom-made solutions for endovascular management of complex aneurysms.

Chimney EVAR has been developed as an alternative and is cheaper, simpler and readily available, making it useful in the emergency setting. It was originally used when a renal artery was inadvertently covered during an endovascular aneurysm repair as a bail-out option [3], although little has been published about the specific technical aspects of the procedure. Issues have been raised, however, regarding the seal between the chimney stents, the main body and the aortic wall [4,5]. Some studies have reported good technical success rates in the short and long term; however, others have not. Furthermore, the long-term patency of the chimney stents has been questioned.

Evidence for chimneys

There are no clinical trials comparing ChEVAR and FEVAR. One meta-analysis compared five studies and a total of 126 patients in the ChEVAR group and 227 in the FEVAR group. It showed comparable results between ChEVAR and FEVAR with respect to technical success (92.9% after ChEVAR vs. 91.2% after FEVAR) and mortality rate (4.8% after ChEVAR vs. 4.4% after FEVAR); however, the number of target vessels was significantly less in the ChEVAR group compared to FEVAR [6]. The 12-month rates of type I endoleak were higher in the ChEVAR group (3.7% vs. 1.7%), while type II endoleaks were higher in the FEVAR group (6.3% vs. 10.1%), but these were not statistically significant between the two groups. Another systematic review demonstrated advantages of FEVAR for 30-day mortality, late mortality and renal adverse events. ChEVAR was favourable for shorter operative and fluoroscopy procedures, lower contrast doses, and less intraoperative blood loss [7]. Although the patency rate of target vessels in ChEVAR has been a theoretical concern, in many studies it has been found to be comparable to FEVAR. All agree, however, that both techniques are options for treating aneurysms with insufficient proximal seal zones for conventional EVAR [6-8].

When to use which?

There are specific areas that can be considered when comparing ChEVAR and FEVAR. In the context of emergent or urgent cases, chimney stents are available off-the-shelf when the manufacture time for FEVAR precludes its use. The reduced duration of the procedures may also be advantageous in this situation.

The angle of the renal arteries and the distance to first branch is very variable. Renal artery cannulation for ChEVAR is achieved by the antegrade approach; for FEVAR this can be performed either by retrograde or antegrade approach. The antegrade approach has been shown to be more efficient with reduced cannulation time when compared to the retrograde for downward pointing renal arteries [9].

Some anatomical features can also preclude the use of custom devices. If the superior mesenteric or coeliac arteries are too close to the most proximal renal artery or the angles are of too similar orientation, manufacturing a custom-made device may not be technically feasible. There is no published data demonstrating actual distances, however, stent manufacture companies will advise on these technical aspects. In this situation it could be considered that a combined fenestrated and chimney endovascular approach could be employed.

Tortuosity of the visceral aortic segment can be restrictive for both fenestrated and chimney approaches. This must be taken into consideration during the planning stages of the procedure, particularly when the fenestrated approach is used, as misjudgement of the angles can result in shuttering of the fenestrations against the target vessels. Even in the absence of significant angulation, when the use of a scallop is employed, shuttering of the SMA has been reported in a significant number of cases [10]. Fenestrated devices tend to have a larger profile compared with standard EVAR which is relevant to both access vessels and tortuosity. It must also be considered that the placement of chimneys can only be performed antegradely, requiring patent upper limb access arteries and is relatively contraindicated if the aortic arch is loaded with thrombus.

What's available?

Until recently, the use of ChEVAR has been off IFU for all stent grafts. The PROTAGORAS study demonstrated good technical success, low type Ia endoleak rate, high primary patency and acceptable freedom from intervention rates [11]. 187 Chimney grafts were deployed in 128 patients with 100% technical success rate, with a 30-day mortality of 0.8% and only 1.6% of patients (all with single chimney stents) required additional chimney placement due to type Ia endoleak. The primary graft patency of the chimney stent was 95.7%, with a freedom-from-intervention rate of 93.1%. The Medtronic Endurant™ II stent graft systems are now CE-marked for use as a ChEVAR technique (Fig. 1).

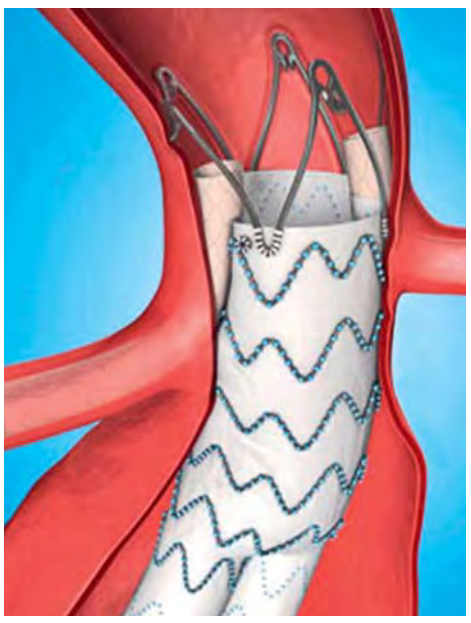

Fig. 1: Medtronic Endurant™, CE-marked for ChEVAR

Chimney EVAR is an important tool in the armoury for managing complex aortic aneurysmal disease. It is useful for urgent cases as it is available off-the-shelf. Technically, ChEVAR seems to have a reduced procedural duration and fluoroscopy times [12]. In addition, in the context of challenging iliofemoral access, ChEVAR can provide a favourable alternative to FEVAR as it can be delivered as a standard EVAR device with a smaller profile compared with FEVAR.

In conclusion, do use chimneys when there are few other options. They have a role for management of aneurysms with short necks in high-risk patients unsuitable for open surgery. ChEVAR is particularly useful for patients with large or symptomatic aneurysms for whom the wait-time for manufacture of a fenestrated stent graft is unacceptable. It is also a bail-out option when proximal extension of an attempted standard EVAR is necessary, either for type Ia endoleak or unplanned coverage of the visceral arteries. But long-term durability remains uncertain and there is a limit to the number of possible chimneys with >2 likely to compromise the seal zone. Therefore, don't use them where there is a suitable proven alternative.

References:
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2. Sala-Almonacil VA et al. Fenestrated and chimney endovascular aneurysm repair versus open surgery for complex abdominal aortic aneurysms. J Cardiovasc Surg. 2017 [Epub ahead of print]
3. Greenberg RK, Clair D, Srivastava S, et al. Should patients with challenging anatomy be offered endovascular aneurysm repair? J Vasc Surg. 2003; 38:990-996
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11. Donas KP et al. The PROTAGORAS study to evaluate the performance of the Endurant stent graft for patients with pararenal pathologic processes treated by the chimney/snorkel endovascular technique. J Vasc Surg. 2016 Jan; 63(1):1-7
12. Lee JT, Lee GK, Chandra V, et al. Early experience and lessons learned with fenestrated endografts compared with the snorkel/chimney technique. J Vasc Surg. 2014; 60:849-856

Film Interpretation Quiz: The Best of Memories

Michelle Weiss, CIRSE Office


1

Who can tell what kind of fun will be had this year? Join us this afternoon to find out!

Monday, September 18, 2017

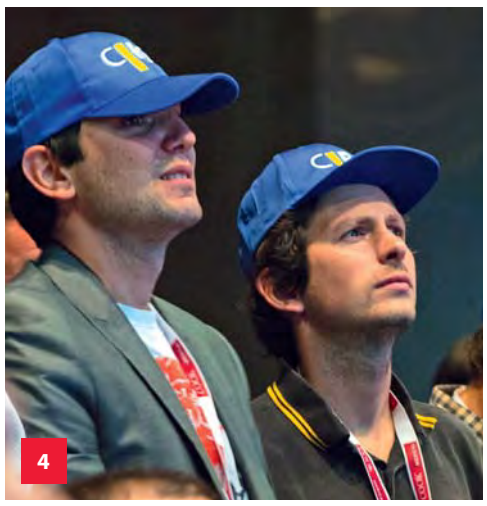
14:30-15:15
FIQ 2101 Film Interpretation Quiz

Coordinators:
X. Buy (Bordeaux/FR),
I.J. McCafferty (Birmingham/UK)


14


2 Elvis


3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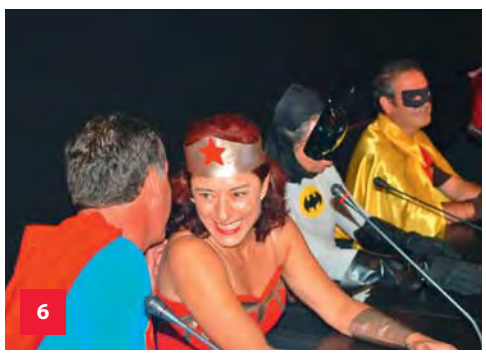
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1 Flags wave wildly at last year's Quiz in Barcelona.

2 Elvis deep in thought during the 2006 Film Interpretation Quiz.

3 The panel of experts pose for a shot at CIRSE 2011 in Munich.

4 Those still standing at the CIRSE 2013 Quiz in Barcelona.

5 Darth Vader gets worked up during the 2006 Quiz.

6 Superman, Wonder Woman, Batman and Robin were among the expert panellists at the 2006 Quiz.

7 The panel of Greek gods and goddesses poses after the 2007 Film Interpretation Quiz.

8 Odysseus triumphantly races across the stage in front of other experts Apollo, Diana and Zeus at the CIRSE 2007 Quiz in Athens.

9 Experts Alexis Kelekis and Christoph Binkert rush to respond to a question during the 2010 Quiz in Valencia.

10 Both teams celebrate after the 2008 Film Interpretation Quiz in Copenhagen.

11 Anthony Watkinson and Otto van Delden open up the CIRSE 2015 Film Interpretation Quiz.

12 Two participants pose during the 2012 Quiz in Lisbon.

13 Hephaestus hobbles on stage in front of the mighty Zeus at the 2007 Quiz.

14 The quiz masters Anthony Watkinson and Ian McCafferty congratulating the 2016 winner Fernando Ezequiel Petra from Mendoza, Argentina (middle).

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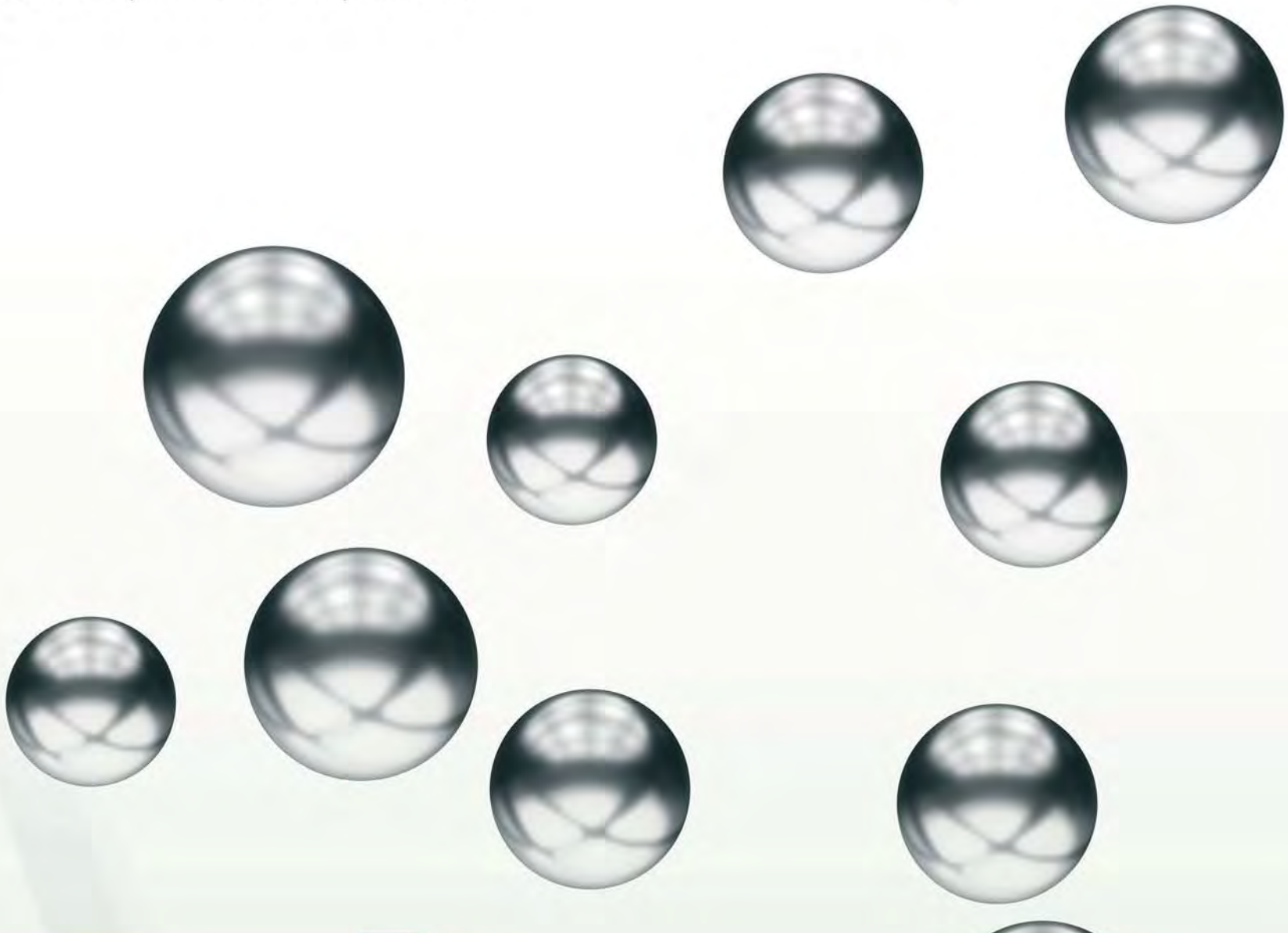

SYMPOSIUM

Monday, September 18, 2017
11:30 – 12:30 | Auditorium 2
Pushing Boundaries: adding Q to SIRT
Moderators: Prof. M. Peeters (Edegem, Belgium) and Dr. T. Jakobs (München, Germany)
Speakers: Prof. R. Sharma (London, United Kingdom); Prof. M. G. E. H. Lam (Utrecht, The Netherlands); Prof. R. T. Hoffmann (Dresden, Germany)

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*Smits *et al*, Journal of Experimental & Clinical Cancer Research 2010, 29:70
Smits *et al*, Lancet Oncol. 2012, Oct;13(10):1025-34
PhD thesis of J.F. Prince; ISBN 978-90-393-6489-5; 2016

PUSHING BOUNDARIES

TERUMO INTERVENTIONAL SYSTEMS

IS706GB0817CHI(0817)E

Breaking the Glass Ceiling in IR

Petra Mann, CIRSE Office


Interventional radiology ranks among the medical specialties with the lowest number of female practitioners. This has been mostly attributed to fears regarding radiation exposure and young physicians' perception that IR, similarly to surgery and other emergency services, does not offer the life-work balance they are looking for. With currently only about 12% of European interventionalists being female, the number of female heads of departments also strongly lags behind other specialties. In a recent CIRSE survey conducted among young IRs, 60% of the female trainees felt that there are barriers preventing female medical students and trainees from choosing IR as their future specialty, indicating the male-dominated work environment and networks as the number one reason.

We spoke with two experienced female interventionalists about why IR is still very much a "boys' club" and what must be done to overcome the gender gap.

CIRSE: In Europe, approximately 12% of IRs are female. How are the numbers for your country?

Szczerbo-Trojanowska: The number is not very high in Poland either. Only about 14% of active IRs are women.

Crocetti: The numbers in Italy are the same; about 14% of our IRs are women, even though 40% of all Italian physicians are women. Furthermore, the number of female physicians is as high as 60% in the age group under 50.

CIRSE: What do you think can be done to make IR more attractive for female physicians?

Szczerbo-Trojanowska: Most physicians already develop an interest for a particular specialty in medical school. It is, thus, very important to make students aware of IR in the early stages of their medical training. Activities such as CIRSE's *be inspIRed* Student Programme are, therefore, of great importance. In addition, particularly having female students in mind, educational programmes should address fears regarding radiation exposure in the IR suite. Surveys show that 1 out of 4 women do not want to pursue a career in IR due to fears of fertility-related radiation risks.

Crocetti: I think it is important for female IRs to penetrate medical school faculties in order to not only increase awareness of our discipline among students, but also to show that it is a fulfilling discipline which should be pursued by men and women alike. Nowadays, female residents in radiology make up at least 50% of many Italian schools. However, many of the doctors choosing radiology as their specialty are attracted by regular work schedules and the possibility to go into private practice, which is far more lucrative and does not entail on-call or night duty. If you choose IR, on the other hand, you will have long work hours, on-call duty, and a certain unpredictability as to when your work day will end. Being an IR is more similar to being a surgeon than being a diagnostic radiologist.

In order to increase the number of female IRs, the corresponding framework must be created: there must be an appropriate infrastructure of nurseries or kindergartens, ideally within the hospital, which is compliant with the unpredictability of our working hours.

CIRSE: How many female physicians head IR departments in your country?

Szczerbo-Trojanowska: At the moment there is only one woman heading an IR department in Poland and that is me. However, in the majority of Polish hospitals, IR is integrated into diagnostic radiology departments. The percentage of women running diagnostic radiology departments in Poland is now almost 28%. Therefore, these women are often the supervisors of their hospital's IR services as well.

Crocetti: A recent census conducted by the Italian College of Interventional Radiology (ICIR) showed that only 2 of the 78 IR Sections or Departments in Italy are led by female physicians (Dr. Niola and Dr. Giampalma, in Naples and Cesena, respectively). Then there are two Diagnostic and IR Departments that have female leaders (Dr. Golfieri in Bologna and Dr. Rossi in Parma). Unfortunately, these low numbers also hold true for university teaching positions. Only 22% of full professors and 37% of associate professors in Italy are female. My hospital, the Azienda Ospedaliera Universitaria Pisana, is a positive exception: out of 98 units, 27 are headed by women.

CIRSE: Do you think it is more difficult for women than for men to achieve leading positions in IR? If so, why?

Szczerbo-Trojanowska: Yes, in general it is more difficult for women, the reasons for which are manifold and do not necessarily only apply to IR. Starting with the fact that we are still struggling with stereotypes that a woman's nature makes her unfit for traditionally male positions in the medical academic hierarchy, particularly in the disciplines which require interventional and leadership skills.

Another traditional explanation for the shortage of women in the higher academic strata is that within their professional development they have not been active for long enough to be qualified for a leadership position. IR as a subspecialty has a long training period, which often extends into the childbearing and childrearing years. Once women with families return to the academic track, a gap of 4-8 years may feel difficult to bridge in such a rapidly developing field.

Other reasons which make academic advancement more difficult for women in general include lack of flexible academic pathways, unsupportive environments, inadequate promotion as well as difficult access to quality mentorship and effective networking.

Crocetti: I agree. It is still more difficult for women to achieve leading positions in IR than it is for men. In Italy this is very much due to a long-standing culture of male dominance which is only changing very slowly. Even though the percentage of women starting an IR career is growing without gender discrimination in the majority of cases, at the time of promotion and becoming leaders, something goes wrong. Being a leader is very time consuming and for many female doctors it is often a matter of choosing between family and work, as the corresponding infrastructure for childcare is not available.

My feeling is that women in IR often decide not to apply for leadership positions believing that it will be too difficult to reconcile such a demanding job with their family life. Sometimes it is also due to lack of self-confidence; we are convinced that we will fail competing with our male colleagues and that it is not even worth trying.

CIRSE: What do you think can be done to increase the number of female IRs in leadership positions?

Szczerbo-Trojanowska: Due to the novelty of the field, IR provides fantastic career opportunities and women should take advantage of this. As IRs, they know that they have chosen a career that is challenging, exciting and satisfying but at the same time, very demanding. There are several personal and organisational factors that determine whether IRs will reach leadership positions. Regarding personal factors, skills such as persistence, resilience and initiative are needed for career success and women are very well aware that they need these qualities to compete with their male colleagues. The organisational factors, however, are often beyond their control.

If we want to help women achieve high posts in IR, we must change a number of things in the academic environment. Departments and universities must create an atmosphere where women are appreciated and valued. A lot of female faculty are not fully aware of how to achieve promotion and advancement in the academic world. We must convey the necessary career building and negotiating skills. For this, it is important to ensure institutional resources and support and create opportunities for mentoring and networking that are equal to those available to men.

We also have to create greater flexibility in the academic track at various points of women's lives. Women should, for example, have the possibility to leave the tenure track and return after a period dedicated to childbearing and family.

Crocetti: Once we have further increased the number of female IRs, the next steps will follow: the best women IRs, not only those with technical and clinical skills but also with the right personal attributes (the "physique du role", as my boss used to say), will emerge and become leaders, provided we create the academic and organisational infrastructure that will allow them to fulfil their full potential.

Some of the great women in IR…

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CIRSE 2017
COPENHAGEN, DENMARK

LEARNING CENTRE PROGRAMME
Monday
18 September

S.M.A.R.T.™ CONTROL™
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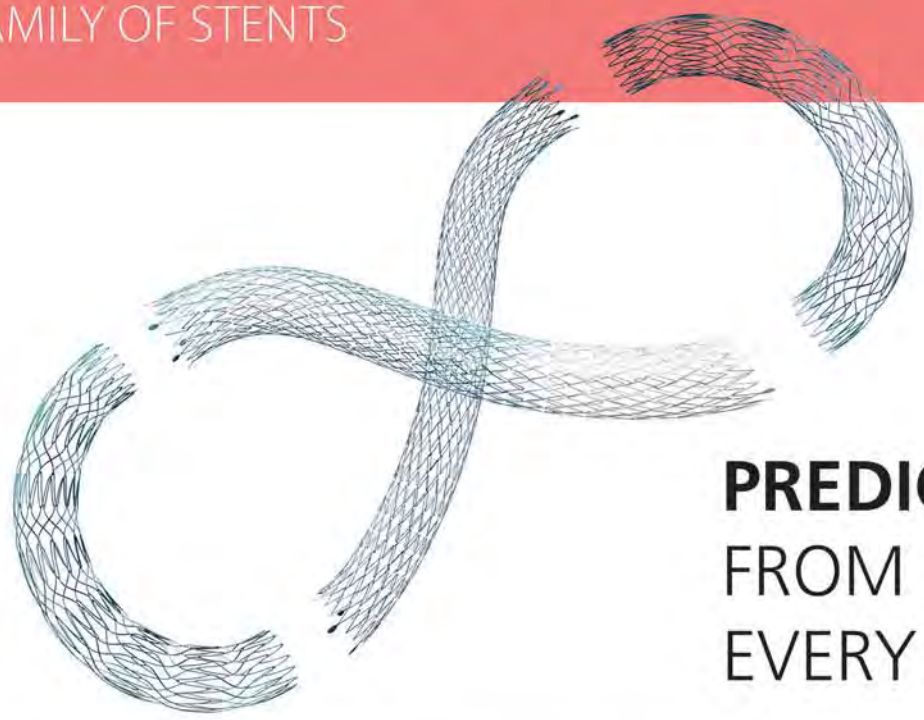

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10:00 - 11:00 | 14:00 - 15:00

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Hands-on session with MYNXGRIP™ Vascular Closure Device

11:30 - 12:30 | 15:00 - 16:00

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INCRAFT™ AAA Stent Graft System: low profile and durability in the daily practice

13:00 - 13:45 Physician Trainer: *F. Wolf (Vienna/AT)*

Attend this session if you want to:
- Know more about low profile stent graft system
- Learn more about clinical outcomes of the INCRAFT™ AAA Stent Graft System

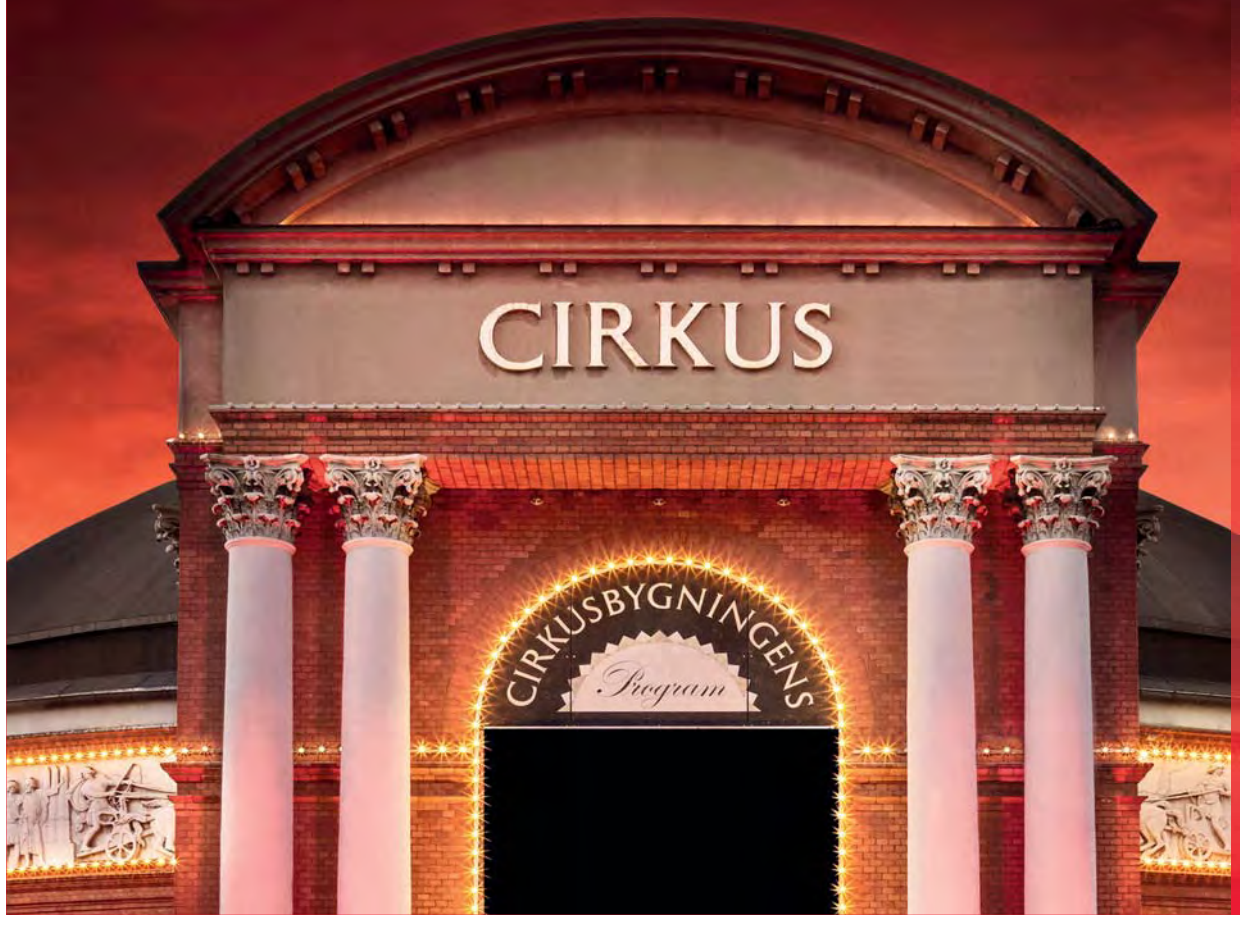
How to treat complex SFA disease in real life population with S.M.A.R.T.™ Flex

16:15 - 17:00 Physician Trainer: *P. Goverde (Antwerp/BE)*

Attend this session if you want to:
- Know more about complex Superficial Femoral Artery treatment
- Learn more about S.M.A.R.T.™ Flex outcomes in the daily practice

CIRSE 2017
Dinner & Farewell Party

Tuesday, September 19
Doors open at 19:30



To round off another CIRSE Congress, come join us for a spectacular evening with friends and colleagues!

This year's farewell event will be held at the fabulous Copenhagen Circus Building, the oldest building of its kind in Europe.

The night will begin with a cocktail reception before guests are served a delicious dinner alongside a string of extraordinary entertainment, including acrobatics, circus artistry and unforgettable musical performances. Following dinner and the show, a DJ will open the dance floor for a late-night party with great music.

Don't miss out on this extravagant evening!

Tickets include a cocktail reception, gala dinner and entertainment programme for EUR 100 each.

Buy your tickets at the "Hotels | Social Events | City Information" desk, located in the entrance hall of the congress centre.

CIRSE supports compliance with ethical standards. Therefore, CIRSE emphasises that the present offer (made by KUONI Congress Destination Management) is directed to participants of CIRSE 2017 and recommends that the participants who want to accept the present offer shall bear any and all costs in this context themselves.

Kindly note that entrance to the CIRSE 2017 Party is NOT included in the CIRSE 2017 registration fee!

Cardiovascular and Interventional Radiological Society of Europe

Patient selection: which type of anaesthesia for which procedure?

Alessandra Vari

The evolving and complex debate on anaesthesia and sedation for interventional radiology will once again feature at the CIRSE 2017 Annual Meeting, most notably at a comprehensive Special Session, enticingly named *Anaesthesia and IR: Time to team up!* Having explored several aspects of the many issues related to anaesthetic practices for interventional radiology at past CIRSE meetings, the 2017 Scientific Programme Committee, in response to the huge interest shown, has decided to dig more deeply into some technical aspects of integrated anaesthetic care for IR clinical activity. The session investigates several specialised common areas of interest and clinical work for anaesthesiologists and interventional radiologists.

In this framework, as outlined by the results of the CIRSE Survey of Anaesthetic Practices for Interventional Radiology in Europe, presented at the CIRSE 2016 Annual Meeting and recently published in *CVIR,* the choice of anaesthetic technique for IR procedures has proved to be a complex process, in which multiple factors are involved.

The range and technical sophistication of procedures performed by IRs have greatly expanded in recent years. These procedures are frequently performed on high-morbidity patients, deemed unfit for conventional treatment. Due to the concomitant pressure to reduce hospital expenses by shifting as many possible cases to outpatient clinics, obvious concerns about the safety and efficacy of peri-procedural management have been raised lately.

Traditionally the first element to be considered, patient selection (thorough assessment, ASA status, co-existing diseases, expected prognosis, risk factors) has recently come to be balanced against other elements that are peculiar to this discipline. As a matter of fact, the intrinsic heterogeneity of interventional radiology as a specialty makes it quite difficult to standardise peri-procedural care. Many elements need to be taken into account: setting (non-operating room environment; availability of emergency team and facilities); equipment (drugs, devices, IR materials); resources (human, infrastructural and consumables); type of procedure (technique, approach, case-related complexity); approximate length and expected pain of the procedure; hospitalisation vs. outpatient regimen for the patient and availability of intermediate/intensive care bed in case of complications.

Other factors related to the procedure itself and the individual interventionalist's preferences also play a pivotal role: patient immobility, control of respiratory movements, patient position on the table, full cooperation vs. unconsciousness (to name but a few), have gained a prominent role in the choice of anaesthetic technique, both when analgesia/sedation is administered by an anaesthesia provider or by the interventional radiologist.

Finally, the patient's individual factors, psychosocial condition, and, ultimately, preferences (whenever these can be taken into account), add more elements to the already-complex planning process.

Pain management represents a great challenge, particularly for those procedures performed under moderate sedation, often in patients with chronic pain (who pose additional, often crucial, challenges for the administration of both effective procedural analgesia and anxyolisis/sedation. The long-standing misperception of interventional radiology as a pain-free subspecialty, due to its minimally invasive nature and the widespread use of the percutaneous approach, seems to have finally disappeared, with a growing interest not only for peri-procedural pharmacological pain management but also for interventional analgesia techniques performed by both anaesthesiologists and interventional radiologists. A deep knowledge of the pharmacology of pain medications – in addition to sedation and cardiopulmonary resuscitation skills – is essential when sedation/analgesia is administered by a non-anaesthesiologist, creating the need for establishing an appropriate curriculum for interventional radiologists.

Finally, the availability of anaesthesia providers versus the provision of sedation/analgesia by the interventionalists themselves, along with the national differences in terms of standards of practice, training and local legal regulations, have recently been shown to play a determining role in the selection of the most appropriate anaesthetic technique, significantly affecting the way IR procedures are performed all over Europe.

This talk is aimed at providing a comprehensive overview of the multifaceted topic of peri-procedural sedation/analgesia technique selection for IR. Far from being an isolated process, this is an essential step in a systematic teamwork approach that, advisably, should become the standard in IR clinical practice, regardless of the geographical and legal differences.

Don't miss it!

Anaesthesia and interventional radiology: time to team up!
Special Session
Monday, September 18, 11:30-12:30
Auditorium 15

Alessandra Vari
University of Rome, La Sapienza
Rome, Italy

Prof. Alessandra Vari is a senior consultant in anaesthesiology and perioperative medicine at the Policlinico Umberto I Hospital, of the Sapienza University of Rome, where she graduated in medicine in 1992. She is also an aggregate professor in emergency medicine at Sapienza's Postgraduate School of Orthoptics and Opthalmic Nursing. She is part of the faculty of the Master in Minimally Invasive Image-Guided Interventional Techniques that is held by the University of Zaragoza, and acts as a consultant to several NGOs in Africa and Central America, including Orbis International and Doctors without Borders. Prof. Vari has been a member of CIRSE since 2013. She is currently based in a WHO field hospital in Northern Iraq.

Suggested Reading:

- Mueller PR, Wittenberg HK, Kaufman A, Lee MJ. Patterns of anesthesia and nursing care for interventional radiology procedures: a national survey. Radiology 1997 Feb; 202(2):339-43
- The Royal College of Radiologists. Safe Sedation, Analgesia and Anaesthesia within the Radiology Department. 2003; (http://www.rcr.ac.uk/publications.aspx?PageID=310&PublicationID=186).
- Neilson GA, Pamela H, Lennox MB. Sedation and anaesthesia for interventional oncology. Seminars in Roentgenology 2007; 42:150-163
- Vari A, Gangi A. Anesthesia Practices for Interventional Radiology in Europe. Cardiovasc Intervent Radiol (2017) 40:803–813

News on Stage

The aim of this session format is to allow physicians to showcase the latest results from multi-centric trials, ground-breaking techniques and many more IR hot topics in an informal and open atmosphere. The presentations will be displayed in a dedicated open area next to the exhibition, giving delegates the opportunity to engage in active, lively discussions.

Today at 13:15-14:15, in the News on Stage area

NoS 2005 – Scientific News on Stage

2005.1 Does chronic outward force of nitinol stents in SFA trigger restenosis? Interim report of the BIOFLEX-COF study
M.A. Funovics (Vienna/AT)

2005.2 Two-year results from the IN.PACT global studies and outcomes in patients with diabetes
M. Brodmann (Graz/AT)

2005.3 Outcomes following subintimal recanalization of chronic total occlusions: a subset analysis of the IN.PACT global CTO imaging cohort
G. Tepe (Rosenheim/DE)

2005.4 Stellarex drug coated balloon: science insights and evidence updates
P. Krishnan (New York, NY/US)

2005.5 Radioembolization practices in Europe in 2017 – a survey among CIRSE members
M.L. Smits (Utrecht/NL)

2005.6 The Lutonix AV trial: Interim 18 month results of a randomized trial of drug coated balloons in hemodialysis arteriovenous fistulae
S.O. Trerotola (Philadelphia, PA/US)

European School of Interventional Radiology – Take Your IR Training to the Next Level

Petra Mann, CIRSE Office

Since 2006, the European School of Interventional Radiology has been providing excellent practice-oriented courses, helping participants stay on the cutting edge of medicine. To date, 80 ESIR courses have been held in 23 countries, covering more than 40 topics on the vast array of diseases treated by IRs as well as other disciplines.

The carefully crafted two-day ESIR courses are taught by some of the field's leading experts and include theory, live or video cases, where appropriate, as well as hands-on experience with state-of-the art devices and technology. More than 2,800 physicians have attended ESIR courses over the past 10 years, an average of 35 participants per course, giving the format an intimate feel and plenty of room for interaction.

ESIR has become one of the pillars of CIRSE's educational efforts. Together with the EBIR examination and the ESIRonline learning platform, it ensures that IRs have access to all the educational opportunities they require.

5 Reasons why ESIR Courses are indispensable for your career

1. **Add new procedures to your practice**
   Stay up to date on the latest developments in IR with introductory and advanced courses on all new procedures and developments.

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   All ESIR Courses are taught by some of the top experts from all over the world, giving you the chance to learn from the best.

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In order to maintain the high quality of the ESIR courses, every attendee is asked to fill out an anonymous survey.
Throughout the years, the courses have received excellent feedback. Here are a few of the comments:

Amsterdam 2015: "Very good course with lots of practical info"

Zaragoza 2014: "Excellent, well-argued course"

Bilbao 2012: "Very good organisation and selection of faculty and topics"

Ingolstadt 2011: "Perfect format for practical learning – thank you!"

Register now for our 2017 ESIR Courses!

Prostate Embolisation
Milan (IT), October 11-12, 2017

This course will take a closer look at one of IR's hot topics: prostate artery embolisation. The theoretical part will cover all aspects of the procedure, including patient selection, therapy options and procedural techniques. In addition, three live cases will be performed during which experts will explain the technique step by step.

Reliability in Percutaneous Tumour Ablation – Fusion, Stereotaxy and Robotics
Innsbruck (AT), December 14-15, 2017

This course will give attendees an overview of the currently available devices and techniques in the field of percutaneous tumour ablation. After a theoretical introduction, trainees will have the chance to test devices under the guidance of experienced experts in the hands-on workshops. In addition, a live case of a stereotactic radiofrequency ablation will be performed. Afterwards, the experts will present their most interesting cases and discuss them with the participants.

ESIR

Expert Education in IO

Michelle Weiss, CIRSE Office

Each year, interventional oncology continues to grow and gain a greater place for itself in the medical oncology community. In support of those efforts in Europe and around the globe, the European Conference on Interventional Oncology provides one of the best opportunities for all medical professionals to increase their knowledge on IO procedures across a broad spectrum of diseases over three and a half days filled with hands-on device training sessions, multidisciplinary tumour boards, video learning sessions and clinical as well as technical focus sessions. From April 23-26, ECIO 2017 took place in the Basque city of Bilbao, where all participants were invited to learn about the latest devices and developments in interventional oncology.

This was the eighth occurrence of the ECIO congress and we were proud to welcome over 1,300 participants from 53 countries for over 45 hours of educational content. The topics of discussion during this year's congress were spread across the gamut of interventional oncology and were showcased through engaging presentations. The strength of the multidisciplinary background of this meeting was seen through the 24% of participants who came from specialties outside of interventional radiology and interventional oncology. This expansive collection of perspectives always helps to make this a unique and revolutionary meeting.

Scientific Focus

This year's programme focused on three main themes: colorectal liver metastases, clinical management and musculoskeletal cancers.

The session *Colorectal cancer and IO: where is the evidence?* discussed notable trials, placing the evidence into the larger context of guidelines and daily clinical practice. The session, which also delved into best research practices, featured lively discussions between the audience, the panel and the speakers.

In the Clinical Focus Session *Getting IO into practice* experts discussed a range of important topics surrounding the motive to push interventional oncology further into mainstream medicine through clinical management strategies. Themes aimed to prioritise patients and included: IO curriculum, increasing patient referral, interacting with other disciplines, promoting IO services to administration, and the patient pathway in IO.

In the session *MSK tumours beyond the spine,* speakers focused on topics such as biomechanical and surgical consolidation in bone cancer patients, ablation and bone consolidation, management of benign bone tumours and treatment options for primary soft tissue tumours. This session also featured an Invited Scientific Paper on a study for preventative internal fixation using a new polymer device on the market.

These are only three of a multitude of sessions covering these themes.

Perfecting Techniques in IO

The Hands-on Device Training (HDT) opportunities offered at this year's meeting served to provide physicians with a detailed overview of the available technologies for tumour ablation in separate practical sessions covering radiofrequency ablation, microwave ablation and alternative techniques, including cryoablation and other image-guided technologies. Each HDT featured a round-table discussion with the coordinators, allowing participants the chance to ask questions and receive feedback.

Innovative Learning

The Video Learning Sessions at ECIO provide a great opportunity for interactive education. Alongside the video, speakers guide viewers through specific cases and interventions, offering their advice and personal experiences. This year, two were offered: one titled *How I do it – liver* and the other *How I do it – lung, kidney, bone.*

Honorary Lecture 2017

Always a highlight of the programme, this year's Honorary Lecture was given by Dr. Jean Palussière and was titled "Metastatic colorectal cancer and percutaneous thermal ablation: a happy marriage?" We were proud to welcome his insights on the issue, and this proved to be another highlight of the programme, touching upon one of the core themes of the congress: metastatic colorectal cancer.

Best Papers of 2016

The *Best IO Papers* session was, for the third time, highly influential, showcasing three invited scientific papers published in 2016. From the Netherlands, Charlotte Rosenbaum delivered the paper on "Yttrium-90 radioembolization for colorectal cancer liver metastases: a prospective cohort study on circulating angiogenic factors and treatment response": Ryan Hickey from the USA presented the paper "Independent analysis of albumin-bilirubin grade in a 765-patient cohort treated with transarterial locoregional therapy for hepatocellular carcinoma"; and Katerina Malagari from Greece concluded with the presentation of "Pharmacokinetics, safety, and efficacy of chemoembolization with doxorubicin-loaded tightly calibrated small microspheres in patients with hepatocellular carcinoma". These top research papers foreground significant clinical research in the subspecialty.

Looking Forward

In 2018, the conference will take place from April 22-25 in Vienna, Austria, and it's one you won't want to miss! Next year's congress will focus on a wide range of clinical topics, from genomics and immunotherapy to HCC and musculoskeletal cancer. The Scientific Programme Committee will be chaired by Afshin Gangi and Alban Denys, who are already hard at work creating a high-quality programme with a variety of sessions. Clinical and Technical Focus sessions will highlight the latest advances in popular and novel therapies with themes such as *Colorectal Cancer in 2018* and *Follow-up imaging: towards consensus,* while video learning sessions will feature first-hand insight into how experienced practitioners are performing specific procedures, such as multipolar liver ablation, chemosaturation, pancreatic electroporation and bone biopsy. With a special session scheduled on avoiding complications and Multidisciplinary Tumour Boards planned on both renal and pulmonary cancers, there is bound to be a subject of interest for everyone working in the oncological field. The 2018 Honorary Lecture will be given by Matthew Callstrom from Rochester, MN/US, who will discuss the topic of "Building the IO department for the future". As we step into a new era for IO, it is vital to be up to date on the best ways to build a strong interventional oncology department. For the first time, abstract submissions will be accepted in order to encourage a variety of speakers to participate, including young IRs. So get those abstracts ready for the deadline in November. Come join us for three and a half days of education and exchange!

We look forward to seeing you next year in Vienna!

If you would like to view any of the sessions from ECIO 2017, log on to www.esir.org and you can access all presentations and satellite symposia from the congress.

Don't miss it !
Controversies in IO
Controversy Special Session
Monday, September 18, 10:00-11:00
Auditorium 2

Ablation is superior to SBRT for oligometastatic lung disease: PRO

Thierry de Baère, EBIR

Thierry de Baère
(EBIR)
Gustave Roussy Cancer Center
Villejuif, France

Prof. Thierry de Baère earned his degree in medicine from the Université Paris-Sud, after which he completed his residency at the Université de Caen – Basse Normandie, where he worked under Prof. Jacques Theron in neuroradiology. In 1990, he joined the Gustave Roussy Cancer Centre in Villejuif, France where he has remained ever since. Prof. de Baère's research interests include tumour ablation, portal vein embolisation and intra-arterial therapies for liver cancer, and he has contributed over 200 peer-reviewed scientific publications. He is a former Chairperson of the European Conference on Interventional Oncology, and was the CIRSE 2016 Honorary Roesch Lecturer.

For lung metastases, a 4-year local efficacy of 89% has been reported after RFA in two studies that examined 61 and 566 patients, with 15 months and 35.5 months of follow-up, respectively [1,2].

The larger study includes 566 patients with 1,037 lung metastases (52% with a primary colorectal tumour), and a median diameter of 15 mm (4–70); 53% of patients had 1 metastasis, 25% had 2, 14% had 3, 5% had 4, and 4% had 5-8 [2]. Median OS was 62 months. OS rates at 1-, 2-, 3-, 4-, and 5-years were 92.4% (se=1.2), 79.4% (se=1.9), 67.7% (se=2.4), 58.9% (se=2.8) and 51.5% (se=3.3). Location of primary disease, DFI, size <2 cm and number of metastases ≥3 were associated with OS in univariate analysis and remained independently associated with OS in multivariate analysis. In a Cox model using local tumour progression as a time-dependant variable and adjusted for these four prognostic factors, local tumour progression at the site of RFA was associated with poor OS [p=0.011, HR : 1.69 (95%CI=1.13-2.54)].

Gillams et al. reported an OS rate of 41 months for 122 patients in a population with 51% of patients having extra-pulmonary disease and 52% of patients with a DFI shorter than 12 months [3]. OS rates after RFA are within the range of the best results obtained by surgical resection of lung metastases, with 27–68% reported in a meta-analysis by Gonzalez et al., and increasing to 39.1 and 67.8% for patients who benefit from R0 resection in a literature review looking at 11 publications with 1,307 patients [4].

Disease control

In metastatic lung patients, the challenge of disease control is more closely linked to the occurrence of new metastases distant from the ablation site than to local recurrences, as demonstrated by 4-year PFS of 13.1% and 72.4% of patients progressing in the lung, retreated by RF up to 4 times in 24% of the initially treated patients, allowing a 4-year control rate of 44.1% [1]. Good tolerance and lung-sparing parenchyma of thermal ablation demonstrated by the absence of post-RFA lung changes in respiratory function tests [2,5] allows for high feasibility of retreatment when needed. Repeatability is definitively higher with thermal ablation than with any other local treatment, including surgery and SABR.

The challenges of SABR

The drawbacks of SABR are the difficulties of treating several metastases in the same region with overlapping irradiation field and the near impossibility to retreat local progression with SABR after a previous SABR treatment. Moreover, in our personal experience, attempts to treat local progression after radiation therapy were responsible for an increase in post-thermal ablation complications, including death. Reports of large series of SABR for lung metastases are scarce. A series of 321 patients with 587 metastases (201 colorectal cancer metastases) treated with SABR over 13 years reports a median OS of 2.4 years (95% CI 2.3–2.7) with 80%, 39%, 23% and 12% OS at 1, 3, 5 and 7.5 years [6]. Performance status (0–1) (HR 0.49; p <0.001), solitary metastasis (HR 0.75; p = 0.049), metastasis <30 mm (HR 0.53; p <0.001), metachronous metastases (HR 0.71; p = 0.02) and pre-SABR chemotherapy (HR 0.59; p <0.001) were independently related to favourable OS. Three deaths were possibly treatment-related. It is noteworthy that SABR is considered a non-invasive technique, even though some complications are directly related to the treatment but often difficult to depict occurring, as with most cases of post-radiation toxicity, usually late after treatment.

Indeed, 127 patients treated with lung SBRT (48 to 60 Gy in 4–5 fractions) in a prospective trial demonstrated a decline in FEV1 (–4.1%; p = 0.01), corrected diffusing capacity for carbon monoxide (–5.2%; p = 0.027), forced vital capacity (–5.7%; p = 0.004), and total lung capacity (–3.6%; p = 0.039) at 12 months [7]. Declines in FEV1 (–7.6%; p = 0.001) and forced vital capacity (–8.9%; p = 0.001) persisted at 24 months. Rates of pneumonitis were 3.1% and 0.8% for grades 2 and 3, respectively. The conclusion of the articles was "declines in lung respiratory function were not associated with worse overall survival" but quality of life was not evaluated. Moreover, it has been reported that placement of the fiducials needed for SABR in 105 patients with tumours of the lung have resulted in 33.3% pneumothoraces (major: 13.3%; minor: 20%) with a 30.5% rate of small peri-tumoural alveolar haemorrhage, and 2.9% of major bleeding, making SABR invasiveness close to that of RFA in term of pneumothoraces [8].

Comparing the therapeutic options

The drawback of thermal ablation versus surgery is that it does not allow for regional control of the disease and specifically of the lymph nodes. This is not a major disadvantage in the treatment of lung metastases, where lymph node resection has not been demonstrated to improve survival, even if positive lymph nodes are a negative predictive factor of OS.

SABR, theoretically, has the same drawback as thermal ablation concerning lymph nodes, however in order to deliver the full dose to the target volume, it is obvious that radiation has to go through the surrounding body, and the effect/benefit of peri-tumoural irradiation (possibly including lymph nodes) even with a low dosage is unknown.

Read the other side of the argument on page 19!

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8. Trumm CG, Haussler SM, Muacevic A, et al. CT fluoroscopy-guided percutaneous fiducial marker placement for CyberKnife stereotactic radiosurgery: technical results and complications in 222 consecutive procedures. J Vasc Interv Radiol. 2014; 25(5):760-768

Ablation is superior to SBRT for oligometastatic lung disease: CON

Puneeth Iyengar

Don't miss it !
Controversies in IO
Controversy Special Session
Monday, September 18, 10:00-11:00
Auditorium 2

The debate today will provide an overview of the benefits of using SBRT in oligometastatic non-small cell lung cancer (NSCLC). The presentation will review the current data to date supporting radiation/SBRT use and offer prognostications as to the direction it will be used in the future for this patient population. There will certainly be an effort to distinguish its benefits over the use of radiofrequency or other ablative techniques.

Despite improved imaging and newer technologies, most patients with NSCLC are diagnosed with advanced metastatic disease. In the modern era of cytotoxic chemotherapy, patients with stage IV NSCLC have had overall survival (OS) in the range of only one year. With the utilisation of targeted therapies and immunotherapy in both the induction/first-line and second-line settings, OS has improved for subsets of patients. Yet, targeted and immunotherapy have varying degrees of success depending on tumour expression of various molecules, including mutant EGFR and fusion ALK and PD-L1. Furthermore, survival outcomes for NSCLC tend to lag behind those of other major primary cancers. Ultimately, for a significant proportion of stage IV NSCLC patients, systemic agents offer limited potential for durable control of disease.

Advanced by Weichselbaum and Hellman, the concept of oligometastatic disease has gained increasing attention. Oligometastatic disease represents a state of malignancy between local and widely disseminated disease with limited metastases (traditionally 3 or fewer). Historically, with limited metastatic colorectal cancer and sarcomas, the use of local therapies including surgery and/or radiation with cytotoxic agents have become part of the standard of care as a means of drastically improving overall survival along with local control. Therefore, as we try to identify more and more subsets of advanced NSCLC patients with favorable biology, it raises the question as to whether there is a group of limited metastatic NSCLC patients who could benefit from local treatments in addition to their systemic therapy regimens. If so, the next steps would be to determine the optimal treatments, when they should be delivered and what the realistic benefits are. This concept of combining local therapy with systemic therapy becomes more relevant with data showing original sites of gross disease as first sites of failure, following systemic agents for advanced NSCLC. The major arguments for aggressive local treatment of metastatic disease in the modern setting include the general lack of ability of systemic therapy to "cure" solid tumours, failures most commonly presenting in original sites of gross disease, the heterogeneity in response to systemic therapy secondary to disease biology and the reduced effectiveness of subsequent lines of systemic agents. All of these points collectively support an argument where a local therapy might enhance overall tumour control, since local therapies are more effective at reducing tumour bulk, are less likely to be rendered ineffective by multidrug resistance mutations and may reduce further metastases by successful gross tumour control.

Over the last several years, a number of groups and institutions have begun to take a more aggressive stance with treatments for oligometastatic/limited metastatic NSCLC by combining local therapies with chemotherapies, targeted agents and immunotherapies. Local therapy could include surgery, radiation and radiofrequency ablation. In ascending order, local control improves when comparing radiofrequency ablation, microwave ablation, cryoablation, stereotactic body radiation therapy (SBRT) and surgical lobectomy; however, despite enhanced local control, the rate of distant disease remains highly variable between studies, whether comparing like or unlike therapies.

Due to its significant capacity for local control over other ablative modalities in a non-invasive and safe/minimal toxicity approach, SBRT has been adopted as the local therapy of choice in a large number of institutions for treating oligometastatic disease in consolidation or salvage for oligoprogression. Data from multiple types of experiences – retrospective analyses, meta-analyses and institutional experiences – had, until recently, supplied the rationale to support potential progression-free survival (PFS), OS, and control benefits in limited metastatic NSCLC patients when compared to historical outcomes. In non-randomised prospective approaches, there is always a question of whether or not oligometastatic disease represents a biological entity with a more indolent disease course, i.e. fewer sites of progression or metastasis, resulting in improved survival independent of treatment management. However, prospective single-arm trials, and now smaller randomised phase II trials, are starting to validate and solidify a possible PFS benefit of local therapy added to systemic agents in oligometastatic lung cancer.

The question will be if this PFS benefit will translate into an OS advantage. NRG LU002, a phase II/III clinical trial, has recently been activated in North America and will randomise 300 limited metastatic NSCLC patients who have stable disease/response after first-line cytotoxic chemotherapy to either maintenance chemotherapy alone or SBRT to all sites of limited metastases (and SBRT or hypofractionated radiation to the primary) followed by maintenance chemotherapy. The primary endpoint of the study will be OS. As approved for first-line or maintenance regimens, immunotherapies will be permitted on NRG LU002 as systemic approaches, with the same question of radiation's role in consolidation being asked. Ultimately, NRG LU002 should provide the answer to how important local therapy is to oligometastatic disease.

Puneeth Iyengar
UT Southwestern Medical Center
Dallas, Texas, USA

Dr. Iyengar is Assistant Professor of Radiation Oncology at UT Southwestern Medical Center, where he treats lung cancer patients with radiation and leads a research lab aimed at discovering how lung tumours become therapeutically resistant and what the basic mechanisms of cancer cachexia are. Among other honours, he has received the Distinguished Researcher Award from the UT Southwestern President's Research Council, a Lung Cancer Research Foundation grant and the Roentgen Research Award from the Radiological Society of North America Research and Education Foundation. Dr. Iyengar's research has been published in many major journals, including Molecular and Cell Biology, the American Journal of Clinical Oncology, and Cancer.

Table of prospective trials of oligometastatic NSCLC treated with consolidative/salvage local therapies – either published or accrual completed

Study Authors	Year	Type of Study	Patient Eligibility	Arms of Study	Primary Endpoint
De Ruysscher et al.	2012	Single Arm Ph2	Oligometastatic NSCLC <5 mets	Chemo with surgery or radiation for mets	Median OS 13.6 months
Collen et al.	2014	Single Arm Ph2	Oligometastatic NSCLC <=5 mets	Chemo followed by SBRT or SBRT alone	Median OS 23 months
Iyengar et al.	2014	Single Arm Ph2	Limited Metastatic NSCLC <=5 mets, failed at least one line of systemic therapy	Erlotinib with SBRT	OS 20.4 months Median PFS 14.7 months
Palma/ Senan	2016 Closed to Accrual	RPh2	Oligometastatic Cancers	Chemo vs SBRT + chemo	?
Gomez et al.	2016	RPh2	Oligometastatic NSCLC (Mut Pos or Neg) <=3 mets	Chemo/obs vs XRT/Surgery + chemo/obs	Median PFS 3.9 months vs 11.9 months
Iyengar et al.	2017	RPh2	Oligometastatic NSCLC <=5 mets	Chemo vs SBRT + chemo	Median PFS 3.8 months vs 9.7 months

Table of actively accruing phase III randomised NSCLC oligometastatic trials

Study	Year	Type of Study	Patient Eligibility	Arms of Study	Primary Endpoint
NRG LU 002 NCT03137771	2017	RPh3	Oligometastatic NSCLC <=3 mets	Chemo vs SBRT + chemo (amendment to include IO)	OS
SARON NCT02417662	2016	RPh3	Oligometastatic NSCLC <=3 mets	Chemo vs SBRT + chemo	OS

Don't miss it !
Successful Strategies Workshop
Monday, September 18, 10:00
Room 20

Building Successful Strategies for the Future

The importance of clinical knowledge and entrepreneurial thinking for the future of interventional radiology is increasingly being recognised. In order to account for this, a workshop called Successful Strategies for Interventional Radiology Practice is being offered which will provide practical insights and solutions from a variety of case studies.

The sessions are geared towards current and future radiology department heads and IR unit leaders and will be split into four learning modules.

The Breakdown

The first module will focus on building clinical business. In this portion of the workshop, physicians will pick up general business aspects of running a clinic, including relevant vocabulary. Participants will learn the definition of "business case" and "target groups". They will also learn how to identify potential partners, competitors and collaborators. The business models currently in action at the Miami Vascular Institute and the Istituto Europeo di Oncologia in Milano will be looked at as examples.

The second module will move on to discuss clinical services. Here, speakers will address the elements of a successful clinical practise as well as how to manage the expectations of prospective patients. Points of discussion will include patient contact time, dedicated office space, follow-up responsibility and the various potential service options, such as stand-alone clinics, multidisciplinary centres or shared services.

Module three will address basic principles of marketing, including segmentation, advantages and disadvantages of communication channels and creating awareness both locally and in a wider respect. Marketing strategies in France and the United States will be analysed, and doctors will leave with a better understanding of communication strategies for interacting with referring doctors, patients and the general public.

Finally, module four will cover the combination of infrastructure and work flow. Questions such as how infrastructure can support patient comfort, enhance education/teaching, and affect personnel will be discussed. Examples of different infrastructural solutions in IR practice will also be shown.

This workshop is the perfect opportunity for interventional radiologists looking to expand their clinical care and gain substantial practical knowledge. The workshop is free to attend for all delegates, but pre-registration was recommended. Interested parties can enquire about last-minute vacancies at the front desk of the session room half an hour before it starts.

Successful Strategies for Interventional Radiology Practice

10:00-10:45
STRAT 1806 Building clinical business

1806.1 Core business planning
M. Noesberger (Solothurn/CH)
1806.2 Business model of IR at Miami Cardiac & Vascular Institute
B.T. Katzen (Miami, FL/US)
1806.3 Business model at Istituto Europeo di Oncologia in Milano
F. Orsi (Milan/IT)
1806.4 Panel discussion

10:45-11:30
STRAT 1807 Clinical services

1807.1 Standard requirements for clinical services
O.M. van Delden (Amsterdam/NL)
1807.2 Stand-alone
R.A. Baum (Boston, MA/US)
1807.3 Multidisciplinary
F. Orsi (Milan/IT)
1807.4 Combined
C.A. Binkert (Winterthur/CH)
1807.5 Panel discussion

12:30-13:15
STRAT 1905 Marketing

1905.1 Effective communication and the use of (social) media
L. Zenk (Vienna/AT)
1905.2 To the patient
R.A. Baum (Boston, MA/US)
1905.3 To the referrers
A. Gangi (Strasbourg/FR)
1905.4 Panel discussion

13:15-14:00
STRAT 1906 Infrastructures

1906.1 Architecture and its impact to the patient pathway
I. Degen (Zurich/CH)
1906.2 Example from Strasbourg
A. Gangi (Strasbourg/FR)
1906.3 Example from Miami
B.T. Katzen (Miami, FL/US)
1906.4 Example from Winterthur
C.A. Binkert (Winterthur/CH)
1906.5 Panel discussion

STUDENT CORNER

be inspIRed...

Risha Rose, CIRSE Office

Becoming an IR: Empowering the Future Generation

The European Trainee Forum (ETF), which was formed late in 2015 and is led by Chairperson Dr. Gregory Makris, had its first official meeting during ECIO 2016. The main objective of this Forum is to bring the trainees closer together at the early stages of their careers and create a dynamic community that will share the same values and aspirations, focusing on the development and further growth of the new generation of IR trainees across Europe. Establishing this network early on is important for improving the quality of IR training in Europe, raising public awareness with regard to the subspecialty and, of course, creating opportunities for collaboration with other European societies and associations.

We had the chance to ask ETF Subcommittee Member, Dr. Fatemeh Sakhinia, some questions on her perspectives on becoming an IR. Read on to find out what she had to say!

CIRSE: What inspired you to choose IR as a career?

Sakhinia: As a child, I was creative, loved solving puzzles and was good with my hands. In medical school, I gravitated towards anatomy and developed a passion for its enormity and complexity.

When I was considering a future career as a junior doctor, I thought that radiology would be the obvious choice to continue my love of anatomy and solving problems, but felt that as a specialty, it was isolated and disconnected from direct patient care.

However, working as a junior doctor in vascular surgery, I discovered interventional radiology and realised how wrong I was. I went to the interventional radiologists with a myriad of clinical problems, to which the they always had a solution despite the complexity of the case. I realised that they not only accurately diagnosed problems on scans but also were able to offer the most innovative, yet simple, solutions to the compound problems.

This was what I was looking for – a unique specialty allowing me to combine all my passions into one.

CIRSE: What is the most exciting part of your work day as an IR?

Sakhinia: The most exciting part of my day is when I am in the angiography suite, dealing with a variety of cases quickly and efficiently. From inserting lines in patients with no peripheral access to repairing aortic aneurysms through 10 mm skin incisions, the challenges never seem to stop.

The ability to think on your feet and make instant changes to treatment that have such a dramatic effect on patients on a day to day basis never fails to excite me.

CIRSE: Do you have an IR specialisation or find a specific area within IR most interesting?

Sakhinia: Although I find all of interventional radiology interesting and exciting, I find interventional oncology most intriguing. The ability to treat cancer with precision while preserving the function of the affected organ with relatively small side effects to patients, and the continuing advancement of therapy and newer techniques kept me glued.

CIRSE: The gender ratio in IR is currently quite significant; do you have any advice for females entering the discipline?

Sakhinia: Don't let anyone tell you it's not a woman's job! I had some discouragement from non-IR consultants due to perceived risks of radiation and that it's a demanding job for females. This could not be farther from the truth. There are many female IRs who have successful careers and great personal lives with families. Even though IR is still strongly male dominated, as a female you can have an excellent, calming and strategic influence. Allow your knowledge and skills to speak for themselves.

As a female IR, most of my challenges are those similar to what my male colleagues would face daily and they don't centre on my gender. As long as you are true to yourself, dedicated to your patients and committed to your practice to the best of your abilities and remain professional, you will go a long way regardless of your gender.

CIRSE: Why did you become involved with the ETF?

Sakhinia: I am passionate about training and making positive changes to secure the future of interventional radiology as part of the wider team of IRs. This passion led me to stand for positions in training councils to make a difference. As part of my responsibility as Chair of the British Society of Interventional Radiologists Trainee Committee (BSIRT), it was important for me to be involved and active with the European group too.

Dr. Fatemeh Sakhinia, first row on far right, with members of ETF at ECIO 2017.

CIRSE: What is the ETF doing to support IRs in training?

Sakhinia: The ETF meets at various European meetings and has regular web conferences. We have an active committee with a representative from a lot of the countries who come together with a variety of ideas on how to help medical students, junior doctors and radiology trainees get the most out of the European IR group. During CIRSE, we plan a variety of IR trainee specific sessions, lectures by world-renowned practicing IRs and workshops covering useful topics.

CIRSE: What educational opportunities does CIRSE provide young IRs?

Sakhinia: There are a number of grants available to IR trainees and medical students who wish to attend the meetings and present educational posters, abstracts or research presentations.

The European Curriculum and Syllabus for IR created by CIRSE is also a comprehensive compilation of standardised guidelines for training that covers an array of general IR topics and safety concepts.

The ETF is also involved with the CIRSE Student Programme to further its impact and help increase the number of European medical students that opt for a career in IR. A further goal of the ETF is to make IR a more attractive choice for female medical students, who are, unfortunately, still somewhat under-represented.

CIRSE: How would you encourage medical students to choose IR?

Sakhinia: I would strongly advise medical students to spend time in IR during their placements in radiology departments by getting involved in clinics, angio sessions, patient follow-ups, multidisciplinary team meetings and image interpretation. Students should grab every opportunity and apply for educational grants and scholarships to attend interventional radiology meetings, such as CIRSE. They should try to present audits, research and projects at these meetings.

CIRSE: What advice would you give to young IRs throughout Europe who are just starting their IR training?

Sakhinia: It is important to stay focused throughout your training. Get involved in cases. Don't just stand and observe the cases, but try to be actively involved. Once the case is finished, read through the case and the techniques, and then log it into your memory bank. Get your EBIR exam towards the end of training, as it will allow you to consolidate all your training. Be actively involved in administration and interventional radiology leadership roles in your country. Remember that if you do not participate, then you forgo the chance to make a difference.

Recommended for Students Today!

SS 1704: Advanced biliary therapies
08:30-09:30, Auditorium 15

SS 1802: Central venous access for IRs
10:00 - 11:00, Auditorium 15

ETF: EBIR exam – practical advice
12:45 – 13:00, ETF Pavilion

RP in fluoroscopy-guided procedures
13:00 – 13:15, Radiation Protection

IDEAS ECD 2103: A bad day in the angiosuite – TEVAR
14:30 – 15:30, Auditorium 3

WS 2202: Revascularisation in acute ischaemic stroke
16:15 – 17:15, Auditorium 2

IDEAS WS 2305: Fundamentals of TEVAR
17:30 – 18:30, Auditorium 3

QUESTIONS OF THE DAY

Monday, September 18, 2017

Be in with a chance to win daily prizes by sending your answers to **students@cirse.org** by 18:00 tonight.

Answers to the below questions can be found within today's Congress News and/or at today's student-recommended sessions.

The first two correct responses will win €20 Amazon vouchers. Ready… set… GO!

1. What are the 5 reasons why ESIR courses are good for developing your career as an IR?

2. The most common complication of percutaneous transhepatic lithotripsy is cholangitis. **True or False.**

3. Fill in the blanks:
   The CIRSE Registry for SIR-Spheres Therapy (CIRT) is a ████████ -wide registry that collects data on how ████████████████ therapy with SIR-Spheres is being used to treat ████ tumours.
   Since it began in ████, the registry has already been able to recruit 30 ████████ from eight different countries and has enrolled over ███ patients.

Don't miss it !
Expert Case Discussion
Difficult recanalisation
Monday, September 18, 08:30-09:30
Auditorium 1

Endovascular treatment of the SFA – difficult recanalisation

Hans Lindgren

Hans Lindgren
Helsingborg Hospital
Helsingborg, Sweden

Hans Lindgren received his medical degree and PhD at the University of Lund and is a senior consultant at Helsingborg Hospital's Department of Interventional Radiology. His research focuses on peripheral artery disease and intermittent claudication, prostate artery embolisation, chronic pain and health-related quality of life outcomes. His current research project has randomised intermittent claudicants to invasive or best medical treatment, and already acquiring one-year follow-up data; the patients will be followed for 2 and 5 years. He is also involved in running a pilot study on 2D perfusion, a new method for evaluating the perfusion in the foot before and after invasive treatment in patients with CLI.

Peripheral arterial disease (PAD) is common, affecting about 200 million individuals worldwide. In addition to best medical treatment (BMT), treatment options include minimally invasive endovascular treatments such as PTA with or without stenting, and surgical procedures such as thromboendarterectomy (TEA) with or without femoropopliteal bypass grafting.

While there is little debate over the indication for invasive treatment of patients with CLI, the management of intermittent claudication (IC) traditionally consists of risk factor modification and BMT with or without supervised exercise training (SET). When IC is caused by infrainguinal lesions, invasive treatment is even more controversial, and international guidelines recommend that infrainguinal lesions should not, in most cases, be revascularised [1]. Recent studies show significantly better health-related quality of life (HRQoL) after invasive treatment [2,3], and both patients with CLI and IC are often treated with endovascular means in common practice.

The SFA is especially difficult to treat with endovascular methods. Due to anatomical reasons (movement of adjacent joints and fixation in the adductor canal), it undergoes deformation: axial compression and extension; radial compression; bending and torsion; and shortens approximately 13% in the foetal compared to the supine position (Fig. 1) [4].

The recanalisation

Lesion characteristics, such as stenosis or occlusion, and lesion lengths also play an important role with regard to whether the lesions can be passed either intraluminally or subintimally. There are different ways of dealing with this problem; if the lesion is short it is often best to stay intraluminal. The longer the lesion and the more calcifications, the more difficult this gets, resulting in subintimal guidewire passage.

Chronic total occlusions (CTO) are especially challenging and one of the primary causes of procedural failure in peripheral interventions [5].

Percutaneous passage of the guidewire is, of course, essential to recanalise the CTO successfully. However, percutaneous recanalisation of long CTOs of the femoropopliteal artery by anterograde methods, using a guidewire and catheter, is not always successful, depending on lesion length, calcification, operator experience and run-off vessels. In that situation, one option can be to perform a subintimal angioplasty (SAP) by deliberately going subintimal and crossing the intima in a healthy part of the vessel above the lesion and re-entering in true lumen below the lesion, as described by Bolia in 1987 [6]. A meta-analysis of all SAP between 1989-2009 (36 studies; 2,800 legs) showed 12-month primary patency of 56% [7].

Other methods, such as a retrograde approach (Fig. 2-4), first described by Tønnesen et al. in 1988 [8], and re-entry devices (Fig. 5-6) can also deliver endovascular solutions for unsuccessful antegrade CTO crossings. As re-entry devices and specially designed crossing catheters are expensive and not available in all countries, persistence with regular devices is a viable alternative. When persisting with regular devices, it can, in some situations, be very difficult to continue with the passage through heavily calcified lesions and the use of the stiff end of a glidewire can be helpful. Already in 1995, Kjellgren described two successful cases where he crossed heavily calcified SFA lesions with this technique [9].

In some rare situations, heavy calcifications can cause difficulty for balloon catheter/microcatheter passage or balloon or stent expansion, even if the guidewire is successfully passed across the lesion. To handle this situation, the PIERCE technique, described by Ichihashi et al. [10], using percutaneous direct needle puncture of the calcified plaque to allow subsequent passage and dilation of the balloon, can be used.

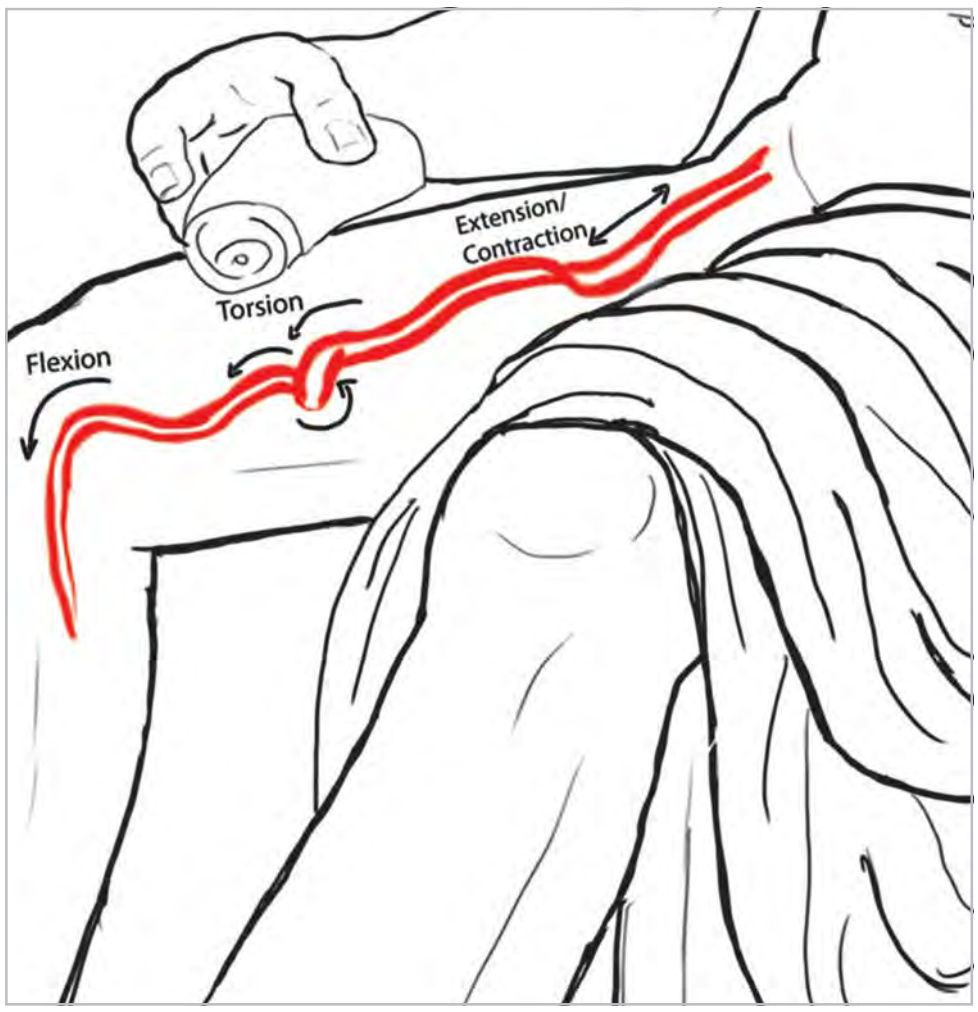

Fig. 1: Movement pattern of the SFA. Illustration by Cecilia Lindgren.

And once the SFA lesion has been crossed?

Once the lesion is passed, the difficult question on how to treat it remains. PTA has been widely used in the treatment of femoropopliteal disease for many years, but results have been suboptimal with very high restenosis rates with PTA alone in long SFA lesions. The presence of occlusion rather than stenosis, lesion length, and the severity of run-off vessel disease all contribute to poor results [11]. Several studies have investigated the patency of balloon-expandable stents in the treatment of SFA lesions. These stents have low flexibility and a high risk of deformation when placed in the SFA, with suboptimal results and high restenosis rates, not better than PTA alone in long SFA lesions [12,13].

Self-expanding nitinol stents, on the other hand, have higher flexibility and exert moderate to high radial force. Promising results have been obtained with placement of such stents in the SFA [14].

The SFA is, however, more subject to stent fracture and restenosis than other vascular territories [15,16] and this is even more pronounced in longer SFA lesions that require longer, frequently overlapping stents [16], due to mechanical fatigue in the stents as a result of the complicated repetitive movement pattern mentioned above (Fig. 1).

In treatment recommendations of infrainguinal lesions, stent placement is still controversial; the role of primary or bail-out stenting and even the question whether to use stents at all are under debate [1]. However, data on self-expanding nitinol bare-metal stents (BMS) are now compiling in numerous prospective clinical trials showing efficacy both in terms of primary patency and safety of primary stenting of the SFA [17].

In the treatment of SFA lesions, the opinion of "leaving nothing behind" is very topical and studies with drug-eluting balloons (DEB) have shown superior results compared to PTA [18-20]. In Sweden, drug-eluting devices (DEB and DES) are still quite rarely used in clinical practice due to a lack of evidence of superiority and for economic reasons. This has prompted the initiation of a national prospective trial in which eligible patients with infrainguinal disease are now randomised between use of drug or non-drug technology [21].

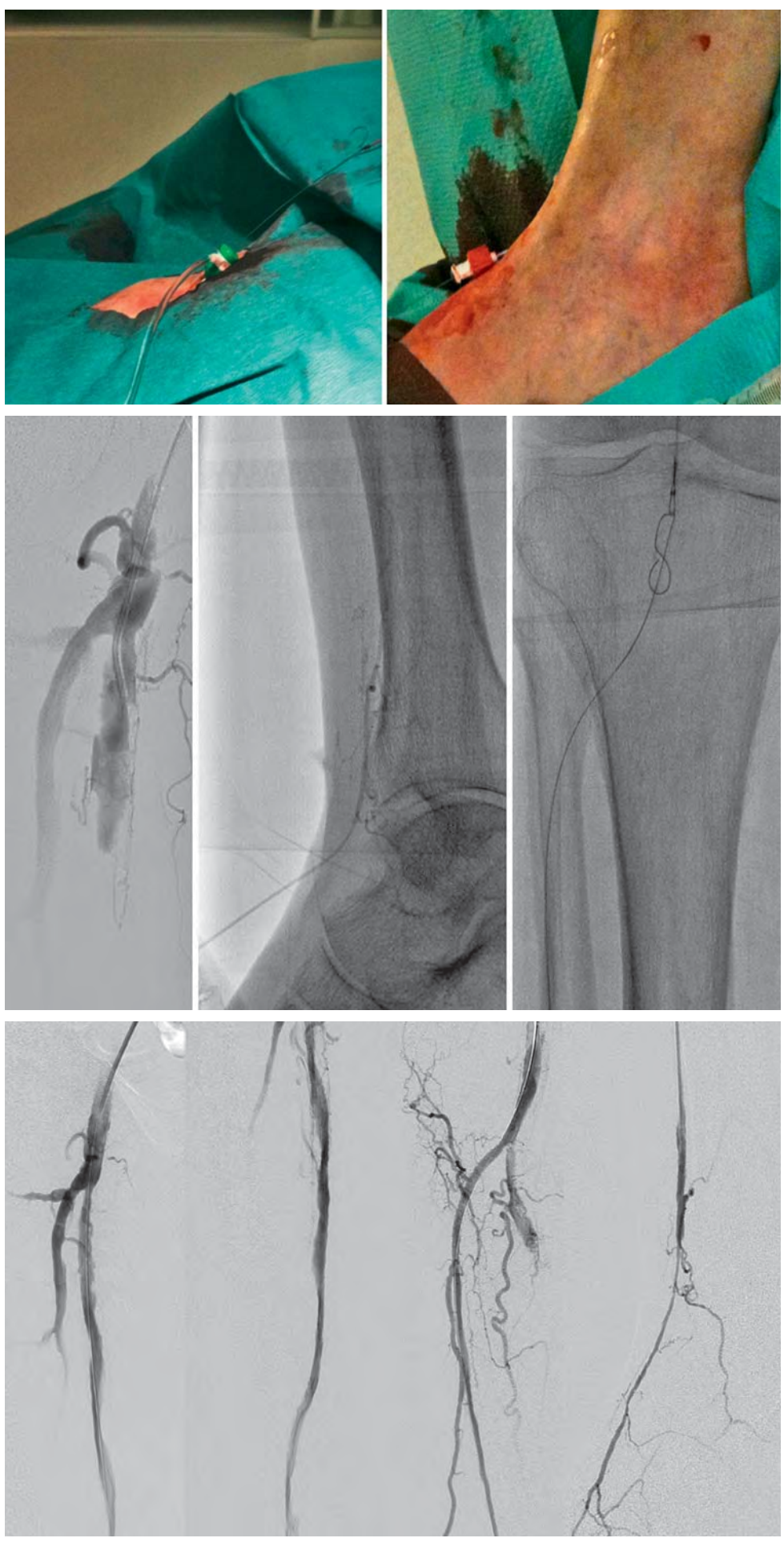

Fig. 2-4: Recanalisation of CTO the whole length of vessels with ante-and retrograde approach. Images from the Department of Interventional Radiology, Helsingborg Hospital, Sweden.

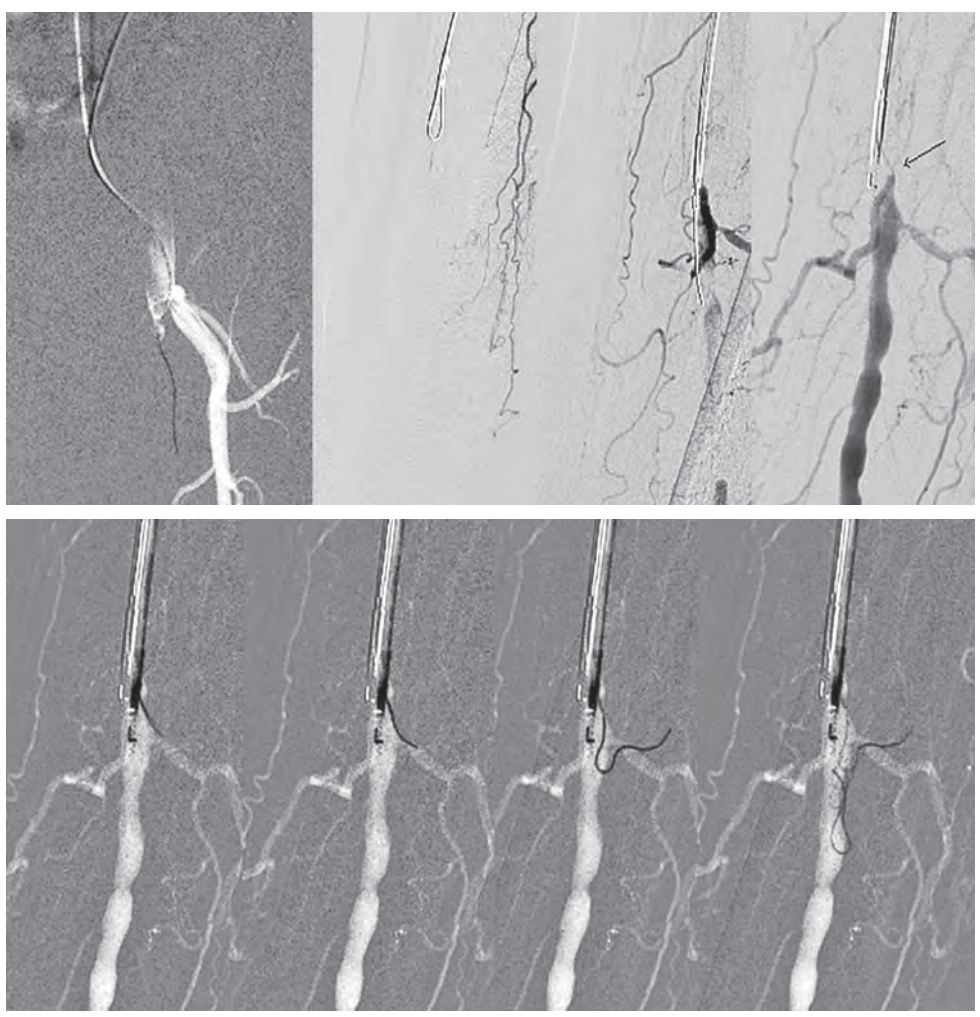

Fig. 5-6: Re-entry into true lumen of SFA with re-entry device. Images from the Department of Interventional Radiology, Helsingborg Hospital, Sweden.

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